DELHI TECHNOLOGICAL UNIVERSITY

(Formerly Delhi College of Engineering)

A

COMPENDIUM OF ABSTRACTS OF PUBLISHED PAPERS

5th RESEARCH EXCELLENCE AWARDS

1st January, 2021 to 31st December, 2021

A

COMPENDIUM OF ABSTRACTS OF PUBLISHED PAPERS

5th RESEARCH EXCELLENCE AWARDS

1st January, 2021 to 31st December, 2021

DELHI TECHNOLOGICAL UNIVERSITY

(Formerly Delhi College of Engineering)

Research at the UNIVERSITY

Delhi Technological University has shown discernible excellence in technical education, research and innovations for nearly eight decades and was formerly called Delhi College of Engineering (established as Delhi Polytechnic in 1941 AD). It came into existence to cater the needs of industries for trained technical manpower with practical experience and sound theoretical knowledge. It was set up as a follow up of the historic recommendations of Wood and Abott Committee (1938 AD) near the traditional occupational centre of Delhi namely Kashmere Gate. It comprised of a multi disciplinary institution offering wide ranging programmes in engineering, technology, arts and sculpture, architecture, pharmacy and commerce. In July 2009 it became Delhi Technological University by an act of Delhi.

It is a non-affiliating teaching–cum–research university to facilitate and promote scientific enquiry using state of art equipments for research, protection of intellectual property rights, technology business incubation, product innovation and extension work in science, technology, management and allied areas. The university is currently offering bachelors programme in fifteen disciplines, masters programme in twenty-three specialisations and doctoral programs in the thrust areas of research. There are fifty doctoral fellowships being offered in order to further strengthen the research culture in the campus. The postgraduate programs at the university focus upon VLSI design, software engineering, information systems, microwave and optical communication, thermal, structural, geotechnical, water resources and environmental engineering, computational design, polymer science and so on.

The university is committed to promote research through the scientific priorities right from undergraduate onwards. It has made significant contributions through the published research in the scholarly journals, patenting, intellectual property rights (IPR), and through an incubation and innovation. The faculty of civil, computer, chemical and polymer, electrical, electronics, environmental, engineering physics and mechanical engineering is involved in to ever increasing number of industrial consultancy projects from the government departments, private organization and sponsored research projects from AICTE, DST, DBT, UGC, CSIR, ICMR, DRDO to name a few. The university provides financial support to the faculty and students for presenting research papers in national and international conferences. There is innovation fund to support inter disciplinary student teams for innovative product development and participation in international design competitions. The university currently houses fifteen startup units. It is a named as a nodal centre for incubation at Delhi supported by the Govt. of NCT of Delhi. The aim of incubation is to serve the society by the technology accelerators and business incubators using the cutting edge research and development at the universities to solve real world problems.

The thrust areas of research at the university are clean energy technologies, material testing, fracture mechanics, rock and geo-mechanics, structural dynamics, CFD, environmental monitoring, future automobile solutions, metro technology and systems, nano-scale devices, biosensors, robotics and machine vision, new and smart materials, conducting polymers, computer aided design, physics of plasma, VLSI design and embedded system, machine learning, software quality and testing, intelligent power systems, broadband on power lines, info security and network management, knowledge and innovation management, socially relevant technologies.

TABLE OF **CONTENTS**

FROM THE DESK OF VICE CHANCELLOR

PREFACE

GUIDELINES FOR RESEARCH AWARDS 1

LIST OF AWARDEES 7

Department of Applied Chemistry

- MR. ATUL VARSHNEY 36
- DR. DEENAN SANTHIYA 37
- MS. DEEPALI AHLUWALIA 39
- PROF. DEVENDRA KUMAR 40
- MS. JYOTI 42
- DR. MANISH JAIN 43
- MR. MUKESH KUMAR MISHRA 45
- MS. RADHIKA BATRA 46
- PROF. RAJINDER K. GUPTA 48
- DR. RAMINDER KAUR 50
- MS. RITIKA KUBBA 51
- PROF. ROLI PURWAR 52
- DR. SAURABH MEHTA 56
- MS. SRISHTI MITTAL 57
- PROF. S. G. WARKAR 59
- MS. TANUSHREE GHOSH 60

Department of Applied Mathematics

- PROF. ADITYA KAUSHIK 61
- MS. ANU KUMARI 63
- MS. ANUMA GARG 64
- PROF. CHANDRA PRAKASH SINGH 65
- PROF. H. C. TANEJA 67
- MR. KAMALJEET GANGANIA 68
- MS. KM. LIPI 69
- MS. NAV SHAKTI MISHRA 70
- MS. PARUL CHAUHAN 71
- MS. RADHIKA KAVRA 72
- MR. RAJESH KUMAR ASTHANA 73
- MS. RICHA ROHIRA 75
- MS. RUCHIKA LOCHAB 76
- PROF. SATYABRATA ADHIKARI 78
- MS. SHAGUN BANGA 81
- MS. SHRUTI AGGARWAL 82
- DR. S. SIVAPRASAD KUMAR 83
- MS. TANYA MALHOTRA 85
- DR. VIVEK KUMAR 86

Department of Applied Physics

- PROF. A. S. RAO 88
- MR. ARYAN 92
- MR. BHAVYA KUMAR 93
- MS. DEEPALI 94
- DR. HARPREET KAUR 95
- DR. M. JAYASIMHADRI 97
- DR. MOHAN SINGH MEHATA 101
- MR. MOHIT MANN 107
- DR. MRITYUNJAY KUMAR SINGH 108
- DR. MUKHTIYAR SINGH 109
- PROF. NITIN KUMAR PURI 110
- MR. RAJAT BAJAJ 111
- PROF. RAVINDRA KUMAR SINHA 112
- PROF. RINKU SHARMA 114
- PROF. RISHU CHAUJAR 115
- DR. S. SHANKAR SUBRAMANIAN 119
- MS. SAMRITI SHARMA 121
- DR. SUMANDEEP KAUR 123
- PROF. SURESH C. SHARMA 124
- MR. VIJAY SINGH MEENA 126
- DR. VINEET SHARMA 127
- DR. VINOD SINGH 129
- DR. YOGITA KALRA 130

Department of Biotechnology

- DR. ANCHITA KALSI 131
- PROF. BANSI DHAR MALHOTRA 133
- PROF. JAI GOPAL SHARMA 135
- DR. KRITI BHANDARI 137
- MR. LAKHAN KUMAR 138
- MR. NAVNEET CHAUDHARY 139
- DR. NAVNEETA BHARADVAJA 140
- PROF. PRAVIR KUMAR 142
- MR. RAHUL KANDPAL 147
- MS. RITIKA LUTHRA 148
- MR. ROHAN GUPTA 150
- MS. SHREEJA DATTA 153
- MS. SIMRAN KAUR 154
- MS. SMITA KUMARI 155
- PROF. YASHA HASIJA 156

Department of Civil Engineering

- DR. MANVENDRA VERMA 157
- PROF. RAJU SARKAR 158
- DR. RITU RAJ 162
- MR. SAGAR MEHRA 164
- MS. SUPRIYA PAL 165

Department of Computer Science and Engineering

- DR. AKSHI KUMAR 167
- MS. AMRITA SISODIA 171
- PROF. ANIL SINGH PARIHAR 172
- MR. ARKA BHOWMIK 174
- DR. ASHISH GIRDHAR 175
- MS. INDU SINGH 176
- MR. KAVINDER SINGH 178
- MS. MANISHA SAINI 179
- MS. MANPREET KAUR 180
- DR. PAWAN SINGH MEHRA 181
- MS. PRATIMA SHARMA 182
- PROF. RAHUL KATARYA 183
- DR. RAJEEV KUMAR 186
- DR. SANJAY KUMAR 188
- PROF. SHAILENDER KUMAR 191

Delhi School of Management

- DR. DEEP SHREE 192

Department of Electrical Engineering

- DR. AAKASH KUMAR SETH 193
- DR. AJAY KUMAR 195
- MR. AJENDRA SINGH 196
- MR. AJISHEK RAJ 197
- DR. AJIT NANDAWADEKAR 199

TABLE OF CONTENTS

- DR. AMBRISH DEVANSHU 200
- MS. ANKITA ARORA 201
- MR. ANUNAY GUPTA 202
- MR. AVDHESH KUMAR 203
- DR. HEMANT SAXENA 205
- MR. KUSHAGRA BHATIA 207
- DR. MAYANK KUMAR 208
- MS. NEHA KHANDUJA 209
- MR. PRAVEEN BANSAL 210
- DR. PRIYANKA CHAUDHARY 211
- MR. PRIYANSH KEDIA 212
- DR. RAJESH KUMAR 213
- DR. RAM BHAGAT 214
- MS. RUPAM SINGH 215
- PROF. VINOD KUMAR YADAV 217

Department of Electronics and Communication Engineering

- MR. ADITYA S KUMAR 218
- MS. AKANKSHA SRIVASTAVA 219
- DR. AKHILESH VERMA 220
- MR. ANURAG CHAUHAN 221
- MS. BHAWNA RAWAT 222
- DR. CHHAVI DHIMAN 224
- DR. DWIJENDRA PANDEY 225
- MS. GARIMA VARSHNEY 226
- DR. GAURAV SAXENA 228
- DR. MANJEET KUMAR 230
- MR. MOHD SAZID 233
- MS. MONICA GUPTA 234
- MR. MUNINDRA 236
- MR. NAVNIT KUMAR 237
- PROF. NEETA PANDEY 238
- MS. NEETIKA YADAV 243
- MR. OM KRISHNA GUPTA 244
- PROF. POORNIMA MITTAL 245
- DR. PRIYANKA GARG 248
- MR. R. ARUNDEEPAKVEL 249
- PROF. RAJIV KAPOOR 250
- MS. RIYA JAIN 252
- PROF. S. INDU 253
- DR. SACHIN TARAN 255
- MR. SHASHWAT SINGH 256
- DR. SONAM REWARI 257
- DR. SUDIPTA MAJUMDAR 258
- MS. SUMEDHA GUPTA 259
- DR. TEJ SINGH 261

Department of Environmental Engineering

- MR. ALI REZA NOORI 263
- PROF. ANIL KUMAR HARITASH 265
- MR. HARSH PIPIL 268
- MS. LOVLEEN GUPTA 269
- DR. RAJEEV KUMAR MISHRA 270
- PROF. S. K. SINGH 273
- DR. SAKSHI 275
- DR. SAURAV KUMAR AMBASTHA 277
- MR. SHAILENDRA KUMAR YADAV 278
- MS. VANDANA SHAN 280

Department of Humanities

- PROF. NAND KUMAR 281

Department of Environmental Engineering

- DR. ASHISH KUMAR 282
- DR. BINDU VERMA 283
- MS. CHAHAT RAJ 284
- MS. DEEPIKA VARSHNEY 285
- PROF. DINESH K. VISHWAKARMA 287
- DR. ISHA SINGH 292
- PROF. KAPIL SHARMA 293
- MR. NARESH KUMAR 296
- MS. PRIYANKA MEEL 297
- MR. SAHIL RAHEJA 299
- PROF. SEBA SUSAN 301
- DR. SHALINI GAKHAR 302
- MS. SRISHTI VASHISHTHA 303
- MS. SWATI SHARDA 304

Department of Mechanical Engineering

- PROF. AKHILESH ARORA 306
- MR. ANAND KUSHWAH 307
- DR. ANIL KUMAR 308
- DR. ANKIT SONTHALIA 311
- MR. ANUJ SHARMA 313
- MR. ASEEM DUBEY 314
- MR. ASHOK KUMAR SINGH 316
- MR. CHANDRA SHEKHAR SINGH 317
- MR. FAIZAN KHALID 318
- MR. FURKAN AHMAD 319
- PROF. GIRISH KUMAR 320
- MR. HUSAIN MEHDI 322
- DR. KAUSHALENDRA KUMAR SINGH 324
- DR. MOHAMMAD ZUNAID 325
- MR. MOHD ASJAD SIDDIQUI 326
- MR. MOHIT VISHNOI 327
- DR. MUKUL TOMAR 328
- DR. N. YUVARAJ 329
- DR. PARAS KUMAR 330
- DR. PRAVIN KUMAR 332
- PROF. RAJESH KUMAR 334
- DR. RAVI BUTOLA 336
- DR. SACHIN DHULL 337
- MR. SHRIKANT VIDYA 338
- PROF. VIJAY GAUTAM 339
- DR. YASHWANT KOLI 340

Department of Software Engineering

- DR. ABHILASHA SHARMA 342
- PROF. RUCHIKA MALHOTRA 343
- MR. SANJAY PATIDAR 344

University School of Management and Entrepreneurship

- DR. NAVAL GARG 345
- DR. RAJESH SHARMA 346

Patent Inventor's Profiles

- DR. KAPIL SHARMA 349


DELTECH
UNIVERSITY
DELHI TECHNOLOGICAL UNIVERSITY

From the Desk of the
VICE CHANCELLOR

Delhi Technological University (formerly Delhi College of Engineering) has an illustrious history spanning over 80 years. This premier institution is well known worldwide for its outstanding education, research & innovations. Delhi Technological University (DTU) currently offers various inter-disciplinary and industry relevant programs in Science, Technology, Management and allied areas at both the undergraduate and postgraduate level.

In this university we have been actively promoting research and innovations by providing research and innovation environment to the students and faculty that meets the international and global standards. We in DTU are committed to support excellence in research and recognizing those who have achieved this.

The university is committed to support excellence in research and recognizing faculty and students, based on this idea, the university has constituted Research Excellence Awards in 2017. The purpose of the awards is to encourage and promote research culture in all the disciplines of the university and to celebrate the individual excellence in research. The university offers three categories of awards annually namely, Outstanding Research Awards, Premier Research Awards and Commendable Research Awards. The university has awarded 103 Researchers with 82 SCI/SCIE indexed publications, 152 researchers with 107 SCI/SCIE indexed publications, 155 researchers with 116 SCI/SCIE indexed publications and 272 researchers with 191 SCI/SCIE indexed publications in 2018, 2019, 2020 and 2021, respectively.

In Times Higher Education World University Rankings, we secured 1001+ when we participated first time and this year, we have been placed in the bracket of 601-800 primarily on the basis of research and citations. We have been placed 7th in India. We have been ranked at 191 in the Emerging Economy Rankings this year. The university has also been consistently ranked among the best 10 engineering institutions as per the various independent Surveys on Best Engineering Institutions of the country. The University has been ranked 7th amongst Government Engineering Colleges by India Today in 2021. The magazine ranking focus on quality of students and placements.

In 2020 NIRF rankings we were ranked 36th position among the engineering institutions and at 45th in the categories of universities. The 2021 NIRF rankings placed DTU at the 36th position among the engineering institutions and at 42th in the categories of universities.

The h-index of Delhi Technological University was 34 in 2016, 44 in 2017, 60 in 2018, 69 in 2019, 79 in 2020 and currently the h-index of the university is 87, as reported by Scopus. The publications of the university are 525 in 2016, 548 in 2017, 665 in 2018, 821 in 2019, 1008 in 2020 and 1562 in 2021. The total citations of the university were 4024 in 2016, 4981 in 2017, 6613 in 2018, 9661 in 2019, 15479 in 2020 and are 21134 in 2021.

The university has established the DTU Innovation and Incubation Foundation and currently, 18 teams are working in the Centre. Recently, Govt. of NCT of Delhi has awarded the university a Project "Youth for Education" with an aim to establish Project Management unit for the Design, Development and Implementation of Youth for Education Program. Under this program, Govt. of NCT of Delhi has launched "Desh Ke Mentor" program, which is one of the largest mentoring programs in school education.

I heartily congratulate all the 2022 research excellence award recipients in various disciplines for their outstanding achievement in research and look forward how their contributions will excel our university and our nation, in the years to come.

Dated: 26.02.2022

Prof. Jai Prakash Saini
Vice-Chancellor, DTU

PREFACE

The promotion of invisible collegiums of natural researchers in to the scientific priority, peer review and enquiry is deeply ingrained in the commitments of the university. In its pursuance, an idea to constitute the research excellence award was conceived and envisaged by the Vice Chancellor of the university, Prof. Yogesh Singh, in the year 2016. The university formed a committee that consisted of distinguished academicians and researchers from various departments to frame a guideline for the research excellence award. The committee witnessed several stormy sessions while framing the guidelines and scrutinizing the nominations received for the award. This award consisted of three categories namely outstanding, premier and commendable research. Such a categorization was an extremely difficult task. It doesn't support any claim of superiority of one category of the publications over the other. It is considered an inspirational incentive for the natural researchers to make efforts for the excellence in research.

This compendium of abstracts of published papers is a collection of works submitted by the faculty members along with the link to the details on the World Wide Web for the year 2021 and considered for research excellence award. It shall be helpful in inspiring young researchers and students who pursue research in the university.

All the publications eligible for research excellence awards must be the result of author's original contribution published and indexed as per the notification issued by the university. The awards are proposed to be presented to the faculty members of the university annually. The primary goal of the ***Outstanding Research Awards*** is to recognize faculty who published papers in outstanding category with clarivate analytics impact factor not less than two. The aim of the ***Premier Research Awards*** is to recognize the faculty who published papers in the reputed journals in primer category with clarivate analytics impact factor not less than one. The goal of the ***Commendable Research Awards*** is to recognize the faculty who published papers in the reputed journals in commendable category clarivate analytics impact factor not less than one. The university decided in 2020 to consider patents granted in the same calendar year as of the research excellence awards for the purpose of recognition and promotion of IPR.

Last year three Scientists from Delhi Technological University have been ranked by Stanford University report, amongst the top 2% scientists in the world in various fields of specializations for career-long citation impact up until the end of 2019. The university recognizes their achievement and congratulate them.

The university congratulates all the members of academic fraternity on receiving the research excellence awards. It hopes to inspire the academic fraternity to work for excellence in research.

Ashutosh Trivedi
Ruchika Malhotra
Delhi Technological University

PROF. JAI PRAKASH SAINI

VICE CHANCELLOR

Prof. Ashutosh Trivedi

DEAN
Industrial Research and Development (IRD)

Prof. Ruchika Malhotra

ASSOCIATE DEAN
Industrial Research and Development (IRD)

DELHI TECHNOLOGICAL UNIVERSITY

Established under Govt. of Delhi Act 6 of 2009
(Formerly Delhi College of Engineering)
BAWANA ROAD, SHAHBAD DAULATPUR, DELHI-42

No. F.DTU/IRD/2020/09/2534 Date: 21.07.2020

NOTIFICATION

In exercise of the powers conferred under sub-section (1) of Section 23 of the Delhi Technological University Act, 2009 (Delhi Act 6 of 2009), the Board of Management of Delhi Technological University in its 37th meeting held on 29.05.2020 vide agenda number 37.5 approved the revision in the Guidelines of Award to the Researchers of Delhi Technological University notified vide notification no: F.DTU/Council/BOM-AC/Notification/31/2018/2443 dated 12.09.2018. The revised guidelines are as under:

Guidelines for the Award for Published Paper of the Researchers of Delhi Technological University

The cash awards will be given to researchers in the recognition of importance of the published research work and to motivate the individual excellence in research. The publications considered must be listed in Science Citation Index (SCI) or SCI expanded. The awards will be granted for the journal papers published in each year (1st January – 31st December, published along with Digital Object Identifier (DOI), pagination and year of publication). Only the first author and/ or the corresponding author shall be eligible to apply for the award. A notice will be circulated annually and the entry form consisting published research papers qualifying the selection criteria will be submitted to concern section. The publication made in the journals, which seeks publication fee (article processing charges or open access charges), shall not be considered for cash awards (irrespective of the listing in the publication societies/ houses/ presses specified in the following lists). Amongst the researchers, if one or more of the authors are found with zero contribution, the paper shall not be considered for the award.

1. DEFINITIONS:

i. **"University"** shall mean Delhi Technological University (DTU), Delhi.
ii. **Paper:** Any publication appearing in journal entitled "....." excluding letters to the editor and the editorials. The publication must be electronically available online with Digital Object Identifier (DOI).
iii. **Faculty Member of the University:** An individual who is a regular faculty member of the University.
iv. **University Student:** An individual who is registered for any degree in the Delhi Technological University.
v. **Researcher:** An individual who is either a faculty member of the university or a student involved in the research.

vi. **Author:** An individual who conforms to all of the following criteria:

a) Made a significant intellectual contribution to the theoretical development, system or experimental design, prototype development, and/or the analysis and interpretation of data associated with the work contained in the article;
b) Contributed to drafting the article or reviewing and/or revising it for intellectual content;
c) Approved the final version of the article as accepted for publication, including references.
d) Contributors who do not meet all of the above criteria (a to c) may be present in the acknowledgment section of the article.
e) Omitting an author who contributed to the article or including a person who did not fulfill all of the above requirements is considered a breach of publishing ethics.
f) **First Author:** An individual who is either a faculty member of the university or a university student and his name appears first in the list of authors on the title page of the paper.
g) **Corresponding Author:** An individual who is either a faculty member of the university or a university student and his name appears first in the list of corresponding authors on the title page of the paper. As a proof of corresponding author, the researcher must provide the screen shot of the tool box of the paper submission system (say, Editorial Manager/ Scholar One) where the name of the author appears on the login page and the title of the paper claimed is listed. If there are more than one corresponding authors then the author whose name appears first on the paper submission system, shall be treated as the corresponding author for the purpose of the award.

2. AWARD CATEGORIES & SELECTION CRITERIA:

A) Outstanding Research Awards

A cash prize of Rs. 5,00,000/- will be awarded along with the certificate of merit.

Selection Criteria: The paper must be a Science Citation Index (SCI)/ Social Science Citation Index (SSCI)/ SCI expanded journal paper of impact factor at least two, and published in the following:

- Nature Journal
- Science
- Harvard Business Review

B) Premier Research Awards

A cash prize of Rs. 1,00,000/- will be awarded along with the certificate of merit.

Selection Criteria: The paper must be a journal paper of impact factor at least 3.0, for Institute of Electrical and Electronics Engineers (IEEE) Transactions and one for all others indexed in SCI/ SSCI or SCI expanded and published in the following:

1. Proceedings of Royal Society
2. American Mathematical Society
3. American Physical Society
4. American Society for Civil Engineers (ASCE)
5. American Society for Mechanical Engineers (ASME)
6. IEEE Transactions (TRIF≥3.0)
7. Association for Computing Machinery (ACM) Transactions
8. Institute of Civil Engineering Publishing, London
9. Institute of Mechanical Engineering, London
10. American Society of Testing Materials (ASTM)
11. Nature Publishing Group

In addition to the above list, the journals with impact factor equal to or more than thirty (30) will be also be considered for the award.

C) Commendable Research Awards

A cash prize of Rs. 50,000/- will be awarded along with the certificate of merit.

Selection Criteria: The paper must be a journal paper of impact factor at least one, indexed in SCI/ SSCI or SCI expanded and published in the following:

1.IEEE Transactions (TRIF<3)
2.IEEE Journals
3.Springer
4.Elsevier (Science Direct)
5.Oxford University Press
6.Pergamon-Elsevier Science Ltd
7.Cambridge University Press
8.Wiley-Blackwell
9. Blackwell Publishing
10.John Wiley & Sons
11.Institute of Engineering and Technology (IET)
12.Biomedical Central Ltd
13.Massachusetts Institute of Technology (MIT) Press
14.Indiana University Press
15.American Meteorological Society
16.American Physiological Society
17.American Society for Microbiology
18.American Chemical Society
19.American Institute of Physics
20.Institute of Physics (IOP) Publishing Ltd.
21.Massachusetts Medical Society
22.IOS Press
23.Princeton University Press
24.Society of Industrial and Applied Mathematics
25.Proceedings of National Academy of Sciences of USA

In the commendable award category, an author shall be eligible for the cash prize for not more than three papers however the university authors of all the papers shall be eligible for the certificate.

In addition to the above list, SCI/SSCI and SCI expanded indexed journal not included in the above list having impact factor equal to or more than five shall also be considered for the award.

3. REGULATIONS FOR DIVISION & DISTRIBUTION OF AWARD PRIZE

Case 1: If all the authors are amongst faculty member of the university, then first author will decide the individual author's contribution for the purpose of distribution of prize amount.

Case 2: If the authors are amongst the faculty member of the university and the university students, then faculty member of the university (whose name appears first in the paper) will decide the individual author's contribution for the purpose of distribution of prize amount.

Case 3: If the first author, corresponding author and other authors are the university students, then the Head of Departments of the first/ corresponding student's department (whose name appears first in the paper) will decide the individual author's contribution in consultation with the first author for the purpose of distribution of prize amount.

Case 4: If one (or more) of the author/s is/are external to the university, then the prize amount will be divided by total number of authors and the equal part (one share) of the total prize amount will be disbursed to the university contributors. The prize amount of the external author will be subtracted from the total prize amount.

Case 5: A faculty member of the university or a university student shall be permitted to claim cash prize for a maximum of three papers as author or co-author in the category of commendable research award.

Annexure 1 will be referred for evaluating the research papers for granting of award to the researchers of DTU and Annexure 2 will be referred for calculation of cash prize for distribution amongst researchers/authors of DTU.

Power to remove difficulties: If any difficulty arises in giving effect to the provisions of these guidelines, the Vice Chancellor may, make such provisions, not inconsistent with the provisions in these guidelines, as appear to be necessary or expedient for removing the difficulty.

The guidelines shall be implemented for the period of 1st January to 31st December of the respective calendar year.

(Prof. Samsher)
Registrar

Copy to:

1. PS to the Hon'ble Vice Chancellor, DTU for kind information
2. All Deans
3. Registrar DTU
4. Associate Dean, IRD
5. All HoDs for vide circulation among the faculty and students of their department
6. Head Computer Centre with a request to upload on website
7. Guard File

8/c

Annexure 1

Guidelines for Evaluation of Published Paper for Research Award

1. The current/present impact factor, indexing (SCI, SCI expanded & SSCI) and other information will be taken from Clarivate analytics for evaluation of the papers. Thus, the current/present statistics including payment and indexing information of the journals will be taken for the purpose of verification by the screening/scrutiny committee.
2. The final publication date of the paper with volume and issue number (acceptance date or date on which the paper was published online will not be considered) will be considered for verifying the year of publication and pagination of the research paper under consideration.

7k

Annexure 2

Formula for Distribution of Awards to the Authors/Researchers

The Research Excellence Awards have been constituted in the university recently and have been effective from AY 2017. The competent authority is pleased to approve the formula for distribution of Award Money for Research Excellence Awards (F.No. DTU/IRD/597/2018/1865 dated 18/12/2018) from 2018 onwards to the Authors/Researchers of the DTU as under:

A is the total award money and there are N authors. The value of Z shall be decided by the principal author and shall be such that $0.5 \leq Z \leq 1$,

- Case 1: When there is no external author, then the minimum amount credited to each of the author shall be as,

  A*Z/N

- Case 2: When there are external authors, then the minimum amount credited to each of the author shall be as,

  (A-Y*(A/N))*Z/(N-Y)

  Where Y number of authors are external to the university

Calculations sheets are enclosed.

Details for Published Papers for
PREMIER RESEARCH AWARDS

1ST JANUARY, 2021 – 31ST DECEMBER, 2021

S. No	Authors	Paper Title	Journal with Publication Details
DEPARTMENT OF APPLIED MATHEMATICS			
1	**Tanya Malhotra** and Anjana Gupta	A New 2-Tuple Linguistic Approach for Unbalanced Linguistic Term Sets	*IEEE Transactions on Fuzzy Systems (IEEE)*, vol. 29, pp. 2158 - 2168, 2021, Impact Factor: 12.029.
DEPARTMENT OF CIVIL ENGINEERING			
2	**Sagar Mehra** and Ashutosh Trivedi	Pile Groups Subjected to Axial and Torsional Loads in Flow-Controlled Geomaterial	*International Journal of Geomechanics (America Society for Civil Engineers)*, vol. 21, no. 3, pp. 04021002, 2021, Impact Factor: 3.819.
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING			
3	**Akshi Kumar** and Arunima Jaiswal	A deep swarm-optimized model for leveraging industrial data analytics in cognitive manufacturing	*IEEE Transactions on Industrial Informatics (IEEE)*, vol. 17, no. 4, pp.2938-2946, 2021, Impact Factor: 10.215.
4	**Akshi Kumar** and Victor Hugo C. Albuquerque	Sentiment Analysis Using XLM-R Transformer and Zero-shot Transfer Learning on Resource-poor Indian Language	*ACM Transactions on Asian and Low-Resource Language Information Processing (ACM)*, vol. 20, no. 5, pp. 1-13, 2021, Impact Factor: 1.413.
DEPARTMENT OF ELECTRICAL ENGINEERING			
5	**Aakash Kumar Seth** and Mukhtiar Singh	Second Order Ripple Minimization in Single Phase Single Stage On-Board PEV Charger	*IEEE Transactions on Transportation Electrification (IEEE),* vol. 7, no. 3, pp. 1186-1195, 2021, Impact Factor: 5.123.
6	**Mayank Kumar**	Open Circuit Fault Detection and Switch Identification for LS-PWM H-Bridge Inverter	*IEEE Transactions on Circuits and Systems II: Express Briefs (IEEE)*, vol. 68, no. 4, pp. 1363-1367, 2021, Impact Factor: 3.292.
7	**Rupam Singh** and Bharat Bhushan	Condition Monitoring Based Control Using Wavelets and Machine Learning for Unmanned Surface Vehicles.	*IEEE Transactions on Industrial Electronics (IEEE*), vol. 68, no. 8, pp. 7464-7473, 2021, Impact Factor: 10.215.

S. No	Authors	Paper Title	Journal with Publication Details
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING			
8	**Chhavi Dhiman**, Dinesh Kumar Vishwakarma and Paras Agarwal	Part-wise Spatio-temporal Attention Driven CNN-based 3D Human Action Recognition	*ACM Transactions on Multimedia Computing, Communications, and Applications (ACM),* vol. 17, no. 3, pp. 1-24, 2021, Impact Factor: 3.144.
9	Shubham Negi, **Poornima Mittal** and Brijesh Kumar	Modeling and Analysis of High-Performance Triple Hole Block Layer Organic LED Based Light Sensor for Detection of Ovarian Cancer	*IEEE Transactions on Circuits and Systems I: Regular Papers (IEEE),* vol. 68, no. 8, pp. 3254-3264, 2021, Impact Factor: 3.605.
10	**Rajiv Kapoor**, Deepak Sharma and Aarchishya Kapoor	Modified Sliding Singular Spectrum Analysis-Based Noncontact-Type Detection of Separated Instrument in Root Canal Therapy Using Low-Frequency Ultrasonic Pattern Transceiver Design	*IEEE Transactions on Instrumentation and Measurement (IEEE)*, vol. 70, pp. 1-9, 2021, Impact Factor: 4.016.
11	Rahul Bansal, **Sudipta Majumdar** and Harish Parthasarthy	Stochastic Filtering in Electromagnetics	*IEEE Transactions on Antennas and Propagation (IEEE)*, vol. 69, no. 4, pp. 2165-2180, 2021, Impact Factor: 4.388.
DEPARTMENT OF INFORMATION TECHNOLOGY			
12	Ashish Kumar Tripathi, **Kapil Sharma**, Manju Bala, Akshi Kumar, Varun G. Menon and Ali Kashif Bashir	A Parallel Military-Dog-Based Algorithm for Clustering Big Data in Cognitive Industrial Internet of Things	*IEEE Transactions on Industrial Informatics (IEEE)*, vol. 17, no. 3, pp. 2134-2142, 2021, Impact Factor: 10.215.
13	**Swati Sharda**, Mukhtiar Singh and Kapil Sharma	RSAM: Robust Self-Attention Based Multi-Horizon Model for Solar Irradiance Forecasting	*IEEE Transactions on Sustainable Energy (IEEE)*, vol. 12, no. 2, pp. 1394-1405, 2021, Impact Factor: 7.917.
DEPARTMENT OF MECHANICAL ENGINEERING			
14	Aseem Dubey and **Akhilesh Arora**	High-Temperature Distillation Using N-Parallel Evacuated Tube Collector Integrated With Double Slope Solar Still in Force Mode	*Journal of Thermal Science and Engineering Applications (ASME),* vol. 1, no. 3, 2021, pp. 031002, 2021, Impact Factor: 1.470.
15	Abdul Khaliq, Bandar A. Almohammadi, Mathkar A. Alharthi, Mohd Asjad Siddiqui and **Rajesh Kumar**	Investigation of a Combined Refrigeration and Air Conditioning System Based on Two-Phase Ejector Driven by Exhaust Gases of Natural Gas Fueled Homogeneous Charge Compression Ignition Engine	*Journal of Energy Resources Technology (ASME)*, vol. 143, no. 12, pp. 120911, 2021, Impact Factor: 2.903.
16	Pankaj Kumar Sharma, **Vijay Gautam** and Atul Kumar Agrawal	Analytical and Numerical Prediction of Springback of SS/Al-Alloy Cladded Sheet in V-Bending	*Journal of Manufacturing Science and Engineering (ASME)*, vol. 143, no. 3, pp. 031011, 2021, Impact Factor: 3.033.

Details for Published Papers for
COMMENDABLE RESEARCH AWARDS

1ST JANUARY, 2021 – 31ST DECEMBER, 2021

S. No	Authors	Paper Title	Journal with Publication Details
DEPARTMENT OF APPLIED CHEMISTRY			
1	**Atul Varshney**, Anil Kumar and Sunil Yadav	Catalytic activity of bis p-nitro A_2B (oxo)Mn(V) corroles towards oxygen transfer reaction to sulphides	*Inorganica Chimica Acta (Elsevier)*, vol. 514, pp. 120013, 2021, Impact Factor: 2.545.
2	Megha Bansal, **Deenan Santhiya** and Jai Gopal Sharma	Behavioural Mechanisms of Microplastic Pollutants in Marine Ecosystem: Challenges and Remediation Measurements	*Water, Air, & Soil Pollution (Springer)*, vol. 232, no. 9, pp. 1-22, 2021, Impact Factor: 2.520.
3	Himansh Goel, Nidhi Gupta, **Deenan Santhiya**, Namit Dey, Himadri B. Bohidar and Aditi Bhattacharya	Bioactivity reinforced surface patch bound collagen-pectin hydrogel	*International Journal of Biological Macromolecules (Elsevier)*, vol. 174, no. 31, pp. 240-253, 2021, Impact Factor: 6.953.
4	Manjot Kaur and **Deenan Santhiya**	UV-shielding antimicrobial zein films blended with essential oils for active food packaging	*Journal of Applied Polymer Science (Wiley)*, vol. 138, no. 7, pp. 49832, 2021, Impact Factor: 3.125.
5	**Deepali Ahluwalia**, Anil Kumar and Sudhir Gopalrao Warkar	Recent developments in *meta*-benziporphodimethene: A new porphyrin analogue	*Journal of Molecular Structure (Elsevier)*, vol. 1228, pp. 129672, 2021, Impact Factor: 3.196.
6	Owais Jalil, Chandra Mouli Pandey and **Devendra Kumar**	Highly sensitive electrochemical detection of cancer biomarker based on anti-EpCAM conjugated molybdenum disulfide grafted reduced graphene oxide nanohybrid	*Bioelectrochemistry (Elsevier)*, vol. 138, pp. 107733, 2021, Impact Factor: 5.373.

S. No	Authors	Paper Title	Journal with Publication Details
7	Geetu Paul, Sakshi Verma, Owais Jalil, Deeksha Thakur, Chandra Mouli Pandey and **Devendra Kumar**	PEDOT: PSS-grafted graphene oxide-titanium dioxide nanohybrid-based conducting paper for glucose detection	*Polymers for Advanced Technologies (Wiley)*, vol. 32,no. 4, pp. 1774-1782, 2021, Impact Factor: 3.665.
8	**Jyoti**, Natalia Fridman, Anil Kumar and Sudhir G. Warkar	Synthesis, structural characterization and binding ability of A_2B cobalt(III) corroles with pyridine	*Inorganica Chimica Acta (Elsevier)*, vol. 527 pp. 120580, 2021, Impact Factor: 2.545.
9	Srishti Mittal, Aniket Gupta, Saksham Srivastava and **Manish Jain**	Artificial Neural Network based modeling of the vacuum membrane distillation process: Effects of operating parameters on membrane fouling	*Chemical Engineering and Processing - Process Intensification (Elsevier)*, vol. 164, pp. 108403, 2021, Impact Factor: 4.237.
10	**Mukesh K. Mishra** and Manish Jain	Removal of sulfur-containing compounds from Fluid Catalytic Cracking unit (FCC) gasoline by pervaporation process: Effects of variations in feed characteristics and mass transfer properties of the membrane	*Asia-Pacific Journal of Chemical Engineering (Wiley)*, vol. 16, no. 4, pp. e2653, 2021, Impact Factor: 1.447.
11	**Radhika Batra**, Roli Purwar, Senthilguru Kulanthaivel and Prashant Mishra	Cetyl Trimethyl Ammonium Bromide Modified Montmorillonite-Doped Tasar Silk Fibroin/Polyvinyl Alcohol Blend 3D Nanowebs for Tissue Engineering Applications	*Macromolecular Materials and Engineering (Wiley)*, vol. 306, no. 11, pp. 2100450, 2021, Impact Factor: 4.367.
12	Nazish Nehal, Bharti Choudhary, Anand Nagpure and **Rajinder K. Gupta**	DNA barcoding: a modern age tool for detection of adulteration in food	*Critical Reviews in Biotechnology (Taylor and Francis)*, vol. 41, no. 5, pp. 767-791, 2021, Impact Factor: 8.429.
13	Surya Tanwar and **Raminder Kaur**	Development and investigation of microencapsulated caprylic acid-based phase change materials for thermal energy storage applications	*International Journal of Energy Research (Wiley), vol.* 45, no. 12, pp. 17302-1731, 2021, Impact Factor: 5.164.
14	**Ritika Kubba**, Omprakash Yadav, Pinky Yadav, Natali Fridmand and Anil Kumar	Penta -hexa coordination behaviour of ABA-P(V) corrole	*Journal of Molecular Structure (Elsevier)*, vol. 1243, pp. 130857, 2021, Impact Factor: 3.196.
15	Radhika Batra and **Roli Purwar**	Deduction of a facile method to construct Antheraea mylitta silk fibroin/ gelatin blend films for prospective biomedical applications	*Polymer International (Wiley)*, vol. 70, no. 1, pp. 73-82, 2021, Impact Factor: 2.990.
16	Preeti Gupta and **Roli Purwar**	Influence of cross-linkers on the properties of cotton grafted poly (acrylamide-*co*-acrylic acid) hydrogel composite: swelling and drug release kinetics	*Iranian Polymer Journal (Springer),* vol. 30, no. 4, pp. 381-391, 2021, Impact Factor: 1.899.

S. No	Authors	Paper Title	Journal with Publication Details
17	Reetu Yadav and **Roli Purwar**	Influence of metal oxide nanoparticles on morphological, structural, rheological and conductive properties of mulberry silk fibroin nanocomposite solutions	*Polymer Testing (Elsevier)*, vol. 93, pp. 106916, 2021, Impact Factor: 4.282.
18	Priya Bansal and **Roli Purwar**	Polyacrylonitrile/clay nanofibrous nanocomposites for efficient adsorption of Cr (VI) ions	*Journal of Polymer Research (Springer)*, vol. 28, no. 7, 2021, pp. 1-19, Impact Factor: 3.097.
19	Dhirendra Brahmchari and **Saurabh Mehta**	Phosphazene superbase mediated cyclization and annulation reactions of functionalized alkynes for the synthesis of heterocyclic compounds	*Chemistry of Heterocyclic Compounds (Springer)*, vol. 57, pp. 234–238, 2021, Impact Factor: 1.277.
20	**Srishti Mittal**, Shailesh Pathak, Heena Dhawan and Sreedevi Upadhyayul	A machine learning approach to improve ignition properties of high-ash Indian coals by solvent extraction and coal blending	*Chemical Engineering Journal (Elsevier)*, vol. 413, pp. 127385, 2021, Impact Factor: 13.273.
21	Khushbu, **Sudhir G. Warkar** and Nandkishore Thombare	Zinc micronutrient - loaded carboxymethyl tamarind kernel gum-based superabsorbent hydrogels: controlled release and kinetics studies for agricultural applications	*Colloid and Polymer Science (Springer*), vol. 299, pp. 1103–1111, 2021, Impact Factor: 1.931.
22	**Tanushree Ghosh**, Trisha Das and Roli Purwar	Review of electrospun hydrogel nanofiber system: Synthesis, Properties and Applications	*Polymer Engineering & Science (Wiley)*, vol. 61, no. 7, pp. 1887-1911, 2021, Impact Factor: 2.428.
DEPARTMENT OF APPLIED MATHEMATICS			
23	**Aditya Kaushik**, Vijayant Kumar, Manju Sharma and Nitika Sharma	A modified graded mesh and higher order finite element method for singularly perturbed reaction–diffusion problems	*Mathematics and Computers in Simulation (Elsevier)*, vol. 185, pp. 486-496, 2021, Impact Factor: 2.463.
24	Aastha Gupta and **Aditya Kaushik**	A robust spline difference method for robin-type reaction-diffusion problem using grid equidistribution	*Applied Mathematics and Computation (Elsevier)*, vol. 390, pp. 125597, 2021, Impact Factor: 4.091.
25	**Aditya Kaushik**, Manju Sharma, Aastha Gupta and Monika Choudhary	Iterative analytic approximation to one-dimensional nonlinear reaction–diffusion equations	*Mathematical Methods in the Applied Sciences (Wiley)*, vol. 44, no. 16, pp. 12152-12168, 2021, Impact Factor: 2.321.
26	**Anu Kumari** and Satyabrata Adhikari	Classification witness operator for the classification of different subclasses of three-qubit GHZ class	*Quantum Information Processing (Springer)*, vol. 20, no. 316, 2021, Impact Factor: 2.349.
27	**Anuma Garg** and Satyabrata Adhikari	Teleportation Criteria Based on Maximum Eigenvalue of the Shared $d \otimes d$ Dimensional Mixed State: Beyond Singlet Fraction	*International Journal of Theoretical Physics (Springer)*, vol. 60, pp. 1038–1052, 2021, Impact Factor: 1.708.

S. No	Authors	Paper Title	Journal with Publication Details
28	Simran Kaur and **C. P. Singh**	Constraints on holographic dark energy model with matter creation in Brans–Dicke theory and thermodynamic analysis	*Physics of the Dark Universe (Elsevier)*, vol. 33, pp. 100869, 2021, Impact Factor: 4.243.
29	**C. P. Singh** and Joan Solà Peracaula	Friedmann cosmology with decaying vacuum density in Brans–Dicke theory	*The European Physical Journal C (Springer)*, vol. 81, no. 960, pp. 1-16, 2021, Impact Factor: 4.590.
30	Ajay Kumar and **C. P. Singh**	The generalized second law of thermodynamics in viscous Ricci dark energy model	*The European Physical Journal Plus (Springer)*, vol. 136, no. 820, pp. 1-20, 2021, Impact Factor: 3.911.
31	Luckshay Batra and **H. C. Taneja**	Approximate-Analytical solution to the information measure's based quanto option pricing model	*Chaos, Solitons & Fractals (Elsevier)*, vol. 153, Part 1, pp. 111493, 2021, Impact Factor: 5.944.
32	S. Sivaprasad Kumar and K**. Gangania**	On Geometrical Properties of Certain Analytic functions	*Iranian Journal of Science and Technology, Transactions A: Science (Springer)*, vol. 45, pp. 1437–1445, 2021, Impact Factor: 1.194.
33	**KM. Lipi** and Naokant Deo	On Modification of Certain Exponential Type Operators Preserving Constant and e^{-x}	*Bulletin of the Malaysian Mathematical Sciences Society (Springer Nature)*, vol. 44, pp. 3269–3284, 2021, Impact Factor: 1.554.
34	**Nav Shakti Mishra** and Naokant Deo	On the preservation of functions with exponential growth by modified Ismail–May operators	*Mathematical Methods in the Applied Sciences (Wiley)*, vol. 44, no. 11, pp. 9012-9025, 2021, Impact Factor: 2.321.
35	**Parul Chauhan** and Anjana Gupta	Matrix games with proportional linguistic payoffs	*Soft Computing (Springer)*, vol. 25, pp. 15067–15081, 2021, Impact Factor: 3.643.
36	**Radhika Kavra**, Anjana Gupta and Sangita Kansal	Interval graph based energy efficient routing scheme for a connected topology in wireless sensor networks	*Wireless Networks (Springer)*, vol. 27, pp. 5085–5104, 2021, Impact Factor: 2.602.
37	**Rajesh Asthana**, Gurjit Singh Walia and Anjana Gupta	A novel biometric crypto system based on cryptographic key binding with user biometrics	*Multimedia Systems (Springer)*, vol. 27, pp. 877–891, 2021, Impact Factor: 1.935.
38	**Rajesh Asthana**, Gurjit Singh Walia and Anjana Gupta	Random area-perimeter method for generation of unimodal and multimodal cancelable biometric templates	*Applied Intelligence (Springer)*, vol. 51, pp. 7281–7297, 2021, Impact Factor: 5.086.
39	**Richa Rohira**, Shreya Sanduja and Satyabrata Adhikari	Construction of a family of positive but not completely positive map for the detection of bound entangled states	*Quantum Information Processing (Springer)*, vol. 20, no. 374, 2021, Impact Factor: 2.349.

S. No	Authors	Paper Title	Journal with Publication Details
40	**Ruchika Lochab** and Vivek Kumar	A new reconstruction of numerical fluxes for conservation laws using fuzzy operators	*International Journal for Numerical Methods in Fluids (Wiley)*, vol. 93, no. 6, pp. 1690-1711, 2021, Impact Factor: 2.107.
41	**Ruchika Lochab** and Vivek Kumar	An improved flux limiter using fuzzy modifiers for Hyperbolic Conservation Laws	*Mathematics and Computers in Simulation (Elsevier)*, vol. 181, pp. 16-37, 2021, Impact Factor: 2.463.
42	**Satyabrata Adhikari**	Constructing a ball of separable and absolutely separable states for $2 \otimes d$ quantum system	*The European Physical Journal D (Springer)*, vol. 75, no. 3, pp. 1-13, 2021, Impact Factor: 1.425.
43	S. Sivaprasad Kumar and **Shagun Banga**	On Certain Exact Differential Subordinations Involving Convex Dominants	*Mediterranean Journal of Mathematics (Springer)*, vol. 18, no. 6, pp. 1-15, 2021, Impact Factor: 1.400.
44	**Shruti Aggarwal** and Satyabrata Adhikari	Witness operator provides better estimate of the lower bound of concurrence of bipartite bound entangled states in $d_1 \otimes d_2$-dimensional system	*Quantum Information Processing (Springer)*, vol. 20, no. 3, pp. 1-26, 2021, Impact Factor: 2.349.
45	**S. Sivaprasad Kumar** and K. Gangania	A cardioid domain and starlike functions	*Analysis and Mathematical Physics (Springer)*, vol. 11, no. 2, pp. 1-34, 2021, Impact Factor: 1.548.
46	**Vivek Kumar a**nd Günter Leugering	Singularly perturbed reaction–diffusion problems on a *k*-star graph	*Mathematical Methods in the Applied Sciences (Wiley)*,vol. 44, no. 18, pp. 14874-14891, 2021, Impact Factor: 2.321.
DEPARTMENT OF APPLIED PHYSICS			
47	Ravita and **A. S. Rao**	Effective energy transfer from Dy^{3+} to Tb^{3+} ions in thermally stable KZABS glasses for intense green emitting device applications	*Journal of Luminescence (Elsevier)*, vol. 239, pp. 118325, 2021, Impact Factor: 3.599.
48	Mohit Kumar and **A. S. Rao**	Influence of Tb^{3+} ions concentration and temperature on lithium bismuth alumino borosilicate glasses for green photonic device applications	*Optical Materials (Elsevier),* vol. 120, pp. 111439, 2021 Impact Factor: 3.080.
49	Yasha Tayal and **A. S. Rao**	Spectroscopic analysis of Dy^{3+} ions activated borosilicate glasses for photonic device applications	*Optical Materials (Elsevier)*, vol. 117, pp. 111112, 2021, Impact Factor: 3.080.
50	**Aryan**, Ruby and Mohan Singh Mehata	Green synthesis of silver nanoparticles using *Kalanchoe pinnata* leaves (life plant) and their antibacterial and photocatalytic activities	*Chemical Physics Letters (Elsevier*), vol. 778, pp. 138760, 2021, Impact Factor: 2.328.

S. No	Authors	Paper Title	Journal with Publication Details
51	**Bhavya Kumar** and Rishu Chaujar	TCAD Temperature Analysis of Gate Stack Gate All Around (GS-GAA) FinFET for Improved RF and Wireless Performance	*Silicon (Springer)*, vol. 13, pp. 3741–3753, 2021, Impact Factor: 2.670.
52	**Deepali**, Ruchira Bisi, Vandana, Harpreet Kaur and M. Jayasimhadri	Structural and spectroscopic properties of Sm^{3+}-doped $NaBaB_9O_{15}$ phosphor for optoelectronic device applications	*Journal of Materials Science: Materials in Electronics (Springer)*, vol. 32, pp. 1650–1658, 2021, Impact Factor: 2.478.
53	**Harpreet Kaur** and M. Jayasimhadri	Spectroscopic and color tunable studies in Dy^{3+}/Eu^{3+}co-doped calcium-bismuth-vanadate phosphor for lighting applications	*Solid State Sciences (Elsevier)*, vol. 122, pp. 106776, 2021, Impact Factor: 3.059.
54	Harpreet Kaur and **Mula Jayasimhadri**	Development of deep red–emitting $CaBiVO_5:Pr^{3+}$ phosphor for multifunctional optoelectronic applications	*Journal of the American Ceramic Society (Wiley)*, vol. 104, no. 11, pp. 5764-5775, 2021, Impact Factor: 3.784.
55	Subhajit Pradhan, Harpreet Kaur and **M. Jayasimhadri**	Photoluminescence and thermal sensing properties of Er^{3+} doped silicate based phosphors for multifunctional optoelectronic device applications	*Ceramics International (Elsevier)*, vol. 47, no. 19, pp. 27694-27701, 2021, Impact Factor: 4.527.
56	Rakshit Jain, Rachna Sinha, Mukesh K. Sahu and **Mula Jayasimhadri**	Synthesis and optimization of photoluminescence properties in potential reddish orange emitting niobate phosphor for photonic device applications	*Luminescence (Wiley)*, vol. 36, no. 6, pp. 1444-1451, 2021, Impact Factor: 2.464.
57	**Mohan Singh Mehata**	An efficient excited-state proton transfer fluorescence quenching based probe (7-hydroxyquinoline) for sensing trivalent cations in aqueous environment	*Journal of Molecular Liquids (Elsevier)*, vol. 326, pp. 115379, 2021, Impact Factor: 6.165.
58	Nisha Fatma, **Mohan Singh Mehata**, Nupur Pandeya and Sanjay Pant	Experimental and theoretical interpretations of spectral behavior of 6-methoxyflavone	*Journal of Photochemistry and Photobiology A: Chemistry (Elsevier),* vol. 404, pp. 112945, Impact Factor: *4.291.*
59	**Mohan Singh Mehata**	Green route synthesis of silver nanoparticles using plants/ginger extracts with enhanced surface plasmon resonance and degradation of textile dye	*Materials Science and Engineering: B (Elsevier*), vol. 273, pp. 115418, 2021, Impact Factor: 4.051.
60	Shahid Husain, **Mohan Singh Mehata**, Nupur Pandey, Hirdyesh Mishra and Sanjay Panta	Reinvestigation of the photophysics of 3-aminobenzoic acid in neat and mixed binary solvents	*Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy (Elsevier)*, vol. 247, pp. 119100, 2021, Impact Factor: 4.098.

S. No	Authors	Paper Title	Journal with Publication Details
61	Nupur Pandey, **Mohan Singh Mehata**, Sanjay Pant and Neeraj Tewari	Structural, Electronic and NLO properties of 6-aminoquinoline: A DFT/TD-DFT study	*Journal of Fluorescence (Springer)*, vol. 31, no. 6, pp. 1719-1729, 2021, Impact Factor: 2.217.
62	**Mohan Singh Mehata** and Supriya Biswas	Synthesis of fluorescent graphene quantum dots from graphene oxide and their application in fabrication of GQDs@AgNPs nanohybrids and sensing of H_2O_2	*Ceramics International (Elsevier)*, vol. 47, no. 13, pp. 19063-19072, 2021, Impact Factor: 4.527.
63	**Mohan Singh Mehata**, Mrityunjay Kumar Singh, Kamlesh Awasthi, Prateek Sharma, Shailesh Rana, and Nobuhiro Ohta,	Temperature-Dependent Electric Field-Induced Optical Transitions of 2D Molybdenum Disulfide (MoS_2) Thin Films: Temperature-Dependent Electroabsorption and Absorption	*Journal of Physical Chemistry C (American Chemical Society)*, vol. 125, no. 48, pp. 26566–26574, 2021, Impact Factor: 4.126.
64	**Mohit Mann**, A. S. Rao and Ramesh C. Sharma	Remote mid IR Photoacoustic Spectroscopy for the detection of panel	*Chemical Physics Letters (Elsevier),* vol. 765, pp. 138231, 2021, Impact Factor: 2.328.
65	**Mrityunjay Kumar Singh** and Mohan Singh Mehata	Temperature-dependent photoluminescence and decay times of different phases of grown TiO_2 nanoparticles: Carrier dynamics and trap states	*Ceramics International (Elsevier)*, vol. 47, no. 23, pp. 32534-32544, 2021, Impact Factor: 4.527.
66	Rajesh Kumar, Ankush Vij and **Mukhtiyar Singh**	Defects assisted luminescence in *m*-HfO_2 nanocrystals: An experimental and theoretical study	*Optik (Elsevier)*, vol. 248, pp. 16812, 2021, Impact Factor: 2.443.
67	Saroj Kumar Jha, Monika Sharma, **Nitin K. Puri** and Bijoy K. Kuanrc	Effect of oxygen growth-pressure on microstructural and magnetic properties of pulse laser deposited epitaxial YIG thin films	*Journal of Alloys and Compounds (Elsevier*), vol. 889, pp. 161741, 2021, Impact Factor: 5.316.
68	**Rajat Bajaj**, A. S. Rao and G. Vijaya Prakash	Linear and nonlinear photoluminescence from thermally stable $KYF_4:Eu^{3+}$ cubic nanocrystals	*Journal of Alloys and Compounds (Elsevier)*, vol. 885, pp. 160893, 2021, Impact Factor: 5.316.
69	Keshav Samrat Modi, Satya Pratap Singh, Jasleen Kaur, Umesh Tiwari and **Ravindra Kumar Sinha**	All dielectric metasurface based tunable optical modulator: Design and analysis	*Photonics and Nanostructures - Fundamentals and Applications (Elsevier)*, vol. 43, pp. 100881, 2021, Impact Factor: 3.008.
70	Anupma Thakur, Praveen Kumar, Sitaramanjaneya Mouli Thalluri, **Ravnindra Kumar Sinha** and Pooja Devi	Flexible polypyrrole activated micro-porous paper-based photoanode for photoelectrochemical water splitting	*International Journal of Hydrogen Energy (Elsevier)*, vol. 46, no. 12, pp. 8444-8453, 2021, Impact Factor: 5.816.
71	Than Singh Saini and **Ravindra Kumar Sinha**	Mid-infrared supercontinuum generation in soft-glass specialty optical fibers: A review	*Progress in Quantum Electronics (Elsevier)*, vol. 78, pp. 100342, 2021, Impact Factor: 12.250.

S. No	Authors	Paper Title	Journal with Publication Details
72	**Rinku Sharma** and Arun Goyal	Excitation energies, transition data of SXR, HXR, EUV and far-UV spectral lines with partition function, thermodynamic parameters and level population for W LXVII and W XLIX	*Journal of Electron Spectroscopy and Related Phenomena (Elsevier)*, vol. 246, pp. 147009, 2021, Impact Factor: 1.957.
73	Bhavya Kumar and **Rishu Chaujar**	Analog and RF Performance Evaluation of Junctionless Accumulation Mode (JAM) Gate Stack Gate All Around (GS-GAA) FinFET	*Silicon (Springer)*, vol. 13, pp. 919–927, 2021, Impact Factor: 2.670.
74	Mridul Prakash Kashyap, Sanmveg Saini and **Rishu Chaujar**	Analysis of a Novel Nanoscale Vacuum Channel TF-FinFET	*Silicon (Springer)*, vol. 13, pp. 3257–3269, 2021, Impact Factor: 2.670.
75	Mridul Prakash Kashyap and **Rishu Chaujar**	Gate Oxide Variability Analysis of a Novel 3 nm Truncated Fin–FinFET for High Circuitry Performance	*Silicon (Springer)*, vol. 13, pp. 3249–3256, 2021, Impact Factor: 2.670.
76	**S. Shankar**, O. P. Thakur and M. Jayasimhadri	Significant improvements in dielectric, impedance, multiferroic and magnetoelectric properties of $(1-x)Co_{0.5}Ni_{0.5}Fe_2O_4-xBaTiO_3$ bulk composites (x = 0, 0.10 and 0.20)	*Journal of Materials Science: Materials in Electronics (Springer)*, vol. 32, pp. 16706–16714, 2021, Impact Factor: 2.478.
77	**S. Shankar**, O. P. Thakur and M. Jayasimhadri	Strong enhancement in structural, dielectric, impedance and magnetoelectric properties of $NdMnO_3$ - $BaTiO_3$ multiferroic composites	*Materials Chemistry and Physics (Elsevier)*, vol. 270, pp. 124856, Impact Factor: 4.094.
78	**Samriti Sharma** and Rishu Chaujar	Band gap and gate metal engineering of novel hetero-material InAs/GaAs-based JLTFET for improved wireless applications	*Journal of Materials Science: Materials in Electronics (Springer)*, vol. 32, pp. 3155–3166, 2021, Impact Factor: 2.478.
79	**Samriti Sharma** and Rishu Chaujar	Performance enhancement in a novel amalgamation of arsenide/antimonide tunneling interface with charge plasma junctionless-TFET	*AEU - International Journal of Electronics and Communications (Elsevier)*, vol. 133, pp. 153669, 2021, Impact Factor: 3.183.
80	**Sumandeep Kaur**, Vaibhav Katyal, Vaishakh Plakkot, Nisha Deopa, Aman Prasad and A. S. Rao	Radiative emission analysis of Sm^{3+} ions doped borosilicate glasses for visible orange photonic devices	*Journal of Non-Crystalline Solids (Elsevier)*, vol. 572, pp. 121106, 2021, Impact Factor: 3.531.
81	Pritty Rao, Sanjiv Kumar, R. Raman, Seema Vinayak and **Suresh C. Sharma**	Amorphous to crystalline transformation of indium sulphide powders on thermal treatment: Studies by x-ray photoelectron spectroscopy and Raman spectroscopy	*Journal of Electron Spectroscopy and Related Phenomena (Elsevier)*, vol. 252, pp. 147119, 2021, Impact Factor: 1.957.

S. No	Authors	Paper Title	Journal with Publication Details
82	Neha Gupta, Ravi Gupta and **Suresh C. Sharma**	Investigations on the effect of process parameters on the growth of vertically oriented graphene sheet in plasma-enhanced chemical vapour deposition system	*Contributions to Plasma Physics (Wiley)*, vol. 61, no. 9, pp. e2021 00069, 2021, Impact Factor: 1.563.
83	Jyotsna Sharma, **Suresh C. Sharma** and Ajay Gahlot	Kinetic theory of effect of dust charge fluctuations on the parametric decay of lower hybrid wave instability by relativistic runaway electrons in tokamak	*Physics of Plasmas (American Institute of Physics)*, vol. 28, no. 4, pp. 043701, 2021, Impact Factor: 2.023.
84	**Vijay Singh Meena** and Mohan Singh Mehata	Investigation of grown ZnS film on HgCdTe substrate for passivation of infrared photodetector	*Thin Solid Films (Elsevier)*, vol. 731, pp. 138751, 2021, Impact Factor: 2.183.
85	**Vineet Sharma** and Mohan Singh Mehata	Rapid optical sensor for recognition of explosive 2,4,6-TNP traces in water through fluorescent ZnSe quantum dots	*Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy (Elsevier)*, vol. 260, pp. 119937, 2021, Impact Factor: 4098.
86	**Vineet Sharma** and Mohan Singh Mehata	Synthesis of photoactivated highly fluorescent Mn^{2+}-doped ZnSe quantum dots as effective lead sensor in drinking water	*Materials Research Bulletin (Elsevier)*, vol. 134, pp. 111121, 2021, Impact Factor: 4.641.
87	Sakshi Sharma, Sonakshi Saini, Maya Khangembam and **Vinod Singh**	Nanomaterials-Based Biosensors for COVID-19 Detection—A Review	IEEE Sensors Journal (IEEE), vol. 21, no. 5, pp. 5598-5611, 2021, Impact Factor: 3.301.
88	Ritika Ranga, **Yogita Kalra** and Kamal Kishor	Design of hourglass nanoantenna for magnetic field enhancement	*Optics Communications (Elsevier)*, vol. 481, pp. 126511, 2021, Impact Factor: 2.310.
DEPARTMENT OF BIOTECHNOLOGY			
89	**Anchita Kalsi**, S. Mary Celin, Pallvi Bhanot, Sandeep Sahai and Jai Gopal Sharma	A novel egg shell-based bio formulation for remediation of RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) contaminated soil	*Journal of Hazardous Materials (Elsevier)*, vol. 401, pp. 123346, 2021, Impact Factor: 10.588.
90	**Anchita Kalsi**, S. Mary Celina, Satyawati Sharma, Sandeep Sahai and Jai Gopal Sharma	Bioaugmentation for remediation of octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) contaminated soil using a clay based bioformulation	*Journal of Hazardous Materials (Elsevier)*, vol. 420, pp. 126575, 2021, Impact Factor: 10.588.
91	Udiptya Saha, Keshav Todi and **Bansi D. Malhotra**	Emerging DNA-based multifunctional nano-biomaterials towards electrochemical sensing applications	*Nanoscale (Royal Society of Chemistry)*, vol. 13, no. 23, pp. 10305-10319, 2021, Impact Factor: 7.790.

S. No	Authors	Paper Title	Journal with Publication Details
92	Suveen Kumar, Niharika Gupta and **Bansi D. Malhotra**	Ultrasensitive biosensing platform based on yttria doped zirconia-reduced graphene oxide nanocomposite for detection of salivary oral cancer biomarker	*Bioelectrochemistry (Elsevier)*, vol. 140, pp. 107799, 2021, Impact Factor: 5.373.
93	**Jai Gopal Sharma**, Amarjeet Singh, Ajima Begum, Sonia, Vungarala Hari Krishna and Rina Chakrabarti	The impact of *Achyranthes aspera* seeds and leaves supplemented feeds on the survival, growth, immune system and specific genes involved in immunostimulation in *Clarias batrachus* fry challenged with *Aeromonas hydrophila* in pond conditions	*Fish & Shelfish Immunology (Elsevier)*, vol. 118, pp. 11-18, 2021, Impact Factor: 4.581.
94	Lokesh Kumar Raminder Kaur and **Jai Gopal Sharma**	The efficiency of zeolites in water treatment for combating ammonia – An experimental study on Yamuna River water & treated sewage effluents	*Inorganic Chemistry Communication (Elsevier)*, vol. 134, pp. 108978, 2021, Impact Factor: 2.495.
95	Ritika Luthra, Simran Kaur and **Kriti Bhandari**	Applications of CRISPR as a potential therapeutic	*Life Sciences (Elsevier)*, vol. 284, pp. 119908, 2021, Impact Factor: 5.037.
96	**Lakhan Kumar**, Venkataraghavan Ragunathan, Mohita Chugh and Navneeta Bharadvaja	Nanomaterials for remediation of contaminants: a review	*Environmental Chemistry Letters (Springer),* vol. 19, pp. 3139–3163, 2021, Impact Factor: 9.027.
97	**Navneet Chaudhary**, Amit K. Yadav, Jai Gopal Sharma and Pratima R. Solanki	Designing and characterization of a highly sensitive and selective biosensing platform for ciprofloxacin detection utilizing lanthanum oxide nanoparticles	*Journal of Environmental Chemical Engineering (Elsevier)*, vol. 9, no. 6, pp. 106771, 2021, Impact Factor: 5.909.
98	Deepti Bhardwaj and **Navneeta Bharadvaja**	Phycoremediation of effluents containing dyes and its prospects for value-added products: A review of opportunities	*Journal of Water Process Engineering (Elsevier)*, vol. 41, pp. 102080, 2021, Impact Factor: 5.485.
99	Harshita Singh and **Navneeta Bharadvaja**	Treasuring the computational approach in medicinal plant research	*Progress in Biophysics and Molecular Biology (Elsevier)*, vol. 164, pp. 19-32, 2021, Impact Factor: 3.667.
100	Arpita Roy and **Navneeta Bharadvaja**	Venom-Derived Bioactive Compounds as Potential Anticancer Agents: A Review	*International Journal of Peptide Research and Therapeutics (Springer)*, vol. 27, pp. 129–147, 2021, Impact Factor: 1.931.
101	Vaibhav Oli, Rohan Gupta and **Pravir Kumar**	FOXO and related transcription factors binding elements in the regulation of neurodegenerative disorders	*Journal of Chemical Neuroanatomy (Elsevier)*, vol. 116, pp. 102012, 2021, Impact Factor: 3.052.

S. No	Authors	Paper Title	Journal with Publication Details
102	Nishtha Malhotra, Rohan Gupta and **Pravir Kumar**	Pharmacological relevance of CDK inhibitors in Alzheimer's disease	*Neurochemistry International (Elsevier)*, vol. 148, pp. 105115, 2021, Impact Factor: 3.921.
103	Rohan Gupta, Ankita Jha, Rashmi K. Ambasta and **Pravir Kumar**	Regulatory mechanism of cyclins and cyclin-dependent kinases in post-mitotic neuronal cell division	*Life Sciences (Elsevier)*, vol. 285, pp. 120006, 2021, Impact Factor: 5.037.
104	**Rahul Kandpal**, Sharda Nara, Mohammad Shahadat, Mohammad Omaish Ansari, Ahmed Alshahri, Syed Wazed Ali, Shaikh Ziauddin Ahammad and Bansi Dhar Malhotra	Impedance spectroscopic study of biofilm formation on pencil lead graphite anode in microbial fuel cell	*Journal of the Taiwan Institute of Chemical Engineers (Elsevier)*, vol. 128, pp. 114-123, 2021, Impact Factor: 5.876.
105	**Ritika Luthra**, Arpita Roy, Soumya Pandit and Ram Prasad	Biotechnological methods for the production of ginsenosides	*South African Journal of Botany (Elsevier)*, vol. 141, pp. 25-36, 2021, Impact Factor: 2.315.
106	**Ritika Luthra**, Shreeja Datta & Arpita Roy	Role of Different Peptides for Cancer Immunotherapy	*International Journal of Peptide Research and Therapeutics (Elsevier),* vol. 27, pp. 2777–2793, 2021, Impact Factor: 1.931.
107	**Rohan Gupta**, Devesh Srivastava, Mehar Sahu, Swati Tiwari, Rashmi K. Ambasta and Pravir Kumar	Artificial intelligence to deep learning: machine intelligence approach for drug discovery	*Molecular Diversity (Springer)*, vol. 25, pages 1315–1360, 2021, Impact Factor: 2.943.
108	**Rohan Gupta**, Rashmi K. Ambasta and Pravir Kumar	Autophagy and apoptosis cascade: which is more prominent in neuronal death?	*Cellular and Molecular Life Sciences (Springer)*, vol. 78, pp. 8001–8047, 2021, Impact Factor: 9.261.
109	**Rohan Gupta,** Rashmi K. Ambasta and Pravir Kumar	Histone deacetylase in neuropathology	*Advances in Clinical Chemistry (Elsevier)*, vol. 104, pp. 151-231, 2021, Impact Factor: 5.394.
110	**Rohan Gupta**, Mehar Sahu, Devesh Srivastava, Swati Tiwari, Rashmi K. Ambasta and Pravir Kumar	Post-translational modifications: Regulators of neurodegenerative proteinopathies	*Ageing Research Reviews (Elsevier)*, vol. 68, pp. 101336, 2021, Impact Factor: 10.895.
111	**Shreeja Datta** & Arpita Roy	Antimicrobial Peptides as Potential Therapeutic Agents: A Review	*International Journal of Peptide Research and Therapeutics (Springer)*, vol. 27, pp. 555–577, 2021, Impact Factor: 1.931.
112	**Simran Kaur** and Arpita Roy	Bioremediation of heavy metals from wastewater using nanomaterials	*Environment, Development and Sustainability (Springer)*, vol. 23, pp. 9617–9640, 2021, Impact Factor: 3.219.

S. No	Authors	Paper Title	Journal with Publication Details
113	**Smita Kumari**, Dia Advani, Sudhanshu Sharma, Rashmi K. Ambasta and Pravir Kumar	Combinatorial therapy in tumor microenvironment: Where do we stand?	*Biochimica et Biophysica Acta (BBA) - Reviews on Cancer (Elsevier)*, vol. 1876, no. 2, pp. 188585, 2021, Impact Factor: 10.680.
114	Richa Nayak and **Yasha Hasija**	A hitchhiker's guide to single-cell transcriptomics and data analysis pipelines	*Genomics (Elsevier),* vol. 113, no. 2, pp. 606-619, Impact Factor: 5.736.
DEPARTMENT OF CIVIL ENGINEERING			
115	**Manvendra Verma** and Nirendra Dev	Sodium hydroxide effect on the mechanical properties of flyash-slag based geopolymer concrete	*Structural Concrete (Wiley)*, vol. 22, pp. E368-E379, 2021, Impact Factor: 3.131.
116	Manob Das, Arijit Das, **Raju Sarkar**, Papiya Mandal, Sunil Saha and Sasanka Ghosh	Exploring short term spatio-temporal pattern of $PM_{2.5}$ and PM_{10} and their relationship with meteorological parameters during COVID-19 in Delhi	*Urban Climate (Elsevier)*, vol. 39, pp. 100944, 2021, Impact Factor: 5.731.
117	Manob Das, Arijit Das, Biplab Giri, **Raju Sarkar** and Sunil Saha	Habitat vulnerability in slum areas of India – What we learnt from COVID-19?	*International Journal of Disaster Risk Reduction (Elsevier)*, vol. 65, pp. 102553, 2021, Impact Factor: 4.320.
118	Sunil Saha, **Raju Sarkar**, Gautam Thapa and Jagabandhu Roy	Modeling gully erosion susceptibility in Phuentsholing, Bhutan using deep learning and basic machine learning algorithms	*Environmental Earth Sciences (Springer),* vol. 80, no. 295, 2021, Impact Factor: 2.784.
119	Tamal Kanti Saha, Swades Pal and **Raju Sarkar**	Prediction of wetland area and depth using linear regression model and artificial neural network based cellular automata	*Ecological Informatics (Elsevier)*, vol. 62, pp. 101272, 2021, Impact Factor: 3.142.
120	Manob Das, Arijit Das, **Raju Sarkar**, Sunil Saha and Papiya Mandal	Regional scenario of air pollution in lockdown due to COVID-19 pandemic: Evidence from major urban agglomerations of India	*Urban Climate (Elsevier),* vol. 37, pp. 100821, 2021, Impact Factor: 5.731.
121	Manob Das, Arijit Das, Sasanka Ghosh, **Raju Sarkar** and Sunil Saha	Spatio-temporal concentration of atmospheric particulate matter ($PM_{2.5}$) during pandemic: A study on most polluted cities of indo-gangetic plain	*Urban Climate (Elsevier)*, vol. 35, pp. 100758, 2021, Impact Factor: 5.731.
122	Supriya Pal and **Ritu Raj**	Evaluation of Wind Induced Interference Effects on Shape Remodeled Tall Buildings	*Arabian Journal for Science and Engineering (Springer)*, vol. 46, pp. 11425–11445, 2021, Impact Factor: 2.334.
123	**Supriya Pal**, Ritu Raj and S. Anbukumar	Comparative study of wind induced mutual interference effects on square and fish-plan shape tall buildings	*Sādhanā (Springer)*, vol. 46, no. 86, 2021, Impact Factor: 1.188.

S. No	Authors	Paper Title	Journal with Publication Details
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
124	**Akshi Kumar**, Kapil Sharma and Aditi Sharma	Genetically optimized Fuzzy C-means data clustering of IoMT-based biomarkers for fast affective state recognition in intelligent edge analytics	*Applied Soft Computing (Elsevier)*, vol. 109, pp. 107525, 2021, Impact Factor: 6.725.
125	**Akshi Kumar,** Kapil Sharma and Aditi Sharma	Hierarchical deep neural network for mental stress state detection using IoT based biomarkers	*Pattern Recognition Letters (Elsevier)*, vol. 145, pp. 81-87, 2021, Impact Factor: 3.756.
126	Divya Gupta, M. P. S. Bhatia and **Akshi Kumar**	Resolving Data Overload and Latency Issues in Multivariate Time-Series IoMT Data for Mental Health Monitoring	*IEEE Sensors Journal (IEEE)*, vol. 21, no. 22, pp. 25421 – 25428, 2021, Impact Factor: 3.301.
127	**Amrita Sisodia** and Rajni Jindal	A meta-analysis of industry 4.0 design principles applied in the health sector	*Engineering Applications of Artificial Intelligence (Elsevier)*, vol. 104, pp. 104377, 2021, Impact Factor: 6.212.
128	**Anil Singh Parihar**, Joyeeta Pal and Ishita Sharma	Multiview video summarization using video partitioning and clustering	*Journal of Visual Communication and Image Representation (Elsevier)*, vol. 74, pp. 102991, 2021, Impact Factor: 2.678.
129	**Anil Singh Parihar**, Gaurav Jain, Shivang Chopra and Suransh Chopra	SketchFormer: transformer-based approach for sketch recognition using vector images	*Multimedia Tools and Applications (Springer)*, vol. 80, pp. 9075–9091, 2021, Impact Factor: 2.757.
130	**Arka Bhowmik**, Sanjay Kumar and Neeraj Bhat	Evolution of automatic visual description techniques-a methodological survey	*Multimedia Tools and Applications (Springer)*, vol. 80, pp. 28015–28059, 2021, Impact Factor: 2.757.
131	**Ashish Girdhar**, Himani Kapur and Vijay Kumar	A novel grayscale image encryption approach based on chaotic maps and image blocks	*Applied Physics B (Springer)*, vol. 127, no. 39, 2021, Impact Factor: 2.070.
132	**Indu Singh**, Narendra Kumar, Srinivasa K. G., Shivam Maini, Umang Ahuja and Siddhant Jain	A multi-level classification and modified PSO clustering based ensemble approach for credit scoring	*Applied Soft Computing (Elsevier)*, vol. 111, pp. 107687, 2021, Impact Factor: 6.725.
133	**Indu Singh** and Rajni Jindal	Expectation maximization clustering and sequential pattern mining based approach for detecting intrusive transactions in databases	*Multimedia Tools and Applications (Springer)*, vol. 80, pp. 27649–27681, 2021, Impact Factor: 2.757.
134	**Kavinder Singh** and Anil Singh Parihar	Variational optimization based single image dehazing	*Journal of Visual Communication and Image Representation (Elsevier)*, vol. 79, pp. 103241, 2021, Impact Factor: 2.678.

S. No	Authors	Paper Title	Journal with Publication Details
135	**Manisha Saini** and Seba Susan	Bag-of-Visual-Words codebook generation using deep features for effective classification of imbalanced multi-class image datasets	*Multimedia Tools and Applications (Springer)*, vol. 80, pp. 20821–20847, 2021, Impact Factor: 2.757.
136	**Manpreet Kaur** and Rajesh Kumar Yadav	Effective Capacity Analysis Over Fisher-Snedecor F Fading Channels with MRC Reception	*Wireless Personal Communications (Springer)*, vol. 121, pp. 1693–1705, 2021, Impact Factor: 1.671.
137	Anshu Kumar Dwivedi, **Pawan Singh Mehra**, Om Pal, Mohammad Najmud Doja and Bashir Alam	EETSP: Energy-efficient two-stage routing protocol for wireless sensor network-assisted Internet of Things	*International Journal of Communication Systems (Wiley)*, vol. 34, no. 17, pp. e4965, 2021, Impact Factor: 2.047.
138	**Pratima Sharma**, Rajni Jindal and Malaya Dutta Borah	Blockchain-based decentralized architecture for cloud storage system	*Journal of Information Security and Applications (Elsevier)*, vol. 62, pp. 102970, 2021, Impact Factor: 3.872.
139	Garima Gupta and **Rahul Katarya**	EnPSO: An AutoML Technique for Generating Ensemble Recommender System	*Arabian Journal for Science and Engineering (Springer)*, vol. 46, pp. 8677–8695, 2021, Impact Factor: 2.334.
140	Aakansha Gupta and **Rahul Katarya**	PAN-LDA: A latent Dirichlet allocation based novel feature extraction model for COVID-19 data using machine learning	*Computers in Biology and Medicine (Elsevier)*, vol. 138, pp. 104920, 2021, Impact Factor: 4.589.
141	Garima Gupta and **Rahul Katarya**	Research on Understanding the Effect of Deep Learning on User Preferences	*Arabian Journal for Science and Engineering (Springer)*, vol. 46, pp. 3247–3286, 2021, Impact Factor: 2.334.
142	Aridaman Singh Nandan, Samayveer Singh, Aruna Malik and **Rajeev Kumar**	A Green Data Collection & Transmission Method for IoT-Based WSN in Disaster Management	*IEEE Sensors Journal (IEEE)*, vol. 21, no. 22, pp. 25912-25921, 2021, Impact Factor: 3.301.
143	Neeraj Kumar**, Rajeev Kumar** and Roberto Caldelli	Local Moment Driven PVO Based Reversible Data Hiding	*IEEE Signal Processing Letters (IEEE)*, vol. 28, pp. 1335 – 1339, 2021, Impact Factor: 3.109.
144	**Sanjay Kumar**, B S Panda and Deepanshu Aggarwal	Community detection in complex networks using network embedding and gravitational search algorithm	*Journal of Intelligent Information Systems (Springer)*, vol. 57, pp. 51–72, 2021, Impact Factor: 1.888.
145	**Sanjay Kumar**, Lakshay Singhla, Kshitij Jindal, Khyati Grover and B. S. Panda	IM-ELPR: Influence maximization in social networks using label propagation based community structure	*Applied Intelligence (Springer)*, vol. 51, pp. 7647–7665, 2021, Impact Factor: 5.086.
146	**Sanjay Kumar**, Muskan Saini, Muskan Goel and B. S. Panda	Modeling information diffusion in online social networks using a modified forest-fire model	*Journal of Intelligent Information Systems (Springer)*, vol. 56, pp. 355–377, 2021, Impact Factor: 1.888.

S. No	Authors	Paper Title	Journal with Publication Details
147	Gunjan Chugh, **Shailender Kumar** and Nanhay Singh	Survey on Machine Learning and Deep Learning Applications in Breast Cancer Diagnosis	*Cognitive Computation (Springer)*, vol. 13, pp. 1451–1470, 2021, Impact Factor: 5.418.
DELHI SCHOOL OF MANAGEMENT			
148	**Deep Shree**, Rajesh Kumar Singh, Justin Paul, Andy Haod and Shichun Xu	Digital platforms for business-to-business markets: A systematic review and future research agenda	*Journal of Business Research (Elsevier)*, vol. 137, pp. 354-365, 2021, Impact Factor: 7.550.
DEPARTMENT OF ELECTRICAL ENGINEERING			
149	**Aakash Kumar Seth** and Mukhtiar Singh	Unified adaptive neuro-fuzzy inference system control for OFF board electric vehicle charger	*International Journal of Electrical Power & Energy Systems (Elsevier)*, vol. 130, pp. 106896, 2021, Impact Factor: 4.630.
150	**Ajay Kumar**, Neha Gupta and Rishu Chaujar	Reliability of Sub-20 nm Black Phosphorus Trench (BP-T) MOSFET in High-Temperature Harsh Environment	*Silicon (Springer)*, vol. 13, pp. 1277–1283, 2021, Impact Factor: 2.670.
151	**Ajendra Singh** and Jitendra Nath Rai	Stability analysis of fractional order fuzzy cellular neural networks with leakage delay and time varying delays	*Chinese Journal of Physics (Elsevier)*, vol. 73, pp. 589-599, 2021, Impact Factor: 3.237.
152	**Ajendra Singh** and Jitendra Nath Rai	Stability of Fractional Order Fuzzy Cellular Neural Networks with Distributed Delays via Hybrid Feedback Controllers	*Neural Processing Letters (Springer),* vol. 53, pp. 1469–1499, 2021, Impact Factor: 2.908.
153	**Ajishek Raj**, Data Ram Bhaskar and Pragati Kumar	Novel architecture of four quadrant analog multiplier/divider circuit employing single CFOA	*Analog Integrated Circuits and Signal Processing* (Springer), vol. 108, pages 689–701, 2021, Impact Factor: 1.337
154	**Ajishek Raj,** Pragati Kumar and Data Ram Bhaskar	Systematic realization of low-frequency third-order sinusoidal oscillators	*International Journal of Circuit Theory and Applications (Wiley),* vol. 49,no. 10, pp. 3302-3316, 2021, Impact Factor: 2.038.
155	**Ajit Nandawadekar**, V. Soni, N. Suman, Sankar Ram T, R. Kumar, S.K. Saini, R G Sharma, Mukhtiar Singh and Soumen Kar	Thermal and Electrical Behaviour of the Persistent Current Switch for a Whole-Body Superconducting MRI Magnet	*IEEE Transactions on Applied Superconductivity (IEEE)*, vol. 31, no. 5, pp. 1-5, 2021, Impact Factor: 1.704.
156	**Ambrish Devanshu**, Madhusudan Singh & Narendra Kumar	Artificial neural network-based current control of field oriented controlled induction motor drive	*Electrical Engineering (Springer)*, vol. 103, pp. 1093–1104, 2021, Impact Factor: 1.836.
157	**Ankita Arora** and Alka Singh	Development and performance analysis of cubic Bezier functional expansion-based adaptive filter for grid-interfaced PV system	*International Transactions on Electrical Energy Systems (Wiley)*, vol. 31, no. 10, pp. e12840, 2021, Impact Factor: 2.860.

S. No	Authors	Paper Title	Journal with Publication Details
158	**Anunay Gupta,** Anjum, Shreyansh Gupta and Rahul Katarya	InstaCovNet-19: A deep learning classification model for the detection of COVID-19 patients using Chest X-ray	*Applied Soft Computing (Elsevier)*, vol. 99, pp. 106859, 2021, Impact Factor: 6.725.
159	**Avdhesh Kumar**, Rachana Garg and Priya Mahajan	Control of Grid Integrated Photovoltaic system using new Variable Step Size Least Mean Square adaptive filter	*Electrical Engineering (Springer)*, vol. 103, pp. 2945–2959, 2021, Impact Factor: 1.836.
160	**Avdhesh Kumar**, Rachana Garg and Priya Mahajan	Modified Synchronous Reference Frame Control of Solar Photovoltaic-Based Microgrid for Power Quality Improvement	*Arabian Journal for Science and Engineering (Springer)*, vol. 46, pp. 1001–1018, 2021, Impact Factor: 2.334.
161	**Hemant Saxena**, Alka Singh and Jitendra Nath Rai	Analysis of SOGI-ROGI for synchronization and shunt active filtering under distorted grid condition	*ISA Transactions (Elsevier)*, vol. 109, pp. 380-388, 2021, Impact Factor: 5.468.
162	**Hemant Saxena**, Alka Singh and Jitendra Nath Rai	Enhanced Third-Order Generalized Integrator-Based Grid Synchronization Technique for DC-Offset Rejection and Precise Frequency Estimation	*Arabian Journal for Science and Engineering (Springer)*, vol. 46, pp. 9753–9762, 2021, Impact Factor: 2.334.
163	**Kushagra Bhatia**, Rajat Mittal, Jyothi Varanasi and M. M. Tripathi	An ensemble approach for electricity price forecasting in markets with renewable energy resources	*Utilities Policy (Elsevier)*, vol. 70, pp. 101185, 2021, Impact Factor: 2.812.
164	**Neha Khanduja** and Bharat Bhushan	Optimal design of FOPID Controller for the control of CSTR by using a novel hybrid metaheuristic algorithm	*Sādhanā (Springer)*, vol. 46, no. 104, 2021, Impact Factor: 1.188.
165	**Praveen Bansal** and Alka Singh	Nonlinear adaptive normalized least mean absolute third algorithm for the control of five-level distribution static compensator	*International Journal of Circuit Theory and Applications (Wiley)*, vol. 49, no. 9, pp. 2840-2864, 2021, Impact Factor: 2.038.
166	**Priyanka Chaudhary** and M. Rizwan	QNBP NN-based *I cos* ϕ algorithm for PV systems integrated with LV/MV grid	*Soft Computing (Springer)*, vol. 25, pp. 2599–2614, 2021, Impact Factor: 3.643.
167	**Priyansh Kedia**, Anjum and Rahul Katarya	CoVNet-19: A Deep Learning model for the detection and analysis of COVID-19 patients	*Applied Soft Computing (Elsevier),* vol. 104, pp.107184, 2021, Impact Factor: 6.725.
168	**Rajesh Kumar** and Smriti Srivastava	A novel dynamic recurrent functional link neural network-based identification of nonlinear systems using Lyapunov stability analysis	*Neural Computing and Applications (Springer)*, vol. 33, pp. 7875–7892, 2021, Impact Factor: 5.606.
169	**Ram Bhagat**, D. R. Bhaskar and Pragati Kumar	Quadrature Sinusoidal Oscillators Using CDBAs: New Realizations	*Circuits, Systems, and Signal Processing (Springer),* vol. 40, pp. 2634–2658, 2021, Impact Factor: 2.225.

S. No	Authors	Paper Title	Journal with Publication Details
170	**Rupam Singh** and Bharat Bhushan	Improved ant colony optimization for achieving self-balancing and position control for balancer systems	*Journal of Ambient Intelligence and Humanized Computing (Springer),* vol. 12, pp. 8339–8356, 2021, Impact Factor: 7.104.
171	**Rupam Singh** and Bharat Bhushan	Randomized algorithms for probabilistic analysis of parametric uncertainties with unmanned helicopters	*Mechanical Systems and Signal Processing (Elsevier)*, vol. 152, pp. 107459, 2021, Impact Factor: 6.823.
172	Santosh Ghosha, **Vinod Kumar Yadav**, Vivekananda Mukherjee and Shubham Gupta	Three decades of Indian power-sector reform: A critical assessment	*Utilities Policy (Elsevier)*, vol. 68, pp. 101158, 2021, Impact Factor: 2.812.
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING			
173	**Aditya S Kumar**, Sagar Jain and NeetaPandey	Clock Aligned Input Adiabatic Logic	*Microelectronics Journal (Elsevier)*, vol. 114, pp. 105122, 2021, Impact Factor: 1.605.
174	**Akanksha Srivastava** and Gurjit Kaur	Resource management for traffic imbalance problem in green cognitive radio networks	*Physical Communication (Elsevier)*, vol. 48, pp. 101437, 2021, Impact Factor: 1.810.
175	**Akhilesh Verma** and Srinivasa Nallanthighal Raghava	Circularly polarized hybrid mode substrate integrated waveguide antenna for two quadrant scanning beamforming applications for 5G	*International Journal of RF and Microwave Computer-Aided Engineering (Wiley)*, vol. 31, no. 10, pp. e22798, 2021, Impact Factor: 1.694.
176	**Anurag Chauhan**, Ankit Maahich and Jatin Pal	First-principles calculations of the electronic and optical properties of $WSe_2/Cd_{0.9}Zn_{0.1}Te$ van der Waals heterostructure	*Journal of Computational Electronics (Springer),* vol. 20, pp. 13–20, 2021, Impact Factor: 1.807.
177	**Bhawna Rawat** and Poornima Mittal	A 32 nm single-ended single-port 7T static random access memory for low power utilization	*Semiconductor Science and Technology (IOP Publishing)*, vol. 36, no. 9, pp. 095006, 2021, Impact Factor: 2.352.
178	**Dwijendra Pandey** and Kailash Chandra Tiwari	Spectral library creation and analysis of urban built-up surfaces and materials using field spectrometry	*Arabian Journal of Geosciences (Springer)*, vol. 14, no. 595, 2021, Impact Factor: 1.827.
179	**Garima Varshney** Neeta Pandey and Rajeshwari Pandey	Electronically tunable fractional-order multivibrator using OTA and its application as versatile modulator	*AEU - International Journal of Electronics and Communications (Elsevier)*, vol. 141, pp. 153956, 2021, Impact Factor: 3.183.
180	**Garima Varshney** Neeta Pandey and Rajeshwari Pandey	Electronically Tunable Multifunction Transadmittance-Mode Fractional-Order Filter	*Arabian Journal for Science and Engineering (Springer)*, vol. 46, pp. 1067–1078, 2021, Impact Factor: 2.334.

S. No	Authors	Paper Title	Journal with Publication Details
181	**Garima Varshney** Neeta Pandey and Rajeshwari Pandey	Generalization of shadow filters in fractional domain	*International Journal of Circuit Theory and Applications (Wiley),* vol. 49, no. 10, pp. 3248-3265, 2021, Impact Factor: 2.038.
182	**Gaurav Saxena**, Priyanka Jain and Y. K. Awasthi	Design and analysis of a planar UWB bandpass filter with stopband characteristics using MMR technique	*International Journal of Microwave and Wireless Technologies (Cambridge University Press)*, vol. 13, no. 10, pp. 999 – 1006, 2021, Impact Factor: 1.064.
183	**Gaurav Saxena**, Y. K. Awasthi and Priyanka Jain	Design of metasurface absorber for low RCS and high isolation MIMO antenna for radio location & navigation	*AEU - International Journal of Electronics and Communications (Elsevier)*, vol. 133, pp. 153680, 2021, Impact Factor: 3.183.
184	Suman Yadav, Richa Yadav, Ashwni Kumar and **Manjeet Kumar**	A novel approach for optimal design of digital FIR filter using grasshopper optimization algorithm	*ISA Transactions (Elsevier)*, vol. 108, pp. 196-206, 2021, Impact Factor: 5.468.
185	Suman Yadav, Richa Yadav, Ashwni Kumar and **Manjeet Kumar**	A novel approach to design optimal 2-D digital differentiator using vortex search optimization algorithm	*Multimedia Tools and Applications (Springer)*, vol. 80, pp. 5901–5916, 2021, Impact Factor: 2.757.
186	Ashish Kumar, Ramana Ranganatham, **Manjeet Kumar** and Rama Komaragiri	Hardware Emulation of a Biorthogonal Wavelet Transform-Based Heart Rate Monitoring Device	*IEEE Sensors Journal (IEEE)*, vol. 21, no. 4, pp. 5271 – 5281, 2021, Impact Factor: 3.301.
187	Ashish Kumar, Harshit Tomar, Virender Kumar Mehla, Rama Komaragiri and **Manjeet Kumar**	Stationary wavelet transform based ECG signal denoising method	*ISA Transactions (Elsevier)*, vol. 114, pp. 251-262, 2021, Impact Factor: 5.468.
188	**Mohd Sazid** and N. S. Raghava	Planar UWB-bandpass filter with multiple passband transmission zeros	*AEU - International Journal of Electronics and Communications (Elsevier)*, vol. 134, pp. 153711, 2021, Impact Factor: 3.183.
189	**Monica Gupta**, Kirti Gupta and Neeta Pandey	A data-independent 9T SRAM cell with enhanced ION/IOFF ratio and RBL voltage swing in near threshold and sub-threshold region	*International Journal of Circuit Theory and Applications (Wiley)*, vol. 49, no. 4, pp. 953-969, 2021, Impact Factor: 2.038.
190	**Monica Gupta**, Kirti Gupta and Neeta Pandey	A novel PVT-variation-tolerant Schmitt-trigger-based 12T SRAM cell with improved write ability and high ION/IOFF ratio in sub-threshold region	*International Journal of Circuit Theory and Applications (Wiley)*, vol. 49, no. 11, pp. 3789-3810, 2021, Impact Factor: 2.038.
191	**Monica Gupta**, Kirti Gupta and Neeta Pandey	Comparative Analysis of the Design Techniques for Low Leakage SRAMs at 32nm	*Microprocessors and Microsystems (Elsevier)*, vol. 85, pp. 104281, 2021, Impact Factor: 1.525.

S. No	Authors	Paper Title	Journal with Publication Details
192	**Munindra** and Deva Nand	Nonlinearity and scaling trends of quasiballistic graphene field-effect transistors targeting RF applications	*Journal of Computational Electronics (Springer)*, vol. 20, pp. 2379–2386, 2021, Impact Factor: 1.807.
193	**Navnit Kumar**, Manjeet Kumar and Neeta Pandey	Unified floating immittance emulator based on CCTA	*Microelectronics Journal (Elsevier)*, vol. 118, pp. 105289, 2021, Impact Factor: 1.605.
194	Praveen Kumar, **Neeta Pandey** and Sajal K. Paul	Electronically Tunable VDTA-Based Multi-function Inverse Filter	*Iranian Journal of Science and Technology, Transactions of Electrical Engineering (Springer)*, vol. 45, pp. 247–257, 2021, Impact Factor: 1.194.
195	Ranjana Sivaram, Kirti Gupta and **Neeta Pandey**	Impact of multi threshold transistor in positive feedback source coupled logic (PFSCL) fundamental cell	*Analog Integrated Circuits and Signal Processing (Springer)*, vol. 109, pp. 173–185, 2021, Impact Factor: 1.337.
196	**Neetika Yadav**, Neeta Pandey and Deva Nand	Leakage reduction in dual mode logic through gated leakage transistors	*Microprocessors and Microsystems (Elsevier)*, vol. 84, pp. 104269, 2021, Impact Factor: 1.525.
197	**Om Krishna Gupta**, Neeta Pandey and Maneesha Gupta	Improved reversed nested miller frequency compensation techniques using flipped and folded flipped voltage follower with resistor for three stage amplifier	*AEU - International Journal of Electronics and Communications (Elsevier)*, vol. 142, pp. 154004, 2021, Impact Factor: 3.183.
198	**Poornima Mittal**, Sugandha Yadav and Shubham Negi	Advancements for organic thin film transistors: Structures, materials, performance parameters, influencing factors, models, fabrication, reliability and applications	*Materials Science in Semiconductor Processing (Elsevier),* vol. 133, pp. 105975 2021, Impact Factor: 3.927.
199	**Poornima Mittal**	Ditch and elevated organic thin film transistor-based improved common source voltage amplifier: Frequency response characteristics and analytical modeling	*Journal of the Society for Information Display (Wiley)*, vol. 29, no. 8, pp. 642-658, 2021, Impact Factor: 2.140.
200	Bhawna Rawat and **Poornima Mittal**	Single bit line accessed high-performance ultra-low voltage operating 7T static random access memory cell with improved read stability	*International Journal of Circuit Theory and Applications (Wiley),* vol. 49, no. 5 pp. 1435-1449, 2021, Impact Factor: 2.038.
201	**Priyanka Garg** and Priyanka Jain	Design and Analysis of a Bandpass Filter Using Dual Composite Right/Left Handed (D-CRLH) Transmission Line Showing Bandwidth Enhancement	*Wireless Personal Communications (Springer),* vol. 120, pp. 1705–1720, 2021, Impact Factor: 1.671.

S. No	Authors	Paper Title	Journal with Publication Details
202	**R. Arundeepakvel**, Jatin, Parth Khatter, Neeta Pandey and Shahram Minaei	A novel design for voltage inverting metamutator and its applications	*Microelectronics Journal (Elsevier)*, vol. 113, pp. 105096, 2021, Impact Factor: 1.605.
203	**Rajiv Kapoor**, Swapnil Verma and Aarchishya Kapoor	Quaternions-based detection of power quality events	*Electrical Engineering (Springer)*, vol. 103, pp. 2911–2927, 2021, Impact Factor: 1.836.
204	**Rajiv Kapoor**, Deepak Sharma and Tarun Gulati	State of the art content based image retrieval techniques using deep learning: a survey	*Multimedia Tools and Applications (Springer)*, vol. 80, pp. 29561–29583, 2021, Impact Factor: 2.757.
205	**Riya Jain** and Neeta Pandey	Approximate Karatsuba multiplier for error-resilient applications	*AEU - International Journal of Electronics and Communications (Elsevier)*, vol. 130, no. 153579, 2021, Impact Factor: 3.183.
206	Manjari Gupta, Lava Bhargava and **S. Indu**	Dynamic workload-aware DVFS for multicore systems using machine learning	*Computing (Springer)*, vol. 103, pp. 1747–1769, 2021, Impact Factor: 2.220.
207	Manjari Gupta, Lava Bhargava and **S. Indu**	Mapping techniques in multicore processors: current and future trends	*The Journal of Supercomputing (Springer)*, vol. 77, pp. 9308–9363, 2021, Impact Factor: 2474.
208	**Sachin Taran**, Varun Bajaj, G. R. Sinha and Kemal Polat	Detection of sleep apnea events using electroencephalogram signals	*Applied Acoustics (Elsevier)*, vol. 181, pp. 108137, 2021, Impact Factor: 2.639.
209	**Shashwat Singh,** Sagar Jain, Rajeshwari Pandey and Neeta Pandey	Adaptive biased current differencing trans-conductance amplifier	*AEU - International Journal of Electronics and Communications (Elsevier),* vol. 128, pp. 153494, 2021, Impact Factor: 3.183.
210	**Sonam Rewari**	Core-Shell Nanowire Junctionless Accumalation Mode Field-Effect Transistor (CSN-JAM-FET) for High Frequency Applications - Analytical Study	*Silicon (Springer)*, vol. 13, pp. 4371–4379, 2021, Impact Factor: 2.670.
211	**Sumedha Gupta**, Neeta Pandey and R. S. Gupta	Analytical modeling of dual-metal gate stack engineered junctionless accumulation-mode cylindrical surrounding gate (DMGSE-JAM-CSG) MOSFET	*Applied Physics A (Springer)*, vol. 127, no. 520, 2021, Impact Factor: 2.584.
212	**Sumedha Gupta**, Neeta Pandey and R S Gupta	Temperature dependency and linearity assessment of dual-metal gate stack junctionless accumulation-mode cylindrical surrounding gate (DMGS-JAM-CSG) MOSFET	*Physica Scripta (IOP Publishing),* vol. 96, no. 12, pp. 124055, 2021, Impact Factor: 2.487.
213	**Tej Singh** and Dinesh Kumar Vishwakarma	A deep multimodal network based on bottleneck layer features fusion for action recognition	*Multimedia Tools and Applications (Springer)*, vol. 80, pp. 33505–33525, 2021, Impact Factor: 2.757.
214	**Tej Singh** and Dinesh Kumar Vishwakarma	A deeply coupled ConvNet for human activity recognition using dynamic and RGB images	*Neural Computing and Applications (Springer)*, vol. 33, pp. 469–485, 2021, Impact Factor: 5.606.

S. No	Authors	Paper Title	Journal with Publication Details
DEPARTMENT OF ENVIRONMENTAL ENGINEERING			
215	**Ali Reza Noori** and S. K. Singh	Status of groundwater resource potential and its quality at Kabul, Afghanistan: a review	*Environmental Earth Sciences (Springer)*, vol. 80, no. 654, 2021, Impact Factor: 2.784.
216	Ankur Aggarwal, Jigyasa Soni, Khyati Sharma, Mohnish Sapra, Chitrakshi, Oznur Karaca and **A. K. Haritash**	Hydrogeochemical Assessment of Groundwater for Drinking and Agricultural Use: A Case Study of Rural Areas of Alwar, Rajasthan	*Environmental Management (Springer),* vol. 67, pp. 513–521, 2021, Impact Factor: 3.266.
217	**Harsh Pipil,** A. K. Haritash and Krishna R. Reddy	Seasonal variability and kinetics of phosphate removal in a *Phragmites*-based engineered wetland	*Rendiconti Lincei. Scienze Fisiche e Naturali (Springer)*, vol. 32, pp. 729–735, 2021, Impact Factor: 1.627.
218	**Lovleen Gupta**, Rishabh Dev, Kumail Zaidi, Ramya Sunder Raman, Gazala Habib and Bipasha Ghosh	Assessment of PM_{10} and $PM_{2.5}$ over Ghaziabad, an industrial city in the Indo-Gangetic Plain: spatio-temporal variability and associated health effects	*Environmental Monitoring and Assessment (Springer)*, vol. 193, no. 735, 2021, Impact Factor: 2.513.
219	**Rajeev Kumar Mishra**, Kartik Nair, Kranti Kumar and Ankita Shukla	Dynamic noise mapping of road traffic in an urban city	*Arabian Journal of Geosciences (Springer)*, vol. 14, no. 122, 2021, Impact Factor: 2.334.
220	Ravindra Kumar, **Rajeev Kumar Mishra**, Satish Chandra and Asif Hussain	Evaluation of urban transport-environment sustainable indicators during Odd–Even scheme in India	*Environment, Development and Sustainability (Springer)*, vol. 23, pp. 17240–17262, 2021, Impact Factor: 3.219.
221	Deepali Goyal, A. K. Haritash and **S. K. Singh**	A comprehensive review of groundwater vulnerability assessment using index-based, modelling, and coupling methods	*Journal of Environmental Management (Elsevier)*, vol. 296, pp. 113161, 2021, Impact Factor: 6.789.
222	Riki Sarma and **Santosh Kumar Singh**	Simulating contaminant transport in unsaturated and saturated groundwater zones	Water Environment Research (Wiley), vol. 93, no. 9, pp. 1496-1509, 2021, Impact Factor: 1.946.
223	Ali Reza Noori and **S. K. Singh**	Spatial and temporal trend analysis of groundwater levels and regional groundwater drought assessment of Kabul, Afghanistan	*Environmental Earth Sciences (Springer),* vol. 80, no. 698, 2021, Impact Factor: 2.784.
224	**Sakshi**, S. K. Singh and A. K. Haritash	Catabolic enzyme activities during biodegradation of three-ring PAHs by novel DTU-1Y and DTU-7P strains isolated from petroleum-contaminated soil	*Archives of Microbiology (Springer)*, vol. 203, pp. 3101–3110, 2021, Impact Factor: 2.552.
225	**Sakshi**, S. K. Singh and A. K. Haritash	Catabolic enzyme activity and kinetics of pyrene degradation by novel bacterial strains isolated from contaminated soil	*Environmental Technology & Innovation (Elsevier)*, vol. 23, pp. 101744, 2021, Impact Factor: 5.263.

S. No	Authors	Paper Title	Journal with Publication Details
226	**Saurav Kumar Ambastha** and A. K. Haritash	Prevalence and risk analysis of fluoride in groundwater around sandstone mine in Haryana, India	*Rendiconti Lincei. Scienze Fisiche e Naturali (Springer)*, vol. 32, pp. 577–584, 2021, Impact Factor: 1.627.
227	**Shailendra Kumar Yadav**, Sobhan Kumar Kompalli, Bhola Ram Gurjar and Rajeev Kumar Mishra	Aerosol number concentrations and new particle formation events over a polluted megacity during the COVID-19 lockdown	*Atmospheric Environment (Elsevier)*, vol. 259, pp. 118526, 2021, Impact Factor: 4.798.
228	**Shailendra Kumar Yadav**,Raghav Sharma, Sankalp Kumar, Aviral Agarwal, Vignesh Mohan, Rajeev Kumar Mishra and Ankita Shukla	Urban air pollution reduction: evidence from phase-wise analysis of COVID-19 pandemic lockdown	*Arabian Journal of Geosciences (Springer)*, vol. 14, no. 1413, 2021, Impact Factor: 1.827.
229	**Vandana Shan**, S. K. Singh and A. K. Haritash	Evaluation of water quality and potential metal contamination in ecologically important Bhindawas bird sanctuary, India	*Applied Water Science (Springer)*, vol. 11, no. 8, 2021, Impact Factor: 3.874.
DEPARTMENT OF HUMANITIES			
230	Aynalem Shita, **Nand Kumar** and Seema Singh	Technology, poverty and income distribution nexus: The case of fertilizer adoption in Ethiopia	*African Development Review - Revue Africaine De Developpement (Wiley), vol. 33, no. 4, pp. 742-755, 2021, Impact Factor: 1.878.*
DEPARTMENT OF INFORMATION TECHNOLOGY			
230	**Ashish Kumar** and N. S. Raghava	An efficient image encryption scheme using elementary cellular automata with novel permutation box	*Multimedia Tools and Applications (Springer)*, vol. 80, pp. 21727–21750, 2021, Impact Factor: 2.757.
231	**Bindu Verma** and Ayesha Choudhary	Affective state recognition from hand gestures and facial expressions using Grassmann manifolds	*Multimedia Tools and Applications (Springer),* vol. 80, pp. 14019–14040, 2021, Impact Factor: 2.757.
232	**Chahat Raj** and Priyanka Meel	ConvNet frameworks for multi-modal fake news detection	*Applied Intelligence (Springer)*, vol. 51, pp. 8132–8148, 2021, Impact Factor: 5.086.
233	**Deepika Varshney** and Dinesh Kumar Vishwakarma	A review on rumour prediction and veracity assessment in online social network	*Expert Systems with Applications (Elsevier)*, vol. 168, pp. 114208, 2021, Impact Factor: 6.954.
234	**Deepika Varshney** and Dinesh Kumar Vishwakarma	A unified approach for detection of Clickbait videos on YouTube using cognitive evidences	*Applied Intelligence (Springer),* vol. 51, pp. 4214–4235, 2021, Impact Factor: 5.086.
235	Kunal Chaturvedi, **Dinesh Kumar Vishwakarma** and Nidhi Singh	COVID-19 and its impact on education, social life and mental health of students: A survey	*Children and Youth Services Review (Elsevier)*, vol. 121, pp. 105866, 2021, Impact Factor: 2.393.

S. No	Authors	Paper Title	Journal with Publication Details
236	Priyanka Meel and **Dinesh Kumar Vishwakarma**	HAN, image captioning, and forensics ensemble multimodal fake news detection	*Information Sciences (Elsevier)*, vol. 567, pp. 23-41, 2021, Impact Factor: 6.795.
237	Deepika Varshney and **Dinesh Kumar Vishwakarma**	Hoax news-inspector: a real-time prediction of fake news using content resemblance over web search results for authenticating the credibility of news articles	*Journal of Ambient Intelligence and Humanized Computing (Springer)*, vol. 12, pp. 8961–8974, 2021, Impact Factor: 7.104.
238	**Isha Singh** and Om Prakash Verma	Impulse noise removal in color image sequences using fuzzy logic	*Multimedia Tools and Applications (Springer)*, vol. 80, pp. 18279–18300, 2021, Impact Factor: 2.757.
239	Keshav Gupta, Gurjit Singh Walia and **Kapil Sharma**	Novel approach for multimodal feature fusion to generate cancelable biometric	*The Visual Computer (Springer)*, vol. 37, pp. 1401–1413, 2021, Impact Factor: 2.601.
240	**Naresh Kumar** and Seba Susan	Particle swarm optimization of partitions and fuzzy order for fuzzy time series forecasting of COVID-19	*Applied Soft Computing (Elsevier)*, vol. 110, pp. 107611, 2021, Impact Factor: 6.725.
241	**Priyanka Meel** and Dinesh Kumar Vishwakarma	A temporal ensembling based semi-supervised ConvNet for the detection of fake news articles	*Expert Systems with Applications(Elsevier),* vol. 177, pp. 115002, 2021, Impact Factor: 6.954.
242	**Sahil Raheja** and Akshi Kumar	Edge detection based on type-1 fuzzy logic and guided smoothening	*Evolving Systems (Springer)*, vol. 12, pp. 447–462, 2021, Impact Factor: 1.908.
243	Akshi Kumar and **Sahil Raheja**	Edge Detection in Digital Images Using Guided L_0 Smoothen Filter and Fuzzy Logic	*Wireless Personal Communications (Springer)*, vol. 121, pp. 2989–3007, 2021, Impact Factor: 1.671.
244	**Seba Susan** and Jatin Malhotra	Learning image by-parts using early and late fusion of auto-encoder features	*Multimedia Tools and Applications (Springer)*, vol. 80, pp. 29601–29615, 2021, Impact Factor: 2.757.
245	**Shalini Gakhar** and Kailash Chandra Tiwari	Spectral – spatial urban target detection for hyperspectral remote sensing data using artificial neural network	*The Egyptian Journal of Remote Sensing and Space Science (Elsevier)*, vol. 24, no. 2, pp. 173-180, 2021, Impact Factor: 5.188.
246	**Srishti Vashishtha** and Seba Susan	Highlighting keyphrases using senti-scoring and fuzzy entropy for unsupervised sentiment analysis	*Expert Systems with Applications (Elsevier)*, vol. 169, pp. 114323, 2021, Impact Factor: 6.954.
247	**Swati Sharda**, Kapil Sharma and Mukhtiar Singh	A real-time automated scheduling algorithm with PV integration for smart home prosumers	*Journal of Building Engineering (Elsevier)*, vol. 44, pp. 102828, 2021, Impact Factor: 5.318.
248	**Swati Sharda**, Mukhtiar Singh and Kapil Sharma	Demand side management through load shifting in IoT based HEMS: Overview, challenges and opportunities	*Sustainable Cities and Society (Elsevier)*, vol. 65, pp. 102517, 2021, Impact Factor: 7.587.

S. No	Authors	Paper Title	Journal with Publication Details
DEPARTMENT OF MECHANICAL ENGINEERING			
249	**Anand Kushwah**, Anil Kumar, Manoj Kumar Gaur and Amit Pal	Garlic dehydration inside heat exchanger-evacuated tube assisted drying system: Thermal performance, drying kinetic and color index	*Journal of Stored Products Research (Elsevier)*, vol. 93, pp. 101852, 2021, Impact Factor: 2.643.
250	Srijit Basu, Alfred John, Akshay and **Anil Kumar**	Design and feasibility analysis of hydrogen based hybrid energy system: A case study	*International Journal of Hydrogen Energy (Elsevier)*, vol. 46, no. 70, pp. 34574-34586, 2021, Impact Factor: 5.816.
251	Sankalp Kumar, Aviral Agarwal and **Anil Kumar**	Financial viability assessment of concentrated solar power technologies under Indian climatic conditions	*Sustainable Energy Technologies and Assessments (Elsevier)*, vol. 43, pp. 100928, 2021, Impact Factor: 5.353.
252	Geetam Richhariya and **Anil Kumar**	Performance evaluation of mixed synthetic organic dye as sensitizer based dye sensitized solar cell	*Optical Materials (Elsevier)*, vol. 111, pp. 110658, 2021, Impact Factor: 3.080.
253	**Anil Kumar**, Ravi Kant and Samsher	Review on Spray-Assisted Solar Desalination: Concept, Performance and Modeling	*Arabian Journal for Science and Engineering (Springer)*, vol. 46, pp. 11521–11541, 2021, Impact Factor: 2.334.
254	**Ankit Sonthalia**, Shivam Garg, Rishav Sharma, Thiyagarajan Subramanian and Naveen Kumar	Effect of electrostatic precipitator on exhaust emissions in biodiesel fuelled CI engine	*Environmental Science and Pollution Research (Springer)*, vol. 28, pp. 11850–11859, 2021, Impact Factor: 4.223.
255	**Ankit Sonthalia** and Naveen Kumar	Comparison of fuel characteristics of hydrotreated waste cooking oil with its biodiesel and fossil diesel	*Environmental Science and Pollution Research (Springer)*, vol. 28, pp. 11824–11834, 2021, Impact Factor: 4.223.
256	**Anuj Sharma**, V. Rastogi and A.K. Agrawal	Estimation and Experimental Validation of Mean-Field Homogenised Effective Properties of Composite	*Experimental Techniques (Springer)*, vol. 45, pp. 445–456, 2021, Impact Factor: 1.167.
257	**Aseem Dubey**, Shiv Kumar and Akhilesh Arora	Enviro-energy-exergo-economic analysis of ETC augmented double slope solar still with 'N' parallel tubes under forced mode: Environmental and economic feasibility	*Journal of Cleaner Production (Elsevier)*, vol. 279, pp. 123859, 2021, Impact Factor: 9.297.
258	**Ashok Kumar Singh** and Samsher	A review study of solar desalting units with evacuated tube collectors	*Journal of Cleaner Production (Elsevier)*, vol. 279, pp. 123542, 2021, Impact Factor: 9.297.
259	**Chandra Shekhar Singh**, Naveen Kumar and Raghvenrda Gautam	Supercritical transesterification route for biodiesel production: Effect of parameters on yield and future perspectives	*Environmental Progress & Sustainable Energy (Wiley)*, vol. 40, no. 6, pp. e13685, 2021, Impact Factor: 2.431.

S. No	Authors	Paper Title	Journal with Publication Details
260	**Faizan Khalid**, Rajesh Kumar and Farrukh Khalid	Feasibility study of a new solar based trigeneration system for fresh water, cooling, and electricity production	*International Journal of Energy Research (Wiley),* vol. 45, no. 13 pp. 19500-19508, 2021, Impact Factor: 5.164.
261	**Furkan Ahmad**, N. Yuvaraj and Pramendra Kumar Bajpai	Influence of reinforcement architecture on static and dynamic mechanical properties of flax/epoxy composites for structural applications	*Composite Structures (Elsevier)*, vol. 255, pp. 112955, 2021, Impact Factor: 5.407.
262	Narender Kumar, **Girish Kumar** and Rajesh Kumar Singh	Big data analytics application for sustainable manufacturing operations: analysis of strategic factors	*Clean Technologies and Environmental Policy (Springer)*, vol. 23, pp. 965–989, 2021, Impact Factor: 3.636.
263	**Husain Mehdi** and R. S. Mishra	Effect of friction stir processing on mechanical properties and heat transfer of TIG welded joint of AA6061 and AA7075	*Defence Technology (Elsevier)*, vol. 17, no. 3, pp. 715-727, 2021, Impact Factor: 3.172.
264	**Husain Mehdi** and R. S. Mishra	Effect of Friction Stir Processing on Mechanical Properties and Wear Resistance of Tungsten Inert Gas Welded Joint of Dissimilar Aluminum Alloys	*Journal of Materials Engineering and Performance (Springer)*, vol. 30, pp. 1926–1937, 2021, Impact Factor: 1.819.
265	**Kaushalendra Kumar Singh**, Rajesh Kumar and Anjana Gupta	Multi-objective Optimization of Thermodynamic and Economic Performances of Natural Refrigerants for Cascade Refrigeration	*Arabian Journal for Science and Engineering (Springer)*, vol. 46, pp. 12235–12252, 2021, Impact Factor: 2.334.
266	Sulekh Tokas, **Mohammad Zunaid** and Mubashshir Ahmad Ansari	Numerical investigation of the performance of 3D-helical passive micromixer with Newtonian fluid and non-Newtonian fluid blood	*Asia-Pacific Journal of Chemical Engineering (Wiley)*, vol. 16, no. 1, pp. e2570, 2021, Impact Factor: 1.447.
267	**Mohd Asjad Siddiqui**, Abdul Khaliq and Rajesh Kumar	Proposal and analysis of a novel cooling-power cogeneration system driven by the exhaust gas heat of HCCI engine fuelled by wet-ethanol	*Energy (Elsevier)*, vol. 232, pp. 120954, 2021, Impact Factor: 7.147.
268	**Mohit Vishnoi**, Paras Kumar and Qasim Murtaza	Surface texturing techniques to enhance tribological performance: A review	*Surfaces and Interfaces (Elsevier)*, vol. 27, pp. 01463, 2021, Impact Factor: 4.837.
269	**Mukul Tomar**, Ankit Sonthalia, Naveen Kumar and Hansham Dewal	Waste glycerol derived bio-propanol as a potential extender fuel for compressed ignition engine	*Environmental Progress & Sustainable Energy (Wiley),* vol. 40, no. 2, pp. e13526, 2021, Impact Factor: 2.431.
270	Jayanta Ghosh Roy, **N. Yuvaraj** and Vipin	Effect of Welding Parameters on Mechanical Properties of Cold Metal Transfer Welded Thin AISI 304 Stainless-Steel Sheets	*Transactions of the Indian Institute of Metals (Springer)*, vol. 74, pp. 2397–2408, 2021, Impact Factor: 1.499.

S. No	Authors	Paper Title	Journal with Publication Details
271	**Paras Kumar** and Harish Hirani	Misalignment effect on gearbox failure: An experimental study	*Measurement (Elsevier)*, vol. 169, pp.108492, 2021, Impact Factor: 3.927.
272	**Paras Kumar**	Traffic noise prediction and optimization using response surface method (RSM)	*Arabian Journal of Geosciences (Springer)*, vol. 14, no. 2181, 2021, Impact Factor: 1.827.
273	**Pravin Kumar**, Rajesh Kr Singh, Justin Paul and Oikantik Sinha	Analyzing challenges for sustainable supply chain of electric vehicle batteries using a hybrid approach of Delphi and Best-Worst Method	*Resources, Conservation and Recycling (Elsevier)*, vol. 175, pp. 105879, 2021, Impact Factor: 10.204.
274	**Pravin Kumar**, Rajesh Kr Singh and Vikas Kumar	Managing supply chains for sustainable operations in the era of industry 4.0 and circular economy: Analysis of barriers	*Resources, Conservation and Recycling (Elsevier)*, vol. 164, pp. 105215, 2021, Impact Factor: 10.204.
275	**Pravin Kumar** and Rajesh Kumar Singh	Selection of sustainable solutions for crop residue burning: an environmental issue in northwestern states of India	*Environment, Development and Sustainability (Springer)*, vol. 23, pp. 3696–3730, 2021, Impact Factor: 3.219.
276	**Ravi Butola**, Prakash Chandra, Kartikeya Bector and Ranganath M Singari	Fabrication and multi-objective optimization of friction stir processed aluminium based surface composites using Taguchi approach	*Surface Topography: Metrology and Properties (IOP Publishing)*, vol. 9, no. 2, pp. 025044, 2021, Impact Factor: 2.038.
277	**Sachin Dhull**, R. S. Walia, Qasim Murtaza and M. S. Niranjan	Experimental, Computational and Mathematical Analysis of Hybrid Abrasive Flow Machining Process	*International Journal of Precision Engineering and Manufacturing (Springer)*, vol. 22, pp. 1657–1680, 2021, Impact Factor: 2.106.
278	**Shrikant Vidya**, Reeta Wattal and P. Venkateswara Rao	Investigation of machining performance in die-sinking electrical discharge machining of pentagonal micro-cavities using cylindrical electrode	*Journal of the Brazilian Society of Mechanical Sciences and Engineering (Springer)*, vol. 43, no. 288, 2021, Impact Factor: 2.220.
279	**Yashwant Koli**, N. Yuvaraj, S. Aravindan and Vipin	CMT Joining of AA6061-T6 and AA6082-T6 and Examining Mechanical Properties and Microstructural Characterization	*Transactions of the Indian Institute of Metals (Springer)*, vol. 74, pp. 313–329, 2021, Impact Factor: 1.499.
280	**Yashwant Koli**, N. Yuvaraj, S. Aravindan and Vipin	Enhancement of Mechanical Properties of 6061/6082 Dissimilar Aluminium Alloys Through Ultrasonic-Assisted Cold Metal Transfer Welding	*Arabian Journal for Science and Engineering (Springer)*, vol. 46, pp. 12089–12104, 2021, Impact Factor: 2.334.
DEPARTMENT OF SOFTWARE ENGINEERING			
281	**Abhilasha Sharma** and Himanshu Shekhar	A predictive analytics framework for Sustainable Water Governance	*Sustainable Computing: Informatics and Systems (Elsevier)*, vol. 32, pp. 100604, 2021, Impact Factor: 4.028.

S. No	Authors	Paper Title	Journal with Publication Details
282	**Ruchika Malhotra** and Kusum Lata	An empirical study to investigate the impact of data resampling techniques on the performance of class maintainability prediction models	*Neurocomputing (Elsevier)*, vol. 459, pp. 432-453, 2021, Impact Factor: 5.719.
283	A. Srivastava, A. Gupta and **S. Patidar**	Review of biomarker systems as an alternative for early diagnosis of ovarian carcinoma	*Clinical and Translational Oncology (Springer)*, vol. 23, pp. 1967–1978, 2021, Impact Factor: 3.405.
UNIVERSITY SCHOOL OF MANAGEMENT AND ENTREPRENEURSHIP			
284	**Naval Garg**, Nancy Katiyar and Mehak	Gratitude Questionnaire (GQ-6)-Exploring Psychometric Properties in India	*Journal of Religion and Health (Springer)*, vol. 60, pp. 3716–3731, 2021, Impact Factor: 1.898.
285	**Rajesh Sharma**	A Systematic Examination of Burden of Childhood Cancers in 183 Countries: Estimates from GLOBOCAN 2018	*European Journal of Cancer Care (Wiley)*, vol. 30, no. 5, pp. e13438, 2021, Impact Factor: 2.520.
286	**Rajesh Sharma**	Breast cancer burden in Africa: evidence from GLOBOCAN 2018	*Journal of Public Health (Oxford University Press)*, vol. 43, no. 4, pp. 763–771, 2021, Impact Factor: 2.341.
287	**Rajesh Sharma**	Examination of incidence, mortality and disability-adjusted life years and risk factors of breast cancer in 49 Asian countries, 1990-2019: estimates from Global Burden of Disease Study 2019	*Japanese Journal of Clinical Oncology (Oxford University Press)*, vol. 51, n. 5, pp. 826-835, 2021, Impact Factor: 3.019.
288	**Rajesh Sharma**	Global, regional, national burden of breast cancer in 185 countries: evidence from GLOBOCAN 2018	*Breast Cancer Research and Treatment (Springer),* vol. 187, no. 2, pp. 557-567, 2021, Impact Factor: 4.872.

PATENTS AWARDED

1ST JANUARY, 2021 – 31ST DECEMBER, 2021

Inventors	Title of Patent and Patent number	Assignee	Date of Patent
Sachin Kumar Agrawal and **Kapil Sharma**	US10454553B2: Beam forming method for a transmitting antenna and a device thereof	Delhi Technological University, Samsung Electronics Co. Ltd.	June 11, 2021

BIOGRAPHY

MR. ATUL VARSHNEY

Department of Applied Chemistry

Mr. Atul Varshney working as a research scholar at the Department of Applied Chemistry, DTU, under the guidance of Prof. Anil Kumar. He had completed his bachelors and masters degree in chemistry from the D. S. College, Aligarh. He pursued M.Sc. in inorganic chemistry as specialization, and hence decided to further explore the subject for Ph.D. degree. He joined DTU in the year 2016 as a JRF under the supervision of Prof. Anil Kumar. His research interests include primarily focus on the synthesis of corroles and exploring its divergent applications. Currently, he is exploring the green applications of corroles.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Varshney**, A. Kumar and S. Yadav, "Catalytic activity of bis p-nitro A_2B (oxo)Mn(V) corroles towards oxygen transfer reaction to sulphides", *Inorganica Chimica Acta*, vol. 514, pp. 120013, 2021. Impact Factor: 2.545.

Catalytic activity of bis p-nitro A_2B (oxo)Mn(V) corroles towards oxygen transfer reaction to sulphides

Atul Varshney, Anil Kumar and Sunil Yadav

Abstract: The 5 A_2B Mn(III) corroles have been synthesized, fully characterized and used for oxygen atom transfer (OAT) from isolated (oxo)manganese(V)corrole to sulfide. Oxidation of Mn(III) were carried out using ozone, a clean oxidant, which resulted in the isolation of the 5 red- coloured (oxo)manganese(V) corroles. The stoichiometric OAT to a different p-thioanisoles gave a mechanistic insight. The electron withdrawing and electron donating group containing phenyl group substituents on C_{10} meso carbon were synthesized to gain effect of substituents on the rate constant. The rate constant suggests the disproportionation reaction for OAT from (oxo)manganese(V) corrole to (oxo)manganese(IV) and (oxo)manganese(VI) corroles. Newly synthesized free bases were characterised by ^{1}H NMR, UV–visible spectroscopy. Manganese(III) corrole, (oxo)manganese(V) corrole were characterized by UV–visible spectroscopy. Self-decay and oxygen atom transfer to sulfide rate constant were determined using UV–visible spectroscopy. Electrochemistry of these Mn(III) corroles shows the effect of meso phenyl substituents on the oxidation potential of Mn(III) corroles. DFT calculation of these synthesized Mn(III) corroles have been carried out and HOMO-LUMO gap varies with the substituents on meso carbons.

For details refer to https://doi.org/10.1016/j.ica.2020.120013

BIOGRAPHY

DR. DEENAN SANTHIYA

Department of Applied Chemistry

Dr. Deenan Santhiya is working as an Assistant professor at the Discipline of Applied Science, Department of Applied Chemistry, Delhi Technological University (formerly Delhi College of Engineering), Delhi, India. She received her Masters and Doctorate degree from the Materials Engineering Department, Indian Institute of Science, Bangalore. She has received Prof. R. M. Mallya Processing Award for the best Ph.D. thesis of the year 2002. She has been recently awarded a DST project entitled Topical delivery of therapeutic loaded bioglass assembly for bone regeneration (2019-2022). Also Mentor for the DST WOS B Kiran Division project entitled Fabrication of collagen-bioactive glass corona through oral delivery for bone regeneration. She has published independent reputed research articles affiliated with Delhi Technological University. Her research interests are in the field of Nano Biotechnology, Gene delivery applications and microbial remediation of nano/micro plastics.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. M. Bansal, **D. Santhiya** and J. G. Sharma, "Behavioural Mechanisms of Microplastic Pollutants in Marine Ecosystem: Challenges and Remediation Measurements", *Water, Air, & Soil Pollution,* vol. 232, no. 9, pp. 1-22, 2021. Impact Factor: 2.520.
2. H. Goel, N. Gupta, **D. Santhiya**, N. Dey, H. B. Bohidar and A. Bhattacharya, "Bioactivity reinforced surface patch bound collagen-pectin hydrogel", *International Journal of Biological Macromolecules*, vol. 174, no. 31, pp. 240-253, 2021. Impact Factor: 6.953.
3. M. Kaur and **D. Santhiya**, "UV-shielding antimicrobial zein films blended with essential oils for active food packaging", *Journal of Applied Polymer Science*, vol. 138, no. 7, pp. 49832,, 2021. Impact Factor: 3.125.

Behavioural Mechanisms of Microplastic Pollutants in Marine Ecosystem: Challenges and Remediation Measurements

Megha Bansal, **Deenan Santhiya*** and Jai Gopal Sharma

Abstract: Plastic pollution is the biggest threat to marine ecosystem owing to its high rates of disposal and low recovery from the environment. Due to inefficiency in degradation, most of plastic is fragmented into microplastics that are reported as ubiquitous toxicants in marine environment. The abundance of toxic microplastics in marine ecosystem causes adverse impacts on aquatic flora and fauna including oceans, lakes, rivers, coastal areas, and seas. This aggravates its toxicity and induces genomic instability, oxidative stress and disruption of marine organisms. Hence, it is necessary to understand the potential sources, types and behaviour of microplastic in marine environment. In this review, considering the pollution of aquatic ecosystem, major contributors of microplastics in marine environment along with their classification are brought out. Also,

**Corresponding Author*

behaviour mechanisms of microplastics including physical, chemical and biological behaviours together with their ecological and toxicological impacts on marine ecosystem are illustrated. Finally, the remediation measures to combat against toxic microplastic pollution in aquatic ecosystem are highlighted to bring out an instant remedy for the environment.

For details refer to https://doi.org/10.1007/s11270-021-05301-1

Bioactivity reinforced surface patch bound collagen-pectin hydrogel

Himansh Goel, Nidhi Gupta, **Deenan Santhiya***, Namit Dey, Himadri B. Bohidar and Aditi Bhattacharya

Abstract: In this report, we discuss the design of a novel collagen/pectin (CP) hybrid composite hydrogel (CPBG) containing in-situ mineralized bioactive glass (BG) particles to simulate an integrative 3D cell environment. Systematic analysis of the CP sol revealed collagen and pectin molecules interacted regardless of both possessing similar net negative charge through the mechanism of surface patch binding interaction. Fourier transform infrared spectroscopy (FTIR) and thermogravimetric analysis (TGA) confirmed this associative interaction which resulted in the formation of a hybrid crosslinked network with the BG nanoparticles acting as pseudo crosslink junctions. Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray Analysis (EDAX) and Transmission Electron Microscopy (TEM) results confirmed uniform mineralization of BG particles, and their synergetic interaction with the network. The in-vitro bioactivity tests on CPBG indicated the formation of bone-like hydroxyapatite ($Ca_{10}(PO_4)_6(OH)_2$) microcrystals on its surface after interaction with simulated body fluid. This hydrogel was loaded with a model antifungal drug amphotericin-B (AmB) and tested against Candida albicans. The AmB release kinetics from the hydrogel followed the Fickian mechanism and showed direct proportionality to gel swelling behavior. Rheological analysis revealed the viscoelastic compatibility of CPBG for the mechanical load bearing applications. Cell viability tests indicated appreciable compatibility of the hydrogel against U2OS and HaCaT cell lines. FDA/PI on the hydrogel portrayed preferential U2OS cell adhesion on hydrophobic hydroxyapatite layer compared to hydrophilic surfaces, thereby promising the regeneration of both soft and hard tissues.

For details refer to https://doi.org/10.1016/j.ijbiomac.2021.01.166

UV-shielding antimicrobial zein films blended with essential oils for active food packaging

Manjot Kaur and **Deenan Santhiya***

Abstract: A comprehensive study on zein film blended with glycerol and essential oils (EOs) is presented in this work. In particular, ultra violet (UV) shielding property and antimicrobial efficacy of developed active zein films (ZF) are tested. The fabricated films show zero transmittance in the UV region as compare to commercial poly-film which shows 40%–80% of UV transmittance. Results show that films are effective against spoilage microorganisms. The incorporation of EOs in ZF significantly reduces the growth of microbes over fruit samples since day 3. Physical interactions existing between EOs along with glycerol and zein provide considerable barrier properties. The glass transition temperature of the film comes out to be 47.7°C having the tensile strength of 1.21 ± 0.05 MPa. TGA curves show major weight loss in the range of 220–375°C. In conclusion, edible active ZF can be used as healthy packages over food and drug to increase their shelf life.

For details refer to https://doi.org/10.1002/app.49832

Corresponding Author

BIOGRAPHY

MS. DEEPALI AHLUWALIA

Department of Applied Chemistry

Ms. Deepali Ahluwalia is working as a full time research scholar (UGC-NET JRF) at the Department of Applied Chemistry, DTU. She has completed her bachelors and masters degree in Chemistry from the University of Delhi. Having physical chemistry as my specialization during her M.Sc, she is always inclined towards quantum and computational chemistry. Hence, she have been working in the field of computational chemistry and analyzing the meta-benziporphodimethene systems employing density functional theory (DFT) as the prime focus of her Ph.D, research work.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **D. Ahluwalia**, A. Kumar and S. G. Warkar, "Recent developments in meta-benziporphodimethene: A new porphyrin analogue", *Journal of Molecular Structure*, vol. 1228, pp. 129672, 2021. Impact Factor: 3.196.

Recent developments in *meta*-benziporphodimethene: A new porphyrin analogue

Deepali Ahluwalia, Anil Kumar and Sudhir Gopalrao Warkar

Abstract: The article underscores a unique class of benziporphyrin analogues, in which two of its *meso*carbon atoms are sp^3 hybridized, leading to the formation of a new molecule: *meta*-benziporphodimethene (*meta*-BPDM). This molecule exhibits intriguing structural, spectroscopic and chemical properties. *meta*-benziporphodimethene was first discovered 16 years ago. Although, initially it was an accidental product obtained while synthesizing *meta*- and *para*- benziporphyrin, but the molecule stood-out when acted as a chemo-sensor for Zn^{2+} ions. The discussion here, starts with outlining the importance of porphyrin molecules, followed by the progress in the field of its synthetic modifications. Special emphasis has been given to the new porphyrin analogue: *meta*-BPDM. We have herein covered some recent applications reported like metal-ion sensing, breast cancer detector, UV-turn-on behavior for toxic metals of *meta*-BPDM. Owing to its low synthetic yield, not much research has been done on these systems, despite their beneficial properties. We have also inculcated the factors that may lead to enhancement of product yield of *meta*-benziporphodimethene systems. The X-ray and NMR analysis indicating weak agostic interactions has also been discussed. This article shall provide a better understanding of this class of carbaporphyrinoid family, to its readers and may open new paths for exploring these systems in future.

For details refer to https://doi.org/10.1016/j.molstruc.2020.129672

BIOGRAPHY

PROF. DEVENDRA KUMAR

Department of Applied Chemistry

Prof. Devendra Kumar is working as Professor in the Department of Applied Chemistry, Delhi Technological University, Delhi. He has worked as Head of the Department of Biotechnology, and Department of Applied Chemistry at Delhi Technological University, Delhi. Recently, featured in the list of World Ranking of Top 2% Scientists in 2021database by Stanford University. He has received several fellowships and awards including UGC Research Award. Prof. Kumar has visited countries namely United Kingdom, Belgium, Malaysia and Japan for Research & Development activities. He has been awarded national/international projects including the International Project, viz, Indiaâ€“Japan Collaborative Research Project twice under DST-JSPS bilateral programme. He has guided 13 Ph.Ds, 85 M.E./M.Tech projects, published 04 chapters/books and over 100 papers in the journals of international repute including Biomaterials, Sensors and Actuators, Synthetic Metals, Canadian Journal of Chemistry, European Polymer Journal, Journal of Applied Polymer Science, International Journal of Adhesion & Adhesives and Materials Science & Engineering C etc. in the areas of conducting polymers, sensors, conductive adhesives, smart hydrogels, helical materials and organic solar cells, toughening of thermosetting polymers, self healing and blast mitigating polymer coatings. Prof. Kumar is a life member of Indian Science Congress Association, India and former member of societies like American Chemical Society, USA and Royal Society of Chemistry, London etc.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. O. Jalil, C. M. Pandey and **D. Kumar**, “Highly sensitive electrochemical detection of cancer biomarker based on anti-EpCAM conjugated molybdenum disulfide grafted reduced graphene oxide nanohybrid”, *Bioelectrochemistry*, vol. 138, pp. 107733, 2021. Impact Factor: 5.373.
2. G. Paul, S. Verma, O. Jalil, D. Thakur, C. M. Pandey and **D. Kumar**, “PEDOT: PSS-grafted graphene oxide-titanium dioxide nanohybrid-based conducting paper for glucose detection”, *Polymers for Advanced Technologies*, vol. 32, no. 4, pp. 1774-1782, 2021. Impact Factor: 3.665.

Highly sensitive electrochemical detection of cancer biomarker based on anti-EpCAM conjugated molybdenum disulfide grafted reduced graphene oxide nanohybrid

Owais Jalil, Chandra Mouli Pandey and **Devendra Kumar***

Abstract: An ultrasensitive, electrochemical biosensor has been fabricated by utilizing molybdenum disulfide (MoS_2) grafted reduced graphene oxide (MoS_2@rGO) nanohybrid as a sensing platform. Biomolecular-assisted synthetic method was adopted to synthesize MoS_2@rGO nanohybrid, where L-cys was used to reduce GO. The MoS_2@rGO nanohybrid exhibits improved electrochemical performance when it has been electrophoretically deposited onto the indium tin oxide (ITO) coated glass substrate. Further, epithelial cell adhesion molecule antibodies (anti-EpCAM) specific to cancer biomarker has been covalently immobilized on the MoS_2@rGO/ITO electrodes for label-free detection of EpCAM. Electrochemical results confirm that anti-EpCAM/MoS_2@rGO/ITO based biosensor can detect EpCAM in the concentration range of 0.001–20 ng mL^{-1} with a detection limit of 44.22 fg mL^{-1} (S/N = 3). The biosensor's excellent analytical performance has been attributed to the efficient immobilization of EpCAM antibodies on the MoS_2@rGO surface, which results in high specificity for EpCAM antigen. The fabricated biosensor showed good selectivity, reproducibility, and stability. The successful detection of EpCAM antigen in spiked samples (human saliva, serum and urine) makes this platform an alternative method for early screening of cancer biomarker.

For details refer to https://doi.org/10.1016/j.bioelechem.2020.107733

PEDOT: PSS-grafted graphene oxide-titanium dioxide nanohybrid-based conducting paper for glucose detection

Geetu Paul, Sakshi Verma, Owais Jalil, Deeksha Thakur, Chandra Mouli Pandey and **Devendra Kumar***

Abstract: An ultrasensitive, electrochemical biosensor has been fabricated by utilizing molybdenum disulfide (MoS_2) grafted reduced graphene oxide (MoS_2@rGO) nanohybrid as a sensing platform. Biomolecular-assisted synthetic method was adopted to synthesize MoS_2@rGO nanohybrid, where L-cys was used to reduce GO. The MoS_2@rGO nanohybrid exhibits improved electrochemical performance when it has been electrophoretically deposited onto the indium tin oxide (ITO) coated glass substrate. Further, epithelial cell adhesion molecule antibodies (anti-EpCAM) specific to cancer biomarker has been covalently immobilized on the MoS_2@rGO/ITO electrodes for label-free detection of EpCAM. Electrochemical results confirm that anti-EpCAM/MoS_2@rGO/ITO based biosensor can detect EpCAM in the concentration range of 0.001–20 ng mL^{-1} with a detection limit of 44.22 fg mL^{-1} (S/N = 3). The biosensor's excellent analytical performance has been attributed to the efficient immobilization of EpCAM antibodies on the MoS_2@rGO surface, which results in high specificity for EpCAM antigen. The fabricated biosensor showed good selectivity, reproducibility, and stability. The successful detection of EpCAM antigen in spiked samples (human saliva, serum and urine) makes this platform an alternative method for early screening of cancer biomarker.

For details refer to https://doi.org/10.1002/pat.5213

**Corresponding Author*

BIOGRAPHY

MS. JYOTI

Department of Applied Chemistry

Ms. Jyoti is working as a research scholar at the Department of Applied Chemistry, DTU. She pursued her bachelor's degree in chemistry (Hons) from the University of Delhi and master's degree from Maharishi Dayanand University. Bio-inorganic chemistry is the broad topic of my research. She is working on macrocyclic chemistry at the moment. The synthesis of novel macrocyclic co-ordination complexes and the application of these complexes for a variety of important applications is the sole goal of her PhD research.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **Jyoti**, N. Fridman, A. Kumar and S. G. Warkar, "Synthesis, structural characterization and binding ability of A2B cobalt(III) corroles with pyridine", *Inorganica Chimica Acta*, vol. 527 pp. 120580, 2021. Impact Factor: 2.545.

Synthesis, structural characterization and binding ability of A_2B cobalt(III) corroles with pyridine

Jyoti, Natalia Fridman, Anil Kumar and Sudhir G.Warkara

Abstract: A series of five A_2B type bis-pyridine ligated cobalt complexes $Co[(p\text{-}NO_2Ph)_2RCor](py)_2$, has been synthesized where R belongs to different electron withdrawing or electron donating substituent at meso position for different complexes. The synthesized complexes were fully characterized through ^1H NMR, HRMS, UV–Visible and single crystal X-ray Spectroscopy. The effect of meso substituents were studied through NMR spectroscopy. The single crystal X-ray structure was obtained for the p-trifluoromethylphenyl substituents (Co-2) located at C_{10}-meso position and indicated that cobalt corroles exist in Co(III) form. In these compounds, the axial pyridines were observed to be labile, and the complexes were almost entirely dissociated in the five coordinated cobalt corrole monopyridine complexes in dilute solutions such as in dichloromethane. Mono- and bis- pyridine ligation behavior was studied by UV–Visible spectroscopy. These complexes were also examined in different non-aqueous media such as dichloromethane, benzonitrile, and pyridine. The effect of substituent behavior present at meso position was also tested through the Hill equation. This provided the fact that the lower the electron density on corrole macrocycle, more the tendency of the complex to bind the ligands axially as the highest binding constant was found for the Co-1 complex, with more electronegative groups on meso position.

For details refer to https://doi.org/10.1016/j.ica.2021.120580

BIOGRAPHY

DR. MANISH JAIN

Department of Applied Chemistry

Dr. Manish Jain is an Assistant Professor in Department of Applied Chemistry, in the discipline of Polymer Science and Chemical Technology, Delhi Technological University, Delhi. He received his master's degree (in Polymer Science and Technology) and doctorate degree (in Chemical Engineering) from Indian Institute of Technology, Delhi. He has 11 years research experience as a research scholar, postdoctoral fellow, and assistant professor. His area of interest is membrane based separation processes and its applications in the fields of water treatment, petroleum processing, renewable energy production and as a novel separation process. He has in depth knowledge of mathematical modeling, designing, optimization, scale-up and feasibility analysis of membrane based processes. Dr. Manish has 15 publications in reputed and high impact journals, and also presented his work in several national and international conferences. Dr. Manish is currently handling one funded research project as Principle Investigator and supervising seven PhD students. He is a fellow of Indian Institute of Chemical Engineers, and an invitee member of its Executive Committee for Northern Regional Centre.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. S. Mittal, A. Gupta, S. Srivastava and **M. Jain**, "Artificial Neural Network based modeling of the vacuum membrane distillation process: Effects of operating parameters on membrane fouling", *Chemical Engineering and Processing - Process Intensification*, vol. 164, pp. 108403, 2021. Impact Factor: 4.237.

2. M. K. Mishra and **M. Jain**, "Removal of sulfur-containing compounds from Fluid Catalytic Cracking unit (FCC) gasoline by pervaporation process: Effects of variations in feed characteristics and mass transfer properties of the membrane", *Asia-Pacific Journal of Chemical Engineering*, vol. 16, no. 4, pp. e2653, 2021. Impact Factor: 1.447.

Artificial Neural Network based modeling of the vacuum membrane distillation process: Effects of operating parameters on membrane fouling

Srishti Mittal, Aniket Gupta, Saksham Srivastava and **Manish Jain***

Abstract: Vacuum membrane distillation is a novel separation process that requires less energy and provides high selectivity. However, me`mbrane fouling is a severe issue in the commercialization of this process. One of the methods to minimize membrane fouling is the use of appropriate operating conditions. In this study, an Artificial Neural Network (ANN) based approach is used to model the vacuum membrane distillation process and analyze the effects of operating parameters on membrane fouling. An ANN was developed through MATLAB's Deep Learning Toolbox. First, the number of nodes in the hidden layer was optimized. The minimum value of mean square error (0.58) was achieved with ten nodes. The model predictions were successfully validated with a correlation coefficient of more than 0.98. The trained ANN was then used to analyze the effects of operating conditions on flux and membrane fouling. High membrane fouling was observed at high feed temperature and vacuum tightness. Higher feed solute concentrations were also responsible for high membrane fouling. In the optimization study, high feed temperature and moderate to high vacuum tightness for lower solute concentration; and high feed temperature and low to moderate vacuum tightness for higher solute concentration were found optimum operating conditions to achieve maximum fluxes.

For details refer to https://doi.org/10.1016/j.cep.2021.108403

Removal of sulfur-containing compounds from Fluid Catalytic Cracking unit (FCC) gasoline by pervaporation process: Effects of variations in feed characteristics and mass transfer properties of the membrane

Mukesh K. Mishra and **Manish Jain***

Abstract: Analyzing the effects of feed characteristics and membrane transport properties are important for designing the industrial-scale pervaporative desulfurization plants. In this study, a new method to analyze the effects of feed composition and membrane characteristics has been proposed, where these properties are represented by average vapor pressure and average permeance coefficient. Spiral wound module geometry is used in this study for more realistic industrial-scale predictions. Results suggested that module performance in terms of stage cut and enrichment factor improved with increasing selectivity of the membrane. However, this effect was profound at lower selectivity (<5) and became negligible at higher selectivity (>10). Moreover, results also depicted that the increase in feed temperature increased enrichment factor when selectivity was low (<2.5), but this trend was reversed when selectivity was greater than 2.5. At a constant membrane selectivity, an increase in permeability reduced the enrichment factor. Thus, membrane selectivity should improve along with membrane permeability for better results. The pervaporation process was found more beneficial for removing highly volatile low molecular weight sulfur-containing compounds. Finally, feed channel temperature drop and permeate channel pressure drop followed the trend of stage cut in all simulations. Therefore, the lower stage cut may improve module efficiency.

For details refer to https://doi.org/10.1002/apj.2653

**Corresponding Author*

BIOGRAPHY

MR. MUKESH KUMAR MISHRA

Department of Applied Chemistry

Mr. Mukesh Kumar Mishra completed his B.Tech from Guru Gobind Singh Indraprastha University from 2009 to 2013 with 69.09% and M.Tech from DTU during 2013 to 2015 with 7.44 CGPA. He qualified various competitive exams such as GATE, NET with 99.14 percentile. He had presented a poster in the international conference held at Delhi Technological University.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **M. K. Mishra** and M. Jain, "Removal of sulfur-containing compounds from Fluid Catalytic Cracking unit (FCC) gasoline by pervaporation process: Effects of variations in feed characteristics and mass transfer properties of the membrane", *Asia-Pacific Journal of Chemical Engineering*, vol. 16, no. 4, pp. e2653, 2021. Impact Factor: 1.447.

Removal of sulfur-containing compounds from Fluid Catalytic Cracking unit (FCC) gasoline by pervaporation process: Effects of variations in feed characteristics and mass transfer properties of the membrane

Mukesh K. Mishra and Manish Jain

Abstract: Analyzing the effects of feed characteristics and membrane transport properties are important for designing the industrial-scale pervaporative desulfurization plants. In this study, a new method to analyze the effects of feed composition and membrane characteristics has been proposed, where these properties are represented by average vapor pressure and average permeance coefficient. Spiral wound module geometry is used in this study for more realistic industrial-scale predictions. Results suggested that module performance in terms of stage cut and enrichment factor improved with increasing selectivity of the membrane. However, this effect was profound at lower selectivity (<5) and became negligible at higher selectivity (>10). Moreover, results also depicted that the increase in feed temperature increased enrichment factor when selectivity was low (<2.5), but this trend was reversed when selectivity was greater than 2.5. At a constant membrane selectivity, an increase in permeability reduced the enrichment factor. Thus, membrane selectivity should improve along with membrane permeability for better results. The pervaporation process was found more beneficial for removing highly volatile low molecular weight sulfur-containing compounds. Finally, feed channel temperature drop and permeate channel pressure drop followed the trend of stage cut in all simulations. Therefore, the lower stage cut may improve module efficiency.

For details refer to https://doi.org/10.1002/apj.2653

BIOGRAPHY

MS. RADHIKA BATRA

Department of Applied Chemistry

Ms. Radhika Batra has submitted her thesis for award of Ph.D. degree from the Department of Applied Chemistry. Her research work is focused on polymeric biomaterials. She has published several research papers in reputed peer reviewed International journals and conferences.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **R. Batra**, R. Purwar, S. Kulanthaivel and P. Mishra, "Cetyl Trimethyl Ammonium Bromide Modified Montmorillonite-Doped Tasar Silk Fibroin/Polyvinyl Alcohol Blend 3D Nanowebs for Tissue Engineering Applications", *Macromolecular Materials and Engineering*, vol. 306, no. 11, pp. 2100450, 2021. Impact Factor: 4.367.
2. **R. Batra** and R. Purwar, "Deduction of a facile method to construct Antheraea mylitta silk fibroin/gelatin blend films for prospective biomedical applications", *Polymer International*, vol. 70, no. 1, pp. 73-82, 2021. Impact Factor: 2.990.

Cetyl Trimethyl Ammonium Bromide Modified Montmorillonite-Doped Tasar Silk Fibroin/Polyvinyl Alcohol Blend 3D Nanowebs for Tissue Engineering Applications

Radhika Batra and Roli Purwar

Abstract: Cetyl trimethyl ammonium bromide (CTAB) modified montmorillonite (MMT) clay (CTAB-MT) doped, tasar silk fibroin-polyvinyl alcohol blend-based 3D nanowebs are generated through electrospinning technique. The morphological analysis reveals the formation of interlinked 3D nanoweb-like architecture and high surface roughness through scanning electron microscopy (SEM) and atomic force microscopy, respectively. The existence of CTAB-MT in nanowebs is confirmed by Fourier transform infrared and complete exfoliation of clay in the polymer blend matrix along with the altered crystallinity of samples is indicated in X-ray diffraction. The incorporation of CTAB-MT clay has shown the enhancement of thermal and mechanical properties of nanoweb samples while the water uptake capacity is reduced and enzymatic biodegradability is found to slow down. The samples present excellent biocompatibility with no cytotoxicity in the Alamar blue assay and high attachment as well as spreading of L929 fibroblast cells covering the entire surface as observed in SEM. The CTAB-MT clay has imparted the samples with good antimicrobial activity against *E. coli* and *S. aureus* bacterial strains. The aforementioned properties of these CTAB-MT clay doped 3D nanowebs direct toward their suitability as a potential candidate for tissue engineering applications in the biomedical field.

For details refer to https://doi.org/10.1002/mame.202100450

Deduction of a facile method to construct Antheraea mylitta silk fibroin/gelatin blend films for prospective biomedical applications

Radhika Batra and Roli Purwar

Abstract: Blend films of two types (I and II) were prepared by mixing *Antheraea mylitta* silk fibroin (AMF) and gelatin solution in various blend ratios via the solution casting method. Two different crosslinkers, namely glutaraldehyde and genipin, were used during blend preparation. The structural characteristics and thermal properties of the blend films were examined by Fourier transform infrared (FTIR) spectroscopy, X-ray diffraction (XRD), Thermogravimetric analysis (TGA) and Diffrential scanning calorimetery (DSC). The FTIR spectra showed conformational alterations in type I blend films while type II films attained high β-sheet crystallinity. The XRD diffractograms presented a high degree of crystallinity in type II blend films compared to type I, which showed an almost amorphous structure. Further, thermal and biological studies were conducted on type II films. According to the TGA thermograms, the degradation temperature of the crosslinked blend films shifted compared to pure gelatin and pure AMF films. Partial miscibility of the two components was indicated by DSC thermograms of the blends. The high water uptake capacity of type II blend films was found to imitate hydrogel behaviour. The blend films did not show any toxicity in 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay and supported L929 fibroblast cell spreading and proliferation. The biodegradation of the blend films was significantly faster than the pure silk film.

For details refer to https://doi.org/10.1002/pi.6087

BIOGRAPHY

PROF. RAJINDER K. GUPTA

Department of Applied Chemistry

Prof. Rajinder K. Gupta is working presently at Delhi Technological University, Department of Applied Chemistry. He completed his higher education (UG & PG), including his first PhD degree from Delhi University in Organic Chemistry of Natural Products. Later he earned his second PhD in Microbiology /Biotechnology from University of Idaho, USA. He was awarded Alexander von Humboldt Fellowship to work at the Technical University, Berlin, Germany, where he worked on Phytochemicals and Natural Products. He worked with bioactive agents from marine organisms at the University of Oklahoma, USA, and on actinomycetes physiology and on their bio catalytic /biotransformation ability of various substrates of natural origin at the University of Idaho, USA. He holds over 198 published (in press & under review) research publications and 9 Indian Patents to his credit and he owns more than four decades of experience in academia, and industry (pharmaceutical, agrochemical, polymer and commercial test house). So far 12 students have finished their PhD degree, 9 student's finished M. Tech thesis in Biotechnology, 46 B. Tech Biotechnology thesis/projects, and 40 students finished M. Tech (Food Processing Technology) thesis. Presently, two PhD students, including one from Ethiopia (working on Unani medicine based antiviral agents) are jointly registered for PhD degree, two students are doing M. Tech (Polymer Technology) project (working on the synthesis of natural polymer based hydrogels and medicinal plant extracts bandages for wound repair &burn patients), and five students are doing B. Tech project on nanomaterial's & polymers. Four student's finished their B. Tech project in June 2019, worked on polymers of insect origin. He is a member of several national & international professional /academic bodies. He has offered consultancy to the Delhi Government to set up an ultra-modern food quality testing facility (Microbiology, Mycotoxins, Metals, & Pesticide Residues etc.,) in Delhi, NABL & ISO certified. He had established M. Tech (Food Processing Technology) for the students of GGSIP University, 80 students passed that course and employed in the food industry and academia in India. His current areas of research include bio-catalytic synthesis of polymers & nanomaterial's, new molecules/drug candidates from microorganisms and plants, and chemistry of nutraceuticals & functional foods.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. N. Nehal, B. Choudhary, A. Nagpure and **R. K. Gupta**, "DNA barcoding: a modern age tool for detection of adulteration in food", *Critical Reviews in Biotechnology*, vol. 41, no. 5, pp. 767-791, 2021. Impact Factor: 8.429.

DNA barcoding: a modern age tool for detection of adulteration in food

Nazish Nehal, Bharti Choudhary, Anand Nagpure and **Rajinder K. Gupta***

Abstract: Globalization of the food trade requires precise and exact information about the origin, methods of production, transformation technologies, authentication, and the traceability of foodstuffs. New challenges in food supply chains such as deliberate fraudulent substitution, tampering or mislabeling of food and its ingredients or food packaging incapacitates the market and eventually the national economy. Currently, no proper standards have been established for the authentication of most of the food materials. However, in order to control food fraud, various robust and cost-effective technologies have been employed, like a spectrophotometer, GC-MS, HPLC, and DNA barcoding. Among these techniques, DNA barcoding is a biotechnology advantage with the principle of using 400–800 bp long standardized unique DNA sequences of mitochondrial (e.g. *COI*) or plastidial (e.g. *rbcL*) of nuclear origin (e.g. *ITS*) to analyze and classify the food commodities. This review covers several traded food commodities like legumes, seafood, oils, herbal products, spices, fruits, cereals, meat, and their unique barcodes which are critically analyzed to detect adulteration or fraud. DNA barcoding is a global initiative and it is being accepted as a global standard/marker for species identification or authentication. The research laboratories and industries should collaborate to realize its potential in setting standards for quality assurance, quality control, and food safety for different food products.

For details refer to https://doi.org/10.1080/07388551.2021.1874279

**Corresponding Author*

BIOGRAPHY

DR. RAMINDER KAUR

Department of Applied Chemistry

Dr. Raminder Kaur is Assistant Professor in the Discipline of Polymer Science and Chemical Technology (Applied Chemistry Department), Delhi Technological University (formerly Delhi College of Engineering), Delhi, India. She received her doctorate degree in Chemical Engineering from Indian Institute of Technology, Delhi (IITD). She has received her M.Tech degree in Polymer Technology from Department of Chemical Engineering, Panjab University, Chandigarh, Punjab and her B.Tech degree in Chemical Engineering from Beant College of Engineering and Technology, Gurdaspur, Punjab. Her research interests include Reaction Engineering, Bio-based Polymeric Materials and Composites, Conducting Polymers, Pollution Abatement Technologies. She has published over 30 research papers in international journals, one book chapter and about 50 papers in national and international conferences. She has worked/presently working on a different research project funded by CSIR, DRDO and DTU. She has received Research Excellence Award from DTU for year 2017, 2018 and 2019. She is a fellow of IEChE, The Society of Polymer Science, India and Asian Polymer Association, Materials Research Society of India, Society for Materials Chemistry, Indian Society of Analytical Scientists and Reviewer of many journals of international repute.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. S. Tanwar and **R. Kaur**, "Development and investigation of microencapsulated caprylic acid-based phase change materials for thermal energy storage applications", *International Journal of Energy Research*, vol. 45, no. 12, pp. 17302-1731, 2021. Impact Factor: 5.164.

Development and investigation of microencapsulated caprylic acid-based phase change materials for thermal energy storage applications

Surya Tanwar and **Raminder Kaur***

Abstract: The present study is focused on the preparation of microencapsulated phase change materials (Micro-PCMs) for thermal energy storage applications. These Micro-PCMs capsules comprise of a renewable material, caprylic acid (CA), as core latent heat storage material, confined inside the polymethylmethacrylate (PMMA) shells and are produced by the suspension-like polymerization method. The prepared Micro-PCMs are characterized by FTIR, SEM, and Particle Size Analyzer. The phase change properties, including melting and crystallization temperatures, and latent heats associated during phase change are determined by DSC and are reported as 14.3 ± 0.2°C, 9.7 ± 0.4°C, and 98.7 ± 1.5 J/g, 99.0 ± 1.7 J/g, respectively. The TGA results indicated that the synthesized Micro-PCMs exhibit a two-step degradation pattern and have good thermal stability. The T-History test is carried out to study the thermal energy storage/release time of the Micro-PCMs. Thermal cycling test has been performed to check the thermal reliability of the microcapsules. The synthesized Micro-PCMs are good contenders for latent heat absorption and can play a vital role in the area of thermal energy storage (TES) applications, such as passive space heating or cooling applications, smart textiles, and thermo-responsive functional coatings.

For details refer to https://doi.org/10.1002/er.6611

**Corresponding Author*

BIOGRAPHY

MS. RITIKA KUBBA

Department of Applied Chemistry

Ms. Ritika Kubba is working as a full-time research scholar working at the Department of Applied Chemistry, Delhi Technological University. She has completed her bachelors and masters degree in Chemistry from the University of Delhi. She pursued masters with physical chemistry as specialization, and had keen interest in biophysics and bioinorganic chemistry. She is currently pursuing Ph.D. degree. Her research work focuses on synthesis and applications of corrole complexes. She is currently exploring the biological and industrial applications of Metallocorroles.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Kubba**, O. Yadav, P. Yadav, N. Fridmand and A. Kumar, "Penta -hexa coordination behaviour of ABA-P(V) corrole", *Journal of Molecular Structure*, vol. 1243, pp. 130857, 2021. Impact Factor: 3.196.

Penta -hexa coordination behaviour of ABA-P(V) corrole

Ritika Kubba, Omprakash Yadav, Pinky Yadav, Natali Fridmand and Anil Kumar

Abstract: ABA (where A = nitrophenyl, and B = pentafluorophenyl group) corrole was isolated as hexacoordinate P(V) complexes that contained two axial hydroxyl groups. NMR spectroscopy (^{1}H, ^{19}F and ^{31}P) in $CDCl_3$ indicated that the hexacoordinated P(V) complexes were prone to axial-ligand dissociation to form pentacoordinated P(V) complexes. Although, in the presence of strong coordinating solvents, such as CH_3OH and CD_3OD, the P(V) corrole complexes were observed to exist in a hexacoordinated geometry in which the strong solvent molecules acted as the ligands at the axial position. Also, we report here the existence of the hexacoordinated P(V) complexes in non-coordinating solvents such as $CHCl_3$, CH_2Cl_2 by using fluoride and methyl substituted silyloxy groups acting as the ligands at the axial position. Moderately bulky nature and electron-donation effect of silyloxy groups proved to be of great aid to prevent the axial ligand dissociation of silyloxy substituted hexacoordinated P(V) complex and strong P-F bond in non-coordinating solvents. The structure of hexacoordinate P(V) complex containing two axial -OH groups and hexacoordinate P(V) complex containing two axial -OCH_3 groups were confirmed by X-ray crystallography.

For details refer to https://doi.org/10.1016/j.molstruc.2021.130857

BIOGRAPHY

PROF. ROLI PURWAR

Department of Applied Chemistry

Prof. Roli Purwar is working as Professor in the discipline of Polymer Science and Chemical Technology, Department of Applied Chemistry, Delhi Technological University (DTU). In addition to academics, she is holding position of Associate Dean of International Affairs, DTU. She obtained her Bachelor of Engineering in Textile Technology from Sri Vaishnav Institute of Technology and Science, Indore in the year 2000. She did M.Tech in Fiber Science and Technology in the year 2001 and completed her PhD in Technical Textiles from IIT Delhi in the year 2006. She worked as Research Associate in the Department of Industrial Research and Development, IIT Delhi on projects funded by Department of Biotechnology, Govt. of India and M/S Lockheed Matrin, USA. Here she developed several technologies which was transferred to Industries. She joined Delhi Technological University as Assistant Professor in the year 2010. Dr. Purwar has published several research papers in Indian and International peer reviewed journals. Two patents (1 Indian, 1 US patent) are in her Credit. She has guided 7 PhD, 11 M.Tech and 20 B .Tech thesis projects. Her current research area includes antimicrobial textiles, wound dressing materials, polymeric membranes for decontamination.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	06

1. P. Gupta and **R. Purwar**, "Influence of cross-linkers on the properties of cotton grafted poly (acrylamide-co-acrylic acid) hydrogel composite: swelling and drug release kinetics", *Iranian Polymer Journal*, vol. 30, no. 4, pp. 381-391, 2021. Impact Factor: 1.899.
2. R. Yadav and **R. Purwar**, "Influence of metal oxide nanoparticles on morphological, structural, rheological and conductive properties of mulberry silk fibroin nanocomposite solutions", *Polymer Testing*, vol. 93, pp. 106916, 2021. Impact Factor: 4.282.
3. P. Bansal and **R. Purwar**, "Polyacrylonitrile/clay nanofibrous nanocomposites for efficient adsorption of Cr (VI) ions", *Journal of Polymer Research*, vol. 28, no. 7, 2021, pp. 1-19. Impact Factor: 3.097.
4. R. Batra, **R. Purwar**, S. Kulanthaivel and P. Mishra, "Cetyl Trimethyl Ammonium Bromide Modified Montmorillonite-Doped Tasar Silk Fibroin/Polyvinyl Alcohol Blend 3D Nanowebs for Tissue Engineering Applications", *Macromolecular Materials and Engineering*, vol. 306, no. 11, pp. 2100450, 2021. Impact Factor: 4.367.
5. R. Batra and **R. Purwar**, "Deduction of a facile method to construct Antheraea mylitta silk fibroin/gelatin blend films for prospective biomedical applications", *Polymer International*, vol. 70, no. 1, pp. 73-82, 2021. Impact Factor: 2.990.
6. T. Ghosh, T. Das and **R. Purwar**, "Review of electrospun hydrogel nanofiber system: Synthesis, Properties and Applications", *Polymer Engineering & Science*, vol. 61, no. 7, pp. 1887-1911, 2021. Impact Factor: 2.428.

Influence of cross-linkers on the properties of cotton grafted poly (acrylamide-co-acrylic acid) hydrogel composite: swelling and drug release kinetics

Preeti Gupta and **Roli Purwar***

Abstract: Cross-linker plays a crucial role in monitoring water holding and drug release properties of a hydrogel system, an essential requirement for smart wound dressings. Present study is focused on the influence of cross-linkers poly ethylene glycol (PEG) and *N*,*N*′-methylene bisacrylamide (MBAAm) on the properties of poly (acrylamide-*co*-acrylic acid) hydrogel grafted over the cotton fabric to form composite for medicated dressings. Fourier transform infrared spectroscopy (FTIR) confirms the grafting of hydrogel on the cotton fabric. Uniform hydrogel layer on the cotton surface is obtained under scanning electron microscopy (SEM). Swelling of the composite prepared using PEG follow first-order kinetics at acidic and neutral pH whereas second-order kinetic model at pH 8.5 while that prepared using MBAAm follow second-order kinetic equation at all the pHs studied. The swelling kinetics is also governed by Peppas model at all pHs. Release of gentamicin sulphate from both the composites are studied in phosphate buffers having pH 4.5, 7 and 8.5 at 37 ± 0.1 °C and observed that it is fastest in phosphate buffer having pH 7. On fitting drug release data into Peppas model, first and second-order kinetic equations, it is found that drug release is diffusion controlled and follows Fickian diffusion mechanism in case of the composite prepared by using PEG as cross-linker, whereas it is controlled by diffusion as well as chain relaxation in case of the composite prepared by using MBAAm. Mechanical testing using universal testing machine supports a higher mechanical strength of the hydrogel composite as compared to its film.

For details refer to https://doi.org/10.1007/s13726-020-00897-3

Influence of metal oxide nanoparticles on morphological, structural, rheological and conductive properties of mulberry silk fibroin nanocomposite solutions

Reetu Yadav and **Roli Purwar***

Abstract: This paper highlights about the effect of metal oxide nanoparticles on rheological and conductive properties of silk fibroin (SF) solution. Silk fibroin nanocomposite solutions are prepared using formic acid with the incorporation of metal oxide nanoparticles such as zinc oxide (ZnO), copper oxide (CuO) and, titanium dioxide (TiO_2) in formic acid. Even distribution of metal oxide nanoparticles in silk fibroin solutions are observed through HRTEM. The addition of metal oxide nanoparticles to silk fibroin solution suppressed the β sheet conformation and enhanced the random coil conformation as confirmed by Fourier transform infrared spectroscopy. The steady shear analysis showed shear-thinning behavior of silk nanocomposite solutions and are found to be highly influenced by the shear rates. The viscosities of silk fibroin solutions are reduced from 5407 mPa s to 316, 367, and 709 mPa s, on the addition of ZnO, CuO, and TiO_2 nanoparticles, respectively at a low shear rate of 0.1 s^{-1}. An oscillatory shear rheology test has been performed to evaluate the dynamics of the viscoelastic behavior of nanocomposite solutions. Silk fibroin/CuO solution is found to be frequency independent as analyzed in oscillatory sweep measurement. In a creep recovery test, pure silk fibroin solution showed delayed elasticity while nanocomposite solutions showed ideal viscous behavior. Rotational (constant low-high-low) shear has been applied to study the structure recovery test. Metal oxide nanoparticles brought better structure recovery in SF nanocomposite solutions. SF/metal oxide nanocomposite solutions show higher conductivity compared to pure silk fibroin solution.

For details refer to https://doi.org/10.1016/j.polymertesting.2020.106916

**Corresponding Author*

Polyacrylonitrile/clay nanofibrous nanocomposites for efficient adsorption of Cr (VI) ions

Priya Bansal and **Roli Purwar***

Abstract: This paper highlights the efficient adsorption of Cr (VI) from wastewater using polyacrylonitrile (PAN)/montmorillonite (Mt) and polyacrylonitrile/zinc oxide nanoparticle-modified montmorillonite (ZnO-Mt) nanofibrous nanocomposites as adsorbents. Mt was modified using zinc oxide nanoparticles (ZnO) by an adsorption process. The particle size of ZnO-Mt was found to be 18±2 nm. Field-emission scanning electron microscopy (FESEM) and high-resolution transmission electron microscopy (HRTEM) images showed the presence of ZnO on and within the layers of Mt. Mt and ZnO-Mt were used to prepare PAN/clay nanofibrous nanocomposites which were further used as adsorbents for Cr (VI) ions. X-ray diffraction (XRD) analysis showed that Mt and ZnO-Mt were exfoliated in the PAN nanofibrous matrix. Mt, ZnO-Mt, PAN/Mt and PAN/ZnO-Mt nanofibrous nanocomposites were analyzed as adsorbents for the adsorption of Cr (VI) ions. The effect of pH, concentration, time and amount of adsorbent on the removal of Cr (VI) ions from water were investigated. Adsorption of Cr (VI) ions over the adsorbents follows pseudo-second-order kinetics, and Langmuir and Freundlich isotherms. PAN/ZnO-Mt and PAN/Mt nanofibrous nanocomposites were found to be more effective adsorbents for Cr (VI) ions compared to ZnO-Mt and Mt.

For details refer to https://doi.org/10.1007/s10965-020-02362-4

Cetyl Trimethyl Ammonium Bromide Modified Montmorillonite-Doped Tasar Silk Fibroin/Polyvinyl Alcohol Blend 3D Nanowebs for Tissue Engineering Applications+

Radhika Batra and **Roli Purwar***

Abstract: Cetyl trimethyl ammonium bromide (CTAB) modified montmorillonite (MMT) clay (CTAB-MT) doped, tasar silk fibroin-polyvinyl alcohol blend-based 3D nanowebs are generated through electrospinning technique. The morphological analysis reveals the formation of interlinked 3D nanoweb-like architecture and high surface roughness through scanning electron microscopy (SEM) and atomic force microscopy, respectively. The existence of CTAB-MT in nanowebs is confirmed by Fourier transform infrared and complete exfoliation of clay in the polymer blend matrix along with the altered crystallinity of samples is indicated in X-ray diffraction. The incorporation of CTAB-MT clay has shown the enhancement of thermal and mechanical properties of nanoweb samples while the water uptake capacity is reduced and enzymatic biodegradability is found to slow down. The samples present excellent biocompatibility with no cytotoxicity in the Alamar blue assay and high attachment as well as spreading of L929 fibroblast cells covering the entire surface as observed in SEM. The CTAB-MT clay has imparted the samples with good antimicrobial activity against *E. coli* and *S. aureus* bacterial strains. The aforementioned properties of these CTAB-MT clay doped 3D nanowebs direct toward their suitability as a potential candidate for tissue engineering applications in the biomedical field.

For details refer to https://doi.org/10.1002/mame.202100450

**Corresponding Author*

Deduction of a facile method to construct Antheraea mylitta silk fibroin/gelatin blend films for prospective biomedical applications +

Radhika Batra and **Roli Purwar***

Abstract: Blend films of two types (I and II) were prepared by mixing *Antheraea mylitta* silk fibroin (AMF) and gelatin solution in various blend ratios via the solution casting method. Two different crosslinkers, namely glutaraldehyde and genipin, were used during blend preparation. The structural characteristics and thermal properties of the blend films were examined by Fourier transform infrared (FTIR) spectroscopy, X-ray diffraction (XRD), Thermogravimetric analysis (TGA) and Diffrential scanning calorimetery (DSC). The FTIR spectra showed conformational alterations in type I blend films while type II films attained high β-sheet crystallinity. The XRD diffractograms presented a high degree of crystallinity in type II blend films compared to type I, which showed an almost amorphous structure. Further, thermal and biological studies were conducted on type II films. According to the TGA thermograms, the degradation temperature of the crosslinked blend films shifted compared to pure gelatin and pure AMF films. Partial miscibility of the two components was indicated by DSC thermograms of the blends. The high water uptake capacity of type II blend films was found to imitate hydrogel behaviour. The blend films did not show any toxicity in 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay and supported L929 fibroblast cell spreading and proliferation. The biodegradation of the blend films was significantly faster than the pure silk film.

For details refer to https://doi.org/10.1002/pi.6087

Review of electrospun hydrogel nanofiber system: Synthesis, Properties and Applications+

Tanushree Ghosh, Trisha Das and **Roli Purwar***

Abstract: Hydrogel-based nanofibers or vice versa are a relatively new class of nanomaterials, in which hydrogels are structured in nanofibrous form. Structure and size of the material directly governs its functionality, therefore, in hydrogel science, the nanofibrous form of hydrogels enables its usage in targeted applications. Hydrogel nanofiber system combines the desirable properties of both hydrogel and nanofiber like flexibility, soft consistency, elasticity, and biocompatibility due to high water content, large surface area to volume ratio, low density, small pore size and interconnected pores, high stiffness, tensile strength, and surface functionality. Swelling behavior is a critical property of hydrogels that is significantly increased in hydrogel nanofibers due to their small size. Electrospinning is the most popular method to fabricate “hydrogel nanofibers,” while other processes like self-assembly, solution blowing and template synthesis also exist. Merging the characteristics of both hydrogels and nanofibers in one system allows applications in drug delivery, tissue engineering, actuation, wound dressing, photoluminescence, light-addressable potentiometric sensor (LAPS), waterproof breathable membranes, and enzymatic immobilization. Treatment of wastewater, detection, and adsorption of metal ions are also emerging applications. In this review paper, we intend to summarize in detail about electrospun “hydrogel nanofiber” in relation to its synthesis, properties, and applications.

For details refer to https://doi.org/10.1002/pen.25709

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

DR. SAURABH MEHTA

Department of Applied Chemistry

Dr. Saurabh Mehta obtained his Ph.D. in Organic Chemistry from Iowa State University, Ames, Iowa, USA (2009). He previously obtained his M.Phil. (Industrial Methods of Chemical Analysis) from IIT Roorkee (2001). He has also worked in the pharmaceutical industry for approximately 3 years. Dr. Mehta has been working as an Assistant Professor in the Department of Applied Chemistry, Delhi Technological University, since July 2010. He was a visiting researcher (2014-15) at the Miller School of Medicine, University of Miami, FL, USA. Dr. Mehta research interests include Synthetic Organic Chemistry, (especially the development of new methodologies for the synthesis of medicinally important heterocyclic compounds), Combinatorial Chemistry, Cheminformatics and Chemical Biology. He is also interested in antibacterial and anticancer Drug Discovery.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. D. Brahmchari and **S. Mehta**, "Phosphazene superbase mediated cyclization and annulation reactions of functionalized alkynes for the synthesis of heterocyclic compounds", *Chemistry of Heterocyclic Compounds*, vol. 57, pp. 234–238, 2021. Impact Factor: 1.277.

Phosphazene superbase mediated cyclization and annulation reactions of functionalized alkynes for the synthesis of heterocyclic compounds

Dhirendra Brahmchari and **Saurabh Mehta***

Abstract: Base-mediated cyclization and annulation reactions are very useful methods in the heterocyclic synthesis. Different types of conventional bases, i.e., inorganic bases or organometallic bases have been traditionally used for carrying out these reactions in the past. Over the years, the phosphazene organic superbases have emerged as effective alternatives to inorganic and organometallic bases. The phosphazene superbase was first used for alkyne cyclization in 2008, and its use has become quite popular over the last decade. This review is aimed to provide an analysis of the use of phosphazene superbase, especially P4–t-Bu as a robust and highly efficient catalyst/reagent in various intra- or intermolecular reactions of substituted alkynes for the synthesis of O,N-heterocycles such as isoindolin-1-ones, benzofurans, isobenzofurans, proline derivatives, pyrroles, etc.

For details refer to https://doi.org/10.1007/s10593-021-02898-3

**Corresponding Author*

BIOGRAPHY

MS. SRISHTI MITTAL

Department of Applied Chemistry

Ms. Srishti Mittal graduated from Delhi Technological University with a B.Tech. in Polymer Science and Chemical Technology in 2021. She is currently pursuing her Master of Science in Chemical Engineering at the University of California, Los Angeles. Her research interest are in applying machine learning techniques to solve chemical engineering problems. In the past, she has worked on coal combustion and membrane processes, and she is currently working on lithium-ion battery research.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **S Mittal**, S. Pathak, H. Dhawan and S. Upadhyayul, "A machine learning approach to improve ignition properties of high-ash Indian coals by solvent extraction and coal blending", *Chemical Engineering Journal*, vol. 413, pp. 127385, 2021. Impact Factor: 13.273.
2. **S. Mittal**, A. Gupta, S. Srivastava and M. Jain, "Artificial Neural Network based modeling of the vacuum membrane distillation process: Effects of operating parameters on membrane fouling", *Chemical Engineering and Processing - Process Intensification*, vol. 164, pp. 108403, 2021. Impact Factor: 4.237.

A machine learning approach to improve ignition properties of high-ash Indian coals by solvent extraction and coal blending

Srishti Mittal, Shailesh Pathak, Heena Dhawan and Sreedevi Upadhyayul

Abstract: Indian coals are of poor quality, having high ash content and lower calorific value as compared to foreign coal reserves. To circumvent the problems of high ash content and low calorific value in coal, this study endeavours to explore two methods of improving ignition characteristics of Indian coals: solvent extraction and coal blending. The thermal decomposition behaviour of four Indian coals with and without solvent extraction were investigated through a thermogravimetric analyser under non-isothermal conditions. Kinetic parameters and activation energies of the coals were determined by using Arrhenius, Coats-Redfern, Doyle-Ozawa and Friedman methods. It was found that solvent extraction of the coal reduced the activation energy by approximately 50%. Pearson correlation analysis performed on the chemical composition and ignition properties of 16 typical Chinese coals and 48 of their blends showed that moisture, volatile matter, fixed carbon, calorific value, oxygen, and carbon content of coals were the most relevant factor to ignition temperature and activation energy. Accordingly, three-layer back-propagation neural network models were trained and tested and found to be reasonably accurate. The selected neural networks were used to predict the ignition characteristics of 17 Indian coals. 16 Indian coals were then hypothetically blended with 84 coals from various other countries to form 1344 blends, whose ignition characteristics were further predicted using the trained neural network models. 220 of these 1344 blends were found to have better ignition properties than the original Indian coals. The maximum reductions observed in ignition temperature and activation energy were 79.08 K and 179.38 kJ/mol respectively.

For details refer to https://doi.org/10.1016/j.cej.2020.127385

Artificial Neural Network based modeling of the vacuum membrane distillation process: Effects of operating parameters on membrane fouling

Srishti Mittal, Aniket Gupta, Saksham Srivastava and Manish Jain

Abstract: Vacuum membrane distillation is a novel separation process that requires less energy and provides high selectivity. However, membrane fouling is a severe issue in the commercialization of this process. One of the methods to minimize membrane fouling is the use of appropriate operating conditions. In this study, an Artificial Neural Network (ANN) based approach is used to model the vacuum membrane distillation process and analyze the effects of operating parameters on membrane fouling. An ANN was developed through MATLAB's Deep Learning Toolbox. First, the number of nodes in the hidden layer was optimized. The minimum value of mean square error (0.58) was achieved with ten nodes. The model predictions were successfully validated with a correlation coefficient of more than 0.98. The trained ANN was then used to analyze the effects of operating conditions on flux and membrane fouling. High membrane fouling was observed at high feed temperature and vacuum tightness. Higher feed solute concentrations were also responsible for high membrane fouling. In the optimization study, high feed temperature and moderate to high vacuum tightness for lower solute concentration; and high feed temperature and low to moderate vacuum tightness for higher solute concentration were found optimum operating conditions to achieve maximum fluxes.

For details refer to https://doi.org/10.1016/j.cep.2021.108403

BIOGRAPHY

PROF. S. G. WARKAR

Department of Applied Chemistry

Dr. S. G. Warkar is a Professor & Head, Department of Applied Chemistry, Delhi Technological University (formerly Delhi College of Engineering), Delhi, India. He received his Doctorate Degree in Chemistry from Delhi Technological University, Delhi (DTU). He has received his M.Sc. Degree in Chemistry from Department of Chemistry, Nagpur University, India and his B.Sc. Degree from Nagpur University, India. His areas of interest are biopolymer-based superabsorbent hydrogels and its applications in the fields of agriculture, water enrichment, drug delivery, biodegradable polymers and benziporphyrins. Dr. Sudhir G. Warkar has 11 publications in reputed and high impact journals in last five years, and also presented his work in several national and international conferences. Dr. Warkar is currently supervising eight PhD Scholars. He has received 'Research Excellence Award' from DTU for the year 2019. He is a life member of Indian Society of Technical Education and reviewer of many journals of international repute.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. Khushbu, **S. G. Warkar** and N. Thombare, "Zinc micronutrient-loaded carboxymethyl tamarind kernel gum-based superabsorbent hydrogels: controlled release and kinetics studies for agricultural applications", *Colloid and Polymer Science*, vol. 299, pp. 1103–1111, 2021, Impact Factor: 1.931.

Zinc micronutrient-loaded carboxymethyl tamarind kernel gum-based superabsorbent hydrogels: controlled release and kinetics studies for agricultural applications

Khushbu, **Sudhir G. Warkar*** and Nandkishore Thombare

Abstract: The novel zinc-loaded superabsorbent hydrogel (ZSAH) was synthesized through in situ incorporation of zinc micronutrient in carboxymethyl tamarind kernel gum cross-linked network. The synthesized ZSAH was characterized by FTIR, SEM, TGA, swelling studies, etc. and found to have good water absorption capacity (410 g/g in distilled water) and with entanglement of zinc with weak physical forces. The ZSAH thus synthesized was assessed for controlled release application in soil as well as water, to test its application in the field of agriculture. The ZSAH exhibited slow and steady release pattern of zinc with 55% release within 72 h in water, and 83% release within 80 days in soil. Under the release kinetics studies, Korsmeyer-Peppas model was found to be best explaining the zinc release pattern through ZSAH. The ZSAH followed Fickian mechanism for release and it was observed that the diffusion was independent of the structure of the polymeric network. The time for zinc release from ZSAH, predicted as per the Olson's single exponential model, revealed significantly prolonged T_{99} (time for release of 99% Zn) in water (12.22 days) as also in soil (625 days). Hence, the novel synthesized ZSAH exhibited great potential as a zinc micronutrient delivery system in agriculture.

For details refer to https://doi.org/10.1007/s00530-020-00656-7

**Corresponding Author*

BIOGRAPHY

MS. TANUSHREE GHOSH

Department of Applied Chemistry

Ms. Tanushree Ghosh holds a B. Tech degree in Polymer Science and Chemical Technology from Delhi Technological University (Formerly Delhi College of Engineering). Leveraging her interest in Polymer field, in her Bachelor's, she worked in the fields of polymer processing, polymer rheology and hydrogel nanofibers. She has one publication in Journal Polymer Engineering and Science and one conference proceedings in Materials Today: Proceedings. Currently, she is working in Bajaj Auto Ltd. as a Polymer Component Development Engineer. She has been an active member of Indian Institute of Chemical Engineers (IIChE) and Americal Chemical Society (ACS).

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **T. Ghosh**, T. Das and R Purwar, "Review of electrospun hydrogel nanofiber system: Synthesis, Properties and Applications", *Polymer Engineering & Science*, vol. 61, no. 7, pp. 1887-1911, 2021. Impact Factor: 2.428.

Review of electrospun hydrogel nanofiber system: Synthesis, Properties and Applications

Tanushree Ghosh, Trisha Das and Roli Purwar

Abstract: Hydrogel-based nanofibers or vice versa are a relatively new class of nanomaterials, in which hydrogels are structured in nanofibrous form. Structure and size of the material directly governs its functionality, therefore, in hydrogel science, the nanofibrous form of hydrogels enables its usage in targeted applications. Hydrogel nanofiber system combines the desirable properties of both hydrogel and nanofiber like flexibility, soft consistency, elasticity, and biocompatibility due to high water content, large surface area to volume ratio, low density, small pore size and interconnected pores, high stiffness, tensile strength, and surface functionality. Swelling behavior is a critical property of hydrogels that is significantly increased in hydrogel nanofibers due to their small size. Electrospinning is the most popular method to fabricate "hydrogel nanofibers," while other processes like self-assembly, solution blowing and template synthesis also exist. Merging the characteristics of both hydrogels and nanofibers in one system allows applications in drug delivery, tissue engineering, actuation, wound dressing, photoluminescence, light-addressable potentiometric sensor (LAPS), waterproof breathable membranes, and enzymatic immobilization. Treatment of wastewater, detection, and adsorption of metal ions are also emerging applications. In this review paper, we intend to summarize in detail about electrospun "hydrogel nanofiber" in relation to its synthesis, properties, and applications.

For details refer to https://doi.org/10.1002/pen.25709

BIOGRAPHY

PROF. ADITYA KAUSHIK

Department of Applied Mathematics

Dr. Aditya Kaushik has been working as a Professor in the Department of Applied Mathematics, Delhi Technological University, Delhi. He has obtained PhD degree from Kurukshetra University, Kurukshetra. He worked at Panjab University, Chandigarh and Kurukshetra University, Kurukshetra, before joining Delhi Technological University in 2018. Besides, he worked and visited leading research and teaching institutes like Institut National De Recherche En Informatique Et En Automatique (France), Massachusetts Institute of Technology (MIT, USA), Austrian Academy of Sciences (Austria), Division of Applied Mathematics, Brown University (USA) and RAND Corporation, California (Santa Monica, USA) to a name a few among others. His area of research interest includes Numerical Analysis and Differential Equations. He organized many international and national conferences and acquired academic/research funding from NBHM-DAE, INSA, DST and UGC. He is on the editorial and advisory board of international journals of repute and life member of many professional and learned societies.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. **A. Kaushik**, V. Kumar, M. Sharma and N. Sharma, "A modified graded mesh and higher order finite element method for singularly perturbed reaction–diffusion problems", *Mathematics and Computers in Simulation*, vol. 185, pp. 486-496, 2021. Impact Factor: 2.463.
2. A. Gupta and **A. Kaushik**, "A robust spline difference method for robin-type reaction-diffusion problem using grid equidistribution", *Applied Mathematics and Computation*, vol. 390, pp. 125597, 2021. Impact Factor: 4.091.
3. **A. Kaushik**, M. Sharma, A. Gupta and M. Choudhary, "Iterative analytic approximation to one-dimensional nonlinear reaction–diffusion equations", *Mathematical Methods in the Applied Sciences*, vol. 44, no. 16, pp. 12152-12168, 2021. Impact Factor: 2.321.

A modified graded mesh and higher order finite element method for singularly perturbed reaction–diffusion problems

Aditya Kaushik, Vijayant Kumar, Manju Sharma and Nitika Sharma

Abstract: This paper presents a modified graded mesh for singularly perturbed reaction–diffusion problems. The mesh we offer is generated recursively using Newton's algorithm and some implicitly defined function. The problem is solved numerically using the finite element method based on polynomials of degree. We prove parameter uniform convergence of optimal order in -weighted energy norm. Test examples are taken, and we present a rigorous comparative analysis with other adaptive meshes. Moreover, we compare the proposed method with others found in the literature.

For details refer to https://doi.org/10.1016/j.matcom.2021.01.006

A robust spline difference method for robin-type reaction-diffusion problem using grid equidistribution

Aastha Gupta and **Aditya Kaushik***

Abstract: This paper presents a numerical approximation technique to solve reaction-diffusion singularly-perturbed differential equation with robin-type boundary conditions. The proposed technique applies cubic splines to discretize the robin-boundary conditions and exponential splines to generate the solution of singularly perturbed differential equation at the internal nodes of a layer adapted grid. The layer adapted grid is generated by equidistributing a positive monitor function. The error estimates indicate that the proposed technique is parameter-uniform second-order convergent and is numerically stable. Numerical experiments have been performed and presented to corroborate the theoretical results.

For details refer to https://doi.org/10.1016/j.amc.2020.125597

Iterative analytic approximation to one-dimensional nonlinear reaction–diffusion equations

Aditya Kaushik, Manju Sharma, Aastha Gupta and Monika Choudhary

Abstract: The paper is concerned with a class of nonlinear reaction–diffusion equations with a dissipating parameter. The problem is singularly perturbed from a mathematical perspective. Solutions of these problems are known to exhibit multiscale character. There are narrow regions in which the solution has a steep gradient. To approximate the multiscale solution, we present and analyze an iterative analytic method based on a Lagrange multiplier technique. We obtain closed-form analytic approximation to nonlinear boundary value problems through iteration. The Lagrange multiplier is obtained optimally, in a general setting, using variational theory and Liouville–Green transforms. The idea of the paper is to overcome the well-known difficulties associated with numerical methods. Two test examples are taken into account, and rigorous comparative analysis is presented. Moreover, we compare the proposed method with others found in the literature.

For details refer to https://doi.org/10.1002/mma.6840

*Corresponding Author

BIOGRAPHY

MS. ANU KUMARI

Department of Applied Mathematics

Ms. Anu Kumari is currently a fourth year research scholar in the Department of Applyed Mathematics, Delhi Technological University. Her research work explores detection and classification of bipartite and multipartite entanglement. She holds M.Sc. in Mathematics and B.Sc.(H) in mathematics both from University of Delhi. Her research is supported by Council of Scientific and Industrial Research (CSIR), India. She has published two research papers in SCI indexed journals.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Kumari** and S. Adhikari, "Classification witness operator for the classification of different subclasses of three-qubit GHZ class", *Quantum Information Processing*, vol. 20, no. 316, 2021. Impact Factor: 2.349.

Classification witness operator for the classification of different subclasses of three-qubit GHZ class

Anu Kumari and Satyabrata Adhikari

Abstract: It is well known that three-qubit system has two kinds of inequivalent genuine entangled classes under stochastic local operation and classical communication. These classes are called as GHZ class and W class. GHZ class proved to be a very useful class for different quantum information processing tasks such as quantum teleportation, controlled quantum teleportation, etc. In this work, we distribute pure three-qubit states from GHZ class into different subclasses denoted by S_1, S_2, S_3, S_4 and show that the three-qubit states either belong to S_2 or S_3 or S_4 may be more efficient than the three-qubit state belong to S_1. Thus, it is necessary to discriminate the states belong to S_i, i=2,3,4 and the state belong to S_1. To achieve this task, we have constructed different witness operators that can classify the subclasses S_i, i=2,3,4 from S_1. We have shown that the constructed witness operator can be decomposed into Pauli matrices and hence can be realized experimentally.

For details refer to https://doi.org/10.1007/s11128-021-03250-6

BIOGRAPHY

MS. ANUMA GARG

Department of Applied Mathematics

Ms. Anuma Garg is currently pursuing Ph.D. in the Department of Applied Mathematics, Delhi Technological University, Delhi. She has completed her B.Sc. (Hons.) Mathematics from Indraprastha College for Women, Delhi University and M.Sc. Applied Mathematics from South Asian University, Delhi. Her research area is Quantum Information Theory.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Garg** and S. Adhikari, "Teleportation Criteria Based on Maximum Eigenvalue of the Shared $d \otimes d$ Dimensional Mixed State: Beyond Singlet Fraction", *International Journal of Theoretical Physics*, vol. 60, pp. 1038–1052, 2021. Impact Factor: 1.708.

Teleportation Criteria Based on Maximum Eigenvalue of the Shared $d \otimes d$ Dimensional Mixed State: Beyond Singlet Fraction

Anuma Garg and Satyabrata Adhikari

Abstract: We derive a criteria for the detection of $d \otimes d$ dimensional negative partial transpose (NPT) entangled state useful for teleportation. The newly derived criteria are based on the maximum eigenvalue of the NPT entangled state, which is easier to determine experimentally than to completely reconstruct the state via tomography. We then illustrate our criteria by considering a class of qubit-qubit system and qutrit-qutrit system.

For details refer to https://doi.org/10.1007/s10773-021-04725-z

BIOGRAPHY

PROF. CHANDRA PRAKASH SINGH

Department of Applied Mathematics

Prof. Chandra Prakash Singh has been working as Professor in the Department of Applied Mathematics, Delhi Technological University, Delhi. He received his Ph D degree in Applied Mathematics in 2000 from Indian Institute of Technology, Banaras Hindu University, Varanasi. His area of research is Gravitation and Cosmology. He has published 86 research papers in refereed International (70) and National (16) journals of repute. He has attended and presented 25 research papers in National and International Conferences. He has also delivered many invited talk lecture in the National and International Conference. He has supervised five (05) PhD students till date and currently three (03) are working under his supervision. He is the reviewer of many journals like, EPJC, Astrophysics and Space Science, Indian Journal of Physics, etc. He has a rich experience of teaching of 23 years in the subject of Pure and Applied Mathematics. Recently, Dr. Singh has been elected for Fellow of Royal Astronomical Society (FRAS), UK. He has received Commendable Research award in 2018, 2019 and 2020, and Premier Research award in 2019 and 2020.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. S. Kaur and **C. P. Singh**, "Constraints on holographic dark energy model with matter creation in Brans–Dicke theory and thermodynamic analysis", *Physics of the Dark Universe*, vol. 33, pp. 100869, 2021. Impact Factor: 4.243.
2. **C. P. Singh** and J. S. Peracaula Friedmann, "Friedmann cosmology with decaying vacuum density in Brans–Dicke theory", *The European Physical Journal C*, vol. 81, no. 960, pp. 1-16, 2021. Impact Factor: 4.590.
3. A. Kumar and **C. P. Singh**, "The generalized second law of thermodynamics in viscous Ricci dark energy model", *The European Physical Journal Plus*, vol. 136, no. 820, pp. 1-20, 2021. Impact Factor: 3.911.

Constraints on holographic dark energy model with matter creation in Brans–Dicke theory and thermodynamic analysis

Simran Kaur and **C. P. Singh***

Abstract: The adiabatic matter creation for a spatially flat, homogeneous and isotropic universe is discussed in holographic dark energy (HDE) in the context of Brans–Dicke theory. Since the HDE density is considered as a dynamical cosmological constant, it is natural to study it in a dynamical frame of Brans–Dicke theory. We show that HDE model with matter creation, whose infrared cutoff is set by the Hubble horizon, leads to solution that unify the early and late time acceleration. The latest observational data from supernovae (Pantheon sample), Hubble $H(z)$ and latest local H_o by SH0ES are used for constraining the model parameters. Using the Markov chain Monte Carlo method, we obtain the best fit values of the parameters for different models. It is found that the HDE model without matter creation does not achieve transition phase when the Hubble horizon is taken as an IR cut-off. However, it achieves the phase transition from decelerated phase to accelerated phase with same IR cut-off with the inclusion of gravitationally induced matter creation. The best fit values of HDE model with matter

creation are fitted very well in Hubble error data. Using AIC and BIC, and geometrical diagnostic parameters, we compare the models with ΛCDM model and discuss the viability of the model. A detailed thermodynamic analysis is also carried out.

For details refer to https://doi.org/10.1016/j.dark.2021.100869

Friedmann cosmology with decaying vacuum density in Brans–Dicke theory

C. P. Singh and J. S. Peracaula Friedmann

Abstract: In this paper, we study Friedmann cosmology with time-varying vacuum energy density in the context of Brans–Dicke theory. We consider an isotropic and homogeneous flat space, filled with a matter-dominated perfect fluid and a dynamical cosmological term $\Lambda(t)$, obeying the equation of state of the vacuum. As the exact nature of a possible time-varying vacuum is yet to be found, we explore $\Lambda(t)$ given by the phenomenological law $\Lambda(t)=\lambda+\sigma H$, where λ and σ are positive constants. We solve the model and then focus on two different cases Λ_{H1} and Λ_{H2} by assuming $\Lambda=\lambda$ and $\Lambda=\sigma H$, respectively. Notice that Λ_{H1} is the analog of the standard ΛCDM, but within the Brans–Dicke cosmology. We find the analytical solution of the main cosmological functions such as the Hubble parameter, the scale factor, deceleration and equation of state parameters for these models. In order to test the viability of the cosmological scenarios, we perform two sets of joint observational analyses of the recent Type Ia supernova data (Pantheon), observational measurements of Hubble parameter data, Baryon acoustic oscillation/Cosmic microwave background data and Local Hubble constant for each model. For the sake of comparison, the same data analysis is performed for the ΛCDM model. Each model shows a transition from decelerated phase to accelerated phase and can be viewed as an effective quintessence behavior. Using the model selection criteria AIC and BIC to distinguish from existing dark energy models, we find that the Brans–Dicke analog of the Λ-cosmology (i.e. our model Λ_{H1}) performs at a level comparable to the standard ΛCDM, whereas Λ_{H2} is less favoured.

For details refer to https://doi.org/10.1140/epjc/s10052-021-09765-7

The generalized second law of thermodynamics in viscous Ricci dark energy model

Ajay Kumar and **C. P. Singh***

Abstract: In this paper, we study the validity of the generalized second law of thermodynamics by applying Bekestein–Hawking (BH) entropy and Barrow entropy for the horizon entropy, respectively in the viscous holographic Ricci dark energy (HRDE) model. The background is a spatially flat Friedmann–Robertson–Walker universe filled with pressureless dark matter and viscous HRDE. The bulk viscous coefficient is assumed to be $\zeta=\zeta_0+\zeta_1 H$. In first step, we find the analytical solution of the field equations of viscous HRDE model. We use the observational data from SNe, OHD and BAO/CMB in order to extract the constraints on viscous HRDE model. In second step, we calculate the entropy time-variation for each fluid component and for the apparent horizon itself. In BH entropy case, the sum of the entropy of the fluids (viscous HRDE and dark matter) enclosed by the apparent horizon plus the entropy of the horizon itself is non-decreasing function of time which shows that the generalized second law of thermodynamics is valid. It also satisfies the convexity condition which shows that the model approaches a stable equilibrium thermal state. However, in the case of Barrow entropy, the generalized second law of thermodynamics may be violated as it depends on the universe evolution. Finally, we examine the generalized second law of thermodynamics of viscous HRDE model by taking into account the Casimir effect and find that it is valid throughout the evolution of the universe.

For details refer to https://doi.org/10.1140/epjp/s13360-021-01821-1

**Corresponding Author*

BIOGRAPHY

PROF. H. C. TANEJA

Department of Applied Mathematics

Prof. H. C. Taneja is a Professor in the Department of Applied Mathematics at Delhi Technological University, Delhi . He got his Ph.D. in the field of Information Theory in the year 1985. He has vast experience of about 42 years of teaching in mathematics and statistics both at UG and PG levels at different universities and technical institutions. Dr. Taneja has published more than sixty five research papers in the field of Information Theory and applications in journals of international repute and is member of various national and international societies. He has guided a number of M.Phil/Ph.D in the area of Information Theory and other allied areas. He has attended various national and international conferences and is member of the Editorial Boards and reviewer of various international journals. He is well travelled in India and Abroad and has been invited to deliver talks and popular lectures at various forums. He is recipient of ISITA 2012 Award given by the Indian Society of Information Theory and its Applications for his contributions in the field of Information Theory. Dr. Taneja has been at various administrative positions in the domain of academia and also has authored two books one entitled, Advanced Engineering Mathematics and the other Statistical Methods for Engineering and Science.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. L. Batra and **H. C. Taneja**, "Approximate-Analytical solution to the information measure's based quanto option pricing model", *Chaos, Solitons & Fractals*, vol. 153, Part 1, pp. 111493, 2021. Impact Factor: 5.944.

Approximate-Analytical solution to the information measure's based quanto option pricing model

Luckshay Batra and **H. C. Taneja***

Abstract: In this paper, we derive risk-neutral density functions of multi-asset to model the price of European options by incorporating a simple constrained minimization of the Kullback measure of relative information. Based on the theoretical analysis, when the underlying financial asset price follows a geometric Brownian motion, we obtain a two-dimensional quanto-option Black-Scholes equation. In addition, to evaluate the explicit solution of this multi-asset option pricing model, we design a Liouville-Caputo time-fractional derivative and use the Laplace homotopy perturbation method to obtain the explicit scheme in the form of convergent series under suitable regularity conditions

For details refer to https://doi.org/10.1016/j.chaos.2021.11149

**Corresponding Author*

BIOGRAPHY

MR. KAMALJEET GANGANIA

Department of Applied Mathematics

Mr. Kamaljeet Gangania, is working as a research scholar in the Department of Applied Mathematicsl, Delhi Technological University. He has joined DTU in June, 2018. His area of intrest included Gometric Function Theory.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. S. S. Kumar and **K. Gangania**, "On Geometrical Properties of Certain Analytic functions", *Iranian Journal of Science and Technology, Transactions A: Science*, vol. 45, pp. 1437–1445, 2021. Impact Factor: 1.194.

On Geometrical Properties of Certain Analytic functions

S. Sivaprasad Kumar and **Kamaljeet Gangania***

Abstract: We introduce the class of analytic functions

$$F(\psi) = \left\{ f \in A : \left(\frac{zf'(z)}{f(z)} \right) - 1 \prec \psi(z), \psi(0) = 0 \right\}$$

where ψ is univalent and establish the growth theorem with some geometric conditions on ψ and obtain the Koebe domain with some related sharp inequalities. Note that functions in this class may not be univalent. As an application, we obtain the growth theorem for the complete range of α and β for the functions in the classes BS(α) := {f ∈ A : (zf ′(z)/f (z)) − 1 ≺ z/(1 − αz2), α ∈ [0, 1)} and Scs(β) := {f ∈ A : (zf ′(z)/f (z)) − 1 ≺ z/((1 − z)(1 + βz)), β ∈ [0, 1)}, respectively which improves the earlier known bounds. The sharp Bohr-radii for the classes S(BS(α)) and BS(α) are also obtained. A few examples as well as certain newly defined classes on the basis of geometry are also discussed.

For details refer to https://doi.org/10.1007/s40995-021-01116-1

**Corresponding Author*

BIOGRAPHY

MS. KM. LIPI

Department of Applied Mathematics

Ms. Km. Lipi joined her PhD program in July 2018 in Department of Applied Mathematics of Delhi Technological University, Delhi. She is working in the area of approximation of functions by positive linear operators. She has already published two research papers. Also she has presented her research work at international conference.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **KM. Lipi** and Naokant Deo, " On Modification of Certain Exponential Type Operators Preserving Constant and e^{-x}", *Bulletin of the Malaysian Mathematical Sciences Society*, vol. 44, pp. 3269–3284, 2021. Impact Factor: 1.554.

On Modification of Certain Exponential Type Operators Preserving Constant and e^{-x}

KM. Lipi and Naokant Deo

Abstract: The key goal of this article is to propose a modification of certain exponential type operators defined by Ismail and May. Particularly, we concentrate on a sequence of operators that preserve e^{-x} and constant functions. We find the moments of these modified operators using the concept of moment generating function with the help of Mathematica software. We show uniform convergence of these modified operators and analyze the asymptotic behaviour with a Voronovskaya type theorem. We also illustrate via graphs that our modified operators approximate better than the original operators for certain family of functions. Finally, we show the convergence of these modified operators graphically using Mathematica Software.

For details refer to https://doi.org/10.1007/s40840-021-01100-

BIOGRAPHY

MS. NAV SHAKTI MISHRA

Department of Applied Mathematics

Ms. Nav Shakti Mishra is currently pursuing her Ph.D. degree at Department of Applied Mathematics, Delhi Technological University (DTU), Delhi. She is an active researcher and has published 04 papers in SCI/SCIE indexed journals and presented her research work in various national and international conferences. She has completed her masters in Mathematics and Statistics from Dr. Ram Manohar Lohia Avadh University, UP. She was awarded with The Chancellor Gold Medal and E. S. Chandrashekhar Gold Medal for securing first rank in the university during her masters degree. She is a keen enthusiast when it comes to teaching and contests in dynamic and innovative environment.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **N. S. Mishra** and N. Deo, "On the preservation of functions with exponential growth by modified Ismail–May operators", *Mathematical Methods in the Applied Sciences*, vol. 44, no. 11, pp. 9012-9025, 2021. Impact Factor: 2.321.

On the preservation of functions with exponential growth by modified Ismail–May operators

Nav Shakti Mishra and Naokant Deo

Abstract: In this study, our aim is to provide a modification of the so-called Ismail–May operators that preserve exponential functions e^{Ax},$\in\mathbb{R}$. In support of this, we begin by estimating the convergence rate of the operators in terms of usual and exponential modulus of continuity. We also provide a global approximation and a quantitative Voronovskaya result. Moreover, to validate the modification, we exhibit some graphical representations using Mathematica software to compare the original operator and its modification. We conclude that the modified operators not only preserve exponential functions but also provide faster rate of convergence for $A > 0$.

For details refer to https://doi.org/10.1002/mma.7328

BIOGRAPHY

MS. PARUL CHAUHAN

Department of Applied Mathematics

Ms. Parul Chauhan is a full-time research scholar in Department of Applied Mathematics, Delhi Technological University. She has completed M.Sc. in Mathematics from Lady Shri Ram College for Women, University of Delhi in 2014. She did B.Sc.(H) in Mathematics from Indraprastha College for Women, University of Delhi.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **P. Chauhan** and A. Gupta, "Matrix games with proportional linguistic payoffs", *Soft Computing*, vol. 25, pp. 15067–15081, 2021. Impact Factor: 3.643.

Matrix games with proportional linguistic payoffs

Parul Chauhan and Anjana Gupta

Abstract: This paper aims to present a novel approach for computing two-player constant-sum matrix games laid on the notion of a "symbolic proportional" linguistic term set. It is not always possible to lay assessments based on uniformly and symmetrically distributed linguistic term sets; hence, the defined concept motivates the decision-makers to represent their opinions using 2-tuples composed of two proportional linguistic terms. The proportional 2-tuple linguistic representation of payoffs concerns linguistic labels, which do not certainly have to be symmetrically distributed or do not have the conventional prerequisite of having uniform distance among them. This representation confers an opportunity to describe the linguistic payoffs of a matrix game using members of a continuous linguistic scale domain. In our work, we have defined a two-player constant-sum proportional linguistic matrix game and proposed an approach of Proportional Linguistic Linear Programming (PLLP) to evaluate these game problems. The framed PLLP problem is then transformed into a crisp LPP that can be easily solved, decreasing the computation complexities involved in solving the linguistic decision-making problems. This perspective of proportional 2-tuples provides decision-makers an approach to represent their opinions not by just using one label, rather by proportional linguistic labels of the form $(\delta u_i, \gamma u_i+1)$, where u_i and u_i+1 are two successive linguistic terms, with $0 \leq \delta, \gamma \leq 1$ and $\delta+\gamma=1$. Besides, some test examples are also presented to show the consistency of our designed approach. Further, the PLLP formulation is utilized to solve a Multi-Criteria Decision-Making problem based on actual-time linguistic data.

For details refer to https://doi.org/10.1007/s00500-021-06363-3

BIOGRAPHY

MS. RADHIKA KAVRA

Department of Applied Mathematics

Ms. Radhika Kavra is currently pursuing Ph.D. from Department of Applied Mathematics, Delhi Technological University, New Delhi, India. She has done M.Sc. Mathematics from IIT Roorkee and B.Sc. (Hons.) Mathematics from Delhi University. Her research area is Graph and Optimization.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Kavra**, A. Gupta and S. Kansal, "Interval graph based energy efficient routing scheme for a connected topology in wireless sensor networks", *Wireless Networks*, vol. 27, pp. 5085–5104, 2021. Impact Factor: 2.602.

Interval graph based energy efficient routing scheme for a connected topology in wireless sensor networks

Radhika Kavra, Anjana Gupta and Sangita Kansal

Abstract: Energy conservation has always been a major issue in wireless sensor network since wireless sensors spend lots of energy while sensing, receiving and transmitting signals, meanwhile network lifetime decreases. Excessive power usage in transmission among the sensors can be reduced by designing an energy efficient routing topology which reduces nodes' energy consumption by abandoning those links which are highly energy expensive. In this paper, energy optimizing algorithms are taken over those wireless sensor network whose graphical layout formation can be a 'connected bidirectional interval graph', in which each node has been assigned with an appropriate power interval to hold network communication. Two new polynomial time algorithms are proposed to optimize energy consumption over the network subject to constraint that the resultant network topology remains strongly connected with minimum number of required links. Both the algorithms work to evaluate an energy optimal path cover whose path components combine to result an energy efficient connected routing structure (spanning path/tree) in an interval graph, reduces power usage over links and nodes in wireless sensor network. Optimization of maximum transmission cost in worst case scenario over a maximum weighted bidirectional interval graph and reduction of maximum power consumption limit of nodes in an interval weighted interval graph to the minimum possible value are also discussed.

For details refer to https://doi.org/10.1007/s11276-021-02782-0

BIOGRAPHY

MR. RAJESH KUMAR ASTHANA

Department of Applied Mathematics

Mr. Rajesh Kumar Asthana completed his graduation (B. Sc.) from DDU University, Gorakhpur (UP) in 1995. He received his Masters Degree (M. Sc.) in Mathematics from DDU University, Gorakhpur (UP) in 1997. Presently, he holds the position of Scientist in Scientific Analysis Group, DRDO, Ministry of Defence, Government of India. He has worked in the field of Cryptography, Machine Learning and Statistical Analysis. He has published more than 30 research papers, prepared more than 50 technical reports and obtained 02 copyrights on statistical analysis software tools. He joined Delhi Technological University, New Delhi as part time Ph.D. Scholar in Applied Mathematics department under the supervision of Prof. Anjana Gupta and Dr. Gurjit Singh Walia in 2016. His current research focuses on biometric authentication systems, biometric template protection mechanisms and biometric cryptosystems. He has proposed various robust and efficient methods in these research areas.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **R. Asthana**, G. S. Walia and A. Gupta, "A novel biometric crypto system based on cryptographic key binding with user biometrics", *Multimedia Systems*, vol. 27, pp. 877–891, 2021. Impact Factor: 1.935.
2. **R. Asthana**, G. S. Walia and A. Gupta, "Random area-perimeter method for generation of unimodal and multimodal cancelable biometric templates", *Applied Intelligence*, vol. 51, pp. 7281–7297, 2021. Impact Factor: 5.086.

A novel biometric crypto system based on cryptographic key binding with user biometrics

Rajesh Asthana, Gurjit Singh Walia and Anjana Gupta

Abstract: Cryptography plays a significant role in ensuring data security and confidentiality. The security provided by a crypto system mainly depends on the secrecy of the cryptographic key. If the secret key gets compromised, then it may lead to compromise of the protected data. Biometric cryptosystem provides a solution for securing the cryptographic key by binding the secret key with user biometric data. In this paper, we have proposed a novel biometric crypto system involving key binding mechanism. New objective functions have been introduced to create helper data by binding the secret key with biometric data of the user. In the retrieval phase, local minima of the objective functions act as anchors to get the secret key. Performance evaluation shows that the proposed method achieves more than 98% success rate even in presence of limited noise in the biometric data. Further, performance metrics viz., FAR, GAR, GWDR and IWDR have been obtained for cryptographic key sizes of 256, 512, 1024 and 2048 bits. Security analysis shows that the proposed method is robust against brute force attack and correlation attack.

For details refer to https://doi.org/10.1007/s00530-021-00768-8

Random area-perimeter method for generation of unimodal and multimodal cancelable biometric templates

Rajesh Asthana, Gurjit Singh Walia and Anjana Gupta

Abstract: In recent times, biometric based authentication systems have seen a tremendous growth in various applications. However, if databases in multiple applications are created using the same biometric characteristic and algorithm, then any compromise of the stored template in one biometric system may jeopardise the security of the other biometric systems as well. More importantly, such a compromise may also lead to a permanent loss of the biometric characteristic. Therefore, the cancelability or revocability of biometrics has become quite an essential requirement. In this paper, a novel scheme, the Random Area & Perimeter Method (RAPM)) is presented in which a biometric characteristic of an individual is transformed into random values which are stored as cancelable biometric templates. The proposed scheme computes area and perimeter of the Bezier curve which are obtained through interpolation of feature points of original biometrics and a random point chosen by the user. The area and perimeter thus computed exhibit pseudo-random properties. This technique outperforms many existing techniques. Moreover, a dimensionality reduction to the tune of more than 95% has been obtained without compromising the matching performance. The average values obtained for EER, DI and RI are 0.0045, 6.28 and 99.64 respectively. These values are better than those obtained from the available state of the art approaches. The proposed scheme has also been analysed for various privacy issues like non-invertibility, revocability, and unlinkability.

For details refer to https://doi.org/10.1007/s10489-021-02201-z

BIOGRAPHY

MS. RICHA ROHIRA

Department of Applied Mathematics

Ms. Richa Rohira is a post graduate in discipline of Mathematics from Applied Mathematics department, Delhi Technological University. In the final year of the post graduate program, she along with a fellow student did their dissertation project under the guidance of Dr. Satyabrata Adhikari to contribute to the ongoing research in the field of Quantum Theory.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Rohira**, S. Sanduja and S. Adhikari, "Construction of a family of positive but not completely positive map for the detection of bound entangled states", *Quantum Information Processing*, vol. 20, no. 374, 2021. Impact Factor: 2.349.

Construction of a family of positive but not completely positive map for the detection of bound entangled states

Richa Rohira, Shreya Sanduja and Satyabrata Adhikari

Abstract: We construct a family of map which is shown to be positive when imposing certain condition on the parameters. Then, we show that the constructed map can never be completely positive. After tuning the parameters, we found that the map still remains positive, but it is not completely positive. We then use the positive but not completely positive map in the detection of bound entangled state and negative partial transpose entangled states.

For details refer to https://doi.org/10.1007/s11128-021-03291-x

BIOGRAPHY

MS. RUCHIKA LOCHAB

Department of Applied Mathematics

Ms. Ruchika Lochab joined PhD programme in the Department of Applied Mathematics at Delhi Technological University, Delhi in July 2017 as a UGC research fellow. Her research is based on the numerical study of hyperbolic conservation laws. She has already four research publications in reputed Mathematics journals. She has also presented her work at various national and international conferences.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **R. Lochab** and V. Kumar, "A new reconstruction of numerical fluxes for conservation laws using fuzzy operators", *International Journal for Numerical Methods in Fluids*, vol. 93, no. 6, pp. 1690-1711, 2021. Impact Factor: 2.107.
2. **R. Lochab** and V. Kumar, "An improved flux limiter using fuzzy modifiers for Hyperbolic Conservation Laws", *Mathematics and Computers in Simulation*, vol. 181, pp. 16-37, 2021. Impact Factor: 2.463.

A new reconstruction of numerical fluxes for conservation laws using fuzzy operators

Ruchika Lochab and Vivek Kumar

Abstract: This article develops a new hybrid flux-limited scheme for a numerical solution of the hyperbolic conservation laws by applying fuzzy logic-based operator functions. The construction of the proposed flux-limiter is explored using a fuzzy modifier function, having a suitable intensity. The purpose of this article is to present an efficient finite volume flux-limited technique, derived from an entirely different subject of fuzzy mathematics, for tackling hyperbolic partial differential equations. Several standard test cases in one and two dimensions are solved numerically for demonstrating the robustness of the proposed new hybrid flux-limited scheme.

For details refer to https://doi.org/10.1002/fld.4948

An improved flux limiter using fuzzy modifiers for Hyperbolic Conservation Laws

Ruchika Lochab and Vivek Kumar

Abstract: The objective of the work in this paper is to computationally tackle a range of problems in hyperbolic conservation laws, which is an interesting branch of computational fluid dynamics. For the simulation of issues in hyperbolic conservation laws, this work explores the concept of fuzzy logic-based operators. This research presents a unique mixture of fuzzy sets and logic with a new branch of conservation laws from fluid dynamics. The approach considers a computational procedure based on the reconstruction of several high-order numerical methods termed as flux-limited methods using some fuzzy logic operators. With the aid of fuzzy modifiers, these flux limiters are further modified. This approach results in improved convergence of approximations and maintains the problem's basic properties to be solved. Additionally, to ensure improved results, modified flux-limited methods are imposed on some famous test problems. The application results are provided wherever required. The work has demonstrated that it is possible to use such technique and apply it to complex areas of computational fluid dynamics to produce a more straightforward approach to studying other topics like flux-limited methods and hence opens up an exciting gateway for future work.

For details refer to https://doi.org/10.1016/j.matcom.2020.09.012

BIOGRAPHY

PROF. SATYABRATA ADHIKARI

Department of Applied Mathematics

Prof. Satyabrata Adhikari working as Assistant Professor (under UGC-Faculty Recharge Programme) in the Department of Applied Mathematics, Delhi Technological University. His research interest is in quantum information theory. He has obtained his Ph.D. degree from Bengal Engineering and Science University, Shibpur (now it is renamed as IIEST). After Ph.D, he had availed post doctoral fellowship from S. N. Bose National Centre for Basic Sciences, Kolkata, India; Korean Advanced Institute of Science and Technology, South Korea and Institute of Physics, Bhubaneswar, India.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	05

1. **S. Adhikari**, "Constructing a ball of separable and absolutely separable states for $2 \otimes d$ quantum system", *The European Physical Journal D*, vol. 75, no. 3, pp. 1-13, 2021. Impact Factor: 1.425.
2. A. Kumari and **S. Adhikari**, "Classification witness operator for the classification of different subclasses of three-qubit GHZ class", *Quantum Information Processing*, vol. 20, no. 316, 2021. Impact Factor: 2.349.
3. A. Garg and **S. Adhikari**, "Teleportation Criteria Based on Maximum Eigenvalue of the Shared $d \otimes d$ Dimensional Mixed State: Beyond Singlet Fraction", *International Journal of Theoretical Physics*, vol. 60, pp. 1038–1052, 2021. Impact Factor: 1.708.
4. R. Rohira, S. Sanduja and **S. Adhikari**, "Construction of a family of positive but not completely positive map for the detection of bound entangled states", *Quantum Information Processing*, vol. 20, no. 374, 2021. Impact Factor: 2.349
5. S. Aggarwal and **S. Adhikari**, "Witness operator provides better estimate of the lower bound of concurrence of bipartite bound entangled states in $d_1 \otimes d_2$ -dimensional system", *Quantum Information Processing*, vol. 20, no. 3, pp. 1-26, 2021. Impact Factor: 2.349.

Constructing a ball of separable and absolutely separable states for $2 \otimes d$ quantum system

Satyabrata Adhikari

Abstract: Absolute separable states is a kind of separable state that remain separable under the action of any global unitary transformation. These states may or may not have quantum correlation and these correlations can be measured by quantum discord. We find that the absolute separable states are useful in quantum computation even if it contains infinitesimal quantum correlation in it. Thus to search for the class of two-qubit absolute separable states with zero discord, we have derived an upper bound for $Tr(\varrho^2)$, where ϱ denoting all zero discord states. In general, the upper bound depends on the state under consideration but if the state belong to some particular class of zero discord states then we found that the upper bound is state independent. Later, it is shown that among these particular classes of zero discord states, there exist sub-classes which are absolutely separable. Furthermore, we have derived necessary conditions for the separability of a given qubit–qudit states. Then, we used the derived conditions to construct a ball for $2 \otimes d$ quantum system described by $Tr(\rho^2) \leq Tr(X^2)+2Tr(XZ)+Tr(Z^2)$, where the $2 \otimes d$ quantum system is described by the density operator ρ which can be expressed by block matrices X, Y and Z with $X,Z \geq 0$. In particular, for qubit–qudit system, we show that the newly constructed ball contain larger class of absolute separable states compared to the ball described by $Tr(\rho^2) \leq 13$. Lastly, we have derived the necessary condition in terms of purity for the absolute separability of a qubit–qudit system under investigation.

For details refer to https://doi.org/10.1140/epjd/s10053-021-00103-w

Classification witness operator for the classification of different subclasses of three-qubit GHZ class

Anu Kumari and **Satyabrata Adhikari***

Abstract: It is well known that three-qubit system has two kinds of inequivalent genuine entangled classes under stochastic local operation and classical communication. These classes are called as GHZ class and W class. GHZ class proved to be a very useful class for different quantum information processing tasks such as quantum teleportation, controlled quantum teleportation, etc. In this work, we distribute pure three-qubit states from GHZ class into different subclasses denoted by S_1, S_2, S_3, S_4 and show that the three-qubit states either belong to S_2 or S_3 or S_4 may be more efficient than the three-qubit state belong to S_1. Thus, it is necessary to discriminate the states belong to S_i, $i=2,3,4$ and the state belong to S_1. To achieve this task, we have constructed different witness operators that can classify the subclasses S_i, $i=2,3,4$ from S_1. We have shown that the constructed witness operator can be decomposed into Pauli matrices and hence can be realized experimentally.

For details refer to https://doi.org/10.1007/s11128-021-03250-6

*Corresponding Author

Teleportation Criteria Based on Maximum Eigenvalue of the Shared $d \otimes d$ Dimensional Mixed State: Beyond Singlet Fraction

Anuma Garg and **Satyabrata Adhikari***

Abstract: We derive a criteria for the detection of $d \otimes d$ dimensional negative partial transpose (NPT) entangled state useful for teleportation. The newly derived criteria are based on the maximum eigenvalue of the NPT entangled state, which is easier to determine experimentally than to completely reconstruct the state via tomography. We then illustrate our criteria by considering a class of qubit-qubit system and qutrit-qutrit system.

For details refer to https://doi.org/10.1007/s10773-021-04725-z

Construction of a family of positive but not completely positive map for the detection of bound entangled states

Richa Rohira, Shreya Sanduja and **Satyabrata Adhikari***

Abstract: We construct a family of map which is shown to be positive when imposing certain condition on the parameters. Then, we show that the constructed map can never be completely positive. After tuning the parameters, we found that the map still remains positive, but it is not completely positive. We then use the positive but not completely positive map in the detection of bound entangled state and negative partial transpose entangled states.

For details refer to https://doi.org/10.1007/s11128-021-03291-x

Witness operator provides better estimate of the lower bound of concurrence of bipartite bound entangled states in $d_1 \otimes d_2$ -dimensional system

Shruti Aggarwal and **Satyabrata Adhikari***

Abstract: It is known that the witness operator is useful in the detection and quantification of entangled states. This motivated us for the construction of the family of witness operators that can detect many mixed entangled states. This family of witness operators is then used to estimate the lower bound of concurrence of the detected mixed entangled states. Our method of construction of witness operator is important in the sense that it will estimate a better lower bound of concurrence of the entangled states in arbitrary $d_1 \otimes d_2 (d_1 \leq d_2)$-dimensional system compared to the lower bound of the concurrence given in Chen et al. (Phys Rev Lett 95:040504, 2005). We have shown the significance of our constructed witness operator by detecting many bound entangled states that are not detected by the earlier methods, and then, we use the expectation value of the witness operator to estimate the lower bound of the concurrence of those bound entangled states.

For details refer to https://doi.org/10.1007/s11128-021-03012-4

**Corresponding Author*

BIOGRAPHY

MS. SHAGUN BANGA

Department of Applied Mathematics

Ms. Shagun Banga is a regular senior research fellow in the Department of Applied Mathematics, Delhi Technological University, Delhi. She acquired her Bachelor's and Master's degree in Mathematics from University of Delhi. She was awarded with SHE scholarship under DST-INSPIRE scheme for five consecutive years (2011-2016) during graduation and post-graduation. She has qualified CSIR UGC NET in June, 2017. Currently, she is pursuing Ph.D. in the area of Geometric Function Theory after being selected for DST-JRF Inspire Fellowship in 2017. She has published three research articles till date in SCIE journals and communicated three papers for publication in reputed international journals. She has also presented her research work at national as well as international conferences.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. S. S. Kumar and **S. Banga**, "On Certain Exact Differential Subordinations Involving Convex Dominants", *Mediterranean Journal of Mathematics*, vol. 18, no. 6, pp. 1-15, 2021. Impact Factor: 1.400.

On Certain Exact Differential Subordinations Involving Convex Dominants

S. Sivaprasad Kumar and **Shagun Banga***

Abstract: Let h be a non-vanishing convex univalent function and p be an analytic function in D. We consider the differential subordination $\psi i(p(z),zp'(z))\prec h(z)$ with the admissible functions

$$\psi_1:=(\beta p(z)+\gamma)^{-\alpha}\left(\frac{(\boldsymbol{\beta p(z)+\gamma})}{\boldsymbol{\beta(1-\alpha)}}+zp'(z)\right) \text{ and}$$

$$\psi_2:=\frac{1}{\sqrt{\boldsymbol{\gamma\beta}}}\arctan\left(\sqrt{\frac{\boldsymbol{\beta}}{\boldsymbol{\gamma}}}p^{1-\alpha}(z)\right)+\left(\frac{1-\boldsymbol{\alpha}}{\boldsymbol{\beta p}^{2(1-\alpha)}(z)+\boldsymbol{\gamma}}\right)\frac{\boldsymbol{zp'(z)}}{\boldsymbol{p\alpha}(z)}.$$

The objective of this paper is to find the dominants, preferably the best dominant (say q) of the solution of the above differential subordination satisfying $\psi_i(q(z),nzq'(z))=h(z)$. Furthermore, we show that $\psi_i(q(z),zq'(z))=h(z)$ is an exact differential equation and q is a convex univalent function in D. In addition, we estimate the sharp lower bound of Rep for different choices of h and derive a univalence criterion for functions in H (class of analytic normalized functions) as an application to our results.

For details refer to https://doi.org/10.1007/s00009-021-01895-2

**Corresponding Author*

BIOGRAPHY

MS. SHRUTI AGGARWAL

Department of Applied Mathematics

Ms. Shruti Aggarwal is currently pursuing for PhD degree in the area of Quantum Information Theory in Department of Applied Mathematics, Delhi Technological University. She did her graduation as well as her post-graduation in mathematics from University of Delhi. She qualified JRF and joined DTU under CSIR fellowship in the year 2019. She has published one research paper in a reputed international SCI journal. She recently presented her work in an International conference.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Aggarwal** and S. Adhikari, "Witness operator provides better estimate of the lower bound of concurrence of bipartite bound entangled states in $d_1 \otimes d_2$ -dimensional system", *Quantum Information Processing*, vol. 20, no. 3, pp. 1-26, 2021. Impact Factor: 2.349.

Witness operator provides better estimate of the lower bound of concurrence of bipartite bound entangled states in $d_1 \otimes d_2$ -dimensional system

Shruti Aggarwal and Satyabrata Adhikari

Abstract: It is known that the witness operator is useful in the detection and quantification of entangled states. This motivated us for the construction of the family of witness operators that can detect many mixed entangled states. This family of witness operators is then used to estimate the lower bound of concurrence of the detected mixed entangled states. Our method of construction of witness operator is important in the sense that it will estimate a better lower bound of concurrence of the entangled states in arbitrary $d_1 \otimes d_2 (d_1 \leq d_2)$-dimensional system compared to the lower bound of the concurrence given in Chen et al. (Phys Rev Lett 95:040504, 2005). We have shown the significance of our constructed witness operator by detecting many bound entangled states that are not detected by the earlier methods, and then, we use the expectation value of the witness operator to estimate the lower bound of the concurrence of those bound entangled states.

For details refer to https://doi.org/10.1007/s11128-021-03012-4

BIOGRAPHY

DR. S. SIVAPRASAD KUMAR

Department of Applied Mathematics

Dr. S. Sivaprasad Kumar is a Professor and Head of the Department of Applied Mathematics, Delhi Technological University. He received his M.Phil. from Madras University and Ph.D. degree from University of Delhi. The broad area of his research is Complex Analysis where he is working in Geometric function theory. He has more than 25 years of teaching and research experience with 38 publications in reputed journals. He has organized and participated in numerous workshops, symposiums and conferences of national and international repute. He has also delivered invited talks at various training programs. Further, he has produced two Ph.Ds so far and six are under progress. His Google scholar citation index is 618 and h-index 11.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. **S. S. Kumar** and K. Gangania, "A cardioid domain and starlike functions", *Analysis and Mathematical Physics*, vol. 11, no. 2, pp. 1-34, 2021. Impact Factor: 1.548.
2. **S. S. Kumar** and K. Gangania, "On Geometrical Properties of Certain Analytic functions", *Iranian Journal of Science and Technology, Transactions A: Science*, vol. 45, pp. 1437–1445, 2021. Impact Factor: 1.194.
3. **S. S. Kumar** and S. Banga, "On Certain Exact Differential Subordinations Involving Convex Dominants", *Mediterranean Journal of Mathematics*, vol. 18, no. 6, pp. 1-15, 2021. Impact Factor: 1.400.

A cardioid domain and starlike functions

S. Sivaprasad Kumar and Kamaljeet Gangania

Abstract: We introduce and study a class of starlike functions defined by

$$S * \wp. = \left\{ f \in A : \frac{zf'(z)}{f(z)} \prec 1 + ze^z =: \wp(z), \right\},$$

where $\wp$ maps the unit disk onto a cardioid domain. We find the radius of convexity of $\wp(z)$ and establish the inclusion relations between the class $S*\wp$ and some well-known classes. Further we derive sharp radius constants and coefficient related results for the class $S*\wp$.

For details refer to https://doi.org/10.1007/s13324-021-00483-7

On Geometrical Properties of Certain Analytic functions

S. Sivaprasad Kumar and Kamaljeet Gangania

Abstract: We introduce the class of analytic functions

$$F(\psi) = \left\{ f \in A : \left(\frac{zf'(z)}{f(z)} \right) - 1 \prec \psi(z), \psi(0) = 0 \right\},$$

where ψ is univalent and establish the growth theorem with some geometric conditions on ψ and obtain the Koebe domain with some related sharp inequalities. Note that functions in this class may not be univalent. As an application, we obtain the growth theorem for the complete range of α and β for the functions in the classes $BS(\alpha) := \{f \in A : (zf'(z)/f(z)) - 1 \prec z/(1 - \alpha z2), \alpha \in [0, 1)\}$ and $Scs(\beta) := \{f \in A : (zf'(z)/f(z)) - 1 \prec z/((1 - z)(1 + \beta z)), \beta \in [0, 1)\}$, respectively which improves the earlier known bounds. The sharp Bohr-radii for the classes S(BS(α)) and BS(α) are also obtained. A few examples as well as certain newly defined classes on the basis of geometry are also discussed.

For details refer to https://doi.org/10.1007/s40995-021-01116-1

On Certain Exact Differential Subordinations Involving Convex Dominants

S. Sivaprasad Kumar and Shagun Banga

Abstract: Let h be a non-vanishing convex univalent function and p be an analytic function in D. We consider the differential subordination $\psi i(p(z),zp'(z)) \prec h(z)$ with the admissible functions

$$\psi_1 := (\beta p(z)+\gamma)^{-\alpha}\left(\frac{(\boldsymbol{\beta p(z)+\gamma})}{\boldsymbol{\beta(1-\alpha)}} + zp'(z)\right) \text{ and}$$

$$\psi_2 := \frac{1}{\sqrt{\gamma\beta}}\arctan\left(\sqrt{\frac{\boldsymbol{\beta}}{\boldsymbol{\gamma}}}p^{1-\alpha}(z)\right) + \left(\frac{1-\boldsymbol{\alpha}}{\boldsymbol{\beta p}2\boldsymbol{(1-\alpha)}(z)+\boldsymbol{\gamma}}\right)\frac{\boldsymbol{zp'(z)}}{\boldsymbol{p\alpha}(z)}.$$

The objective of this paper is to find the dominants, preferably the best dominant (say q) of the solution of the above differential subordination satisfying $\psi_i(q(z),nzq'(z))=h(z)$. Furthermore, we show that $\psi_i(q(z),zq'(z))=h(z)$ is an exact differential equation and q is a convex univalent function in D. In addition, we estimate the sharp lower bound of Rep for different choices of h and derive a univalence criterion for functions in H (class of analytic normalized functions) as an application to our results.

For details refer to https://doi.org/10.1007/s00009-021-01895-2

BIOGRAPHY

MS. TANYA MALHOTRA

Department of Applied Mathematics

Ms. Tanya Malhotra, a regular full-time Ph.D. research scholar in the Department of Applied Mathematics. She has joined the Department as a Ph.D. student on 20/07/2017 under the DTU fellowship scheme. I have completed my graduation and post-graduation, majored in mathematics from Kirori Mal College, North Campus, University of Delhi. Her alacrity towards mathematics and deep-seated interest in exploring the horizon of applications it has offered encourages her to perform well in the education she is pursuing currently. It has also motivated her to research in the field to broaden my understanding of the subject and realize the practical implications. During her graduation, she worked on a summer project entitled, "Study on neutrino-oscillation and quark-gluon plasma," where she explored the application of Mathematics in the field of Physics. Continuing further in terms of her knowledge, skills, and a very high degree of motivation and sincerity, she could publish four research publications at present in very reputed journals.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01

1. **T. Malhotra** and A. Gupta, "A New 2-Tuple Linguistic Approach for Unbalanced Linguistic Term Sets", *IEEE Transactions on Fuzzy Systems*, vol. 29, pp. 2158 - 2168, 2021. Impact Factor: 12.029.

A New 2-Tuple Linguistic Approach for Unbalanced Linguistic Term Sets

Tanya Malhotra and Anjana Gupta

Abstract: Several real-world problems employ linguistic-based approaches to handle qualitative data. The set of linguistic terms that is utilized in the problems are mostly alleged to be symmetrically distributed. However, with the advent of time, as the complexity of the problem increases, the equidistant linguistic term set seems improper. Consequently, in such cases, experts often prefer to use the set of the unbalanced linguistic term to direct the appraisal for the problems. In this article, we tend to propose a method that is newly designed to deal with a set of unbalanced linguistic terms. In this direction, we initially propose an algorithm to represent unbalanced linguistic information via a multiplicative linguistic label set that has a global inconsistent linguistic term distribution. Furthermore, in light of the Herrera and Martínez, "2-tuple linguistic model," we develop a novel 2-tuple approach for the unbalanced linguistic set, which is based on the notion of minimum distance measure. Finally, to validate the proposed model in the physical realm and to demonstrate the functioning of the method, a numerical example is being elucidated. The proposed methodology seeks to indicate a reduction in the computation time and also enhances the decision-makers' evaluations.

For details refer to https://doi.org/10.1109/TFUZZ.2020.2994987

BIOGRAPHY

DR. VIVEK KUMAR

Department of Applied Mathematics

Dr. Vivek Kumar Aggarwal is an Assistant Professor at the Department of Applied Mathematics, Delhi Technological University, Delhi, India. He received his masters and doctorate (in Mathematics) degree from the Indian Institute of Technology, Roorkee, India and the Indian Institute of Technology, Kanpur, India, respectively. Recently, He has received full funding from the Brazilian Govt. to attend ICM 2018 during Aug. 1-9, 2018 held in Rio, Brazil. Also, he got a visiting position in Friedrich-Alexander-Universität Erlangen-Nürnberg during June - Sept. 2017. His research interests are in computational methods for differential equations. He has published more than 40 research papers in national, international journals and conferences. He has guided 03 PhD students and currently, he is supervising 04 PhD students.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. **V. Kumar** and G. Leugering, "Singularly perturbed reaction–diffusion problems on a k-star graph", *Mathematical Methods in the Applied Sciences*, vol. 44, no. 18, pp. 14874-14891, 2021. Impact Factor: 2.321.
2. R. Lochab and **V. Kumar**, "A new reconstruction of numerical fluxes for conservation laws using fuzzy operators", *International Journal for Numerical Methods in Fluids*, vol. 93, no. 6, pp. 1690-1711, 2021. Impact Factor: 2.107.
3. R. Lochab and **V. Kumar**, "An improved flux limiter using fuzzy modifiers for Hyperbolic Conservation Laws", *Mathematics and Computers in Simulation*, vol. 181, pp. 16-37, 2021. Impact Factor: 2.463.

Singularly perturbed reaction–diffusion problems on a k-star graph

Vivek Kumar and Günter Leugering

Abstract: Singularly perturbed reaction–diffusion equations on a star graph (having k+1 nodes and k edges) resulting in a system with k individual partial differential equations along the edges with coupling conditions at the common junction are presented. In the singular limit, as the diffusion parameter tends to zero, possibly individually along each edge, boundary layers may occur at the multiple nodes as well as at the simple nodes. Numerically, the proposed equations are solved using central finite difference schemes on properly extended Shishkin meshes. Error estimates are discussed and validated by solving a test problem on a graph with three edges (tripod). A more general graph problem with eight edges and three connecting nodes has also been solved numerically.

For details refer to https://doi.org/10.1002/mma.7749

A new reconstruction of numerical fluxes for conservation laws using fuzzy operators

Ruchika Lochab and **Vivek Kumar***

Abstract: This article develops a new hybrid flux-limited scheme for a numerical solution of the hyperbolic conservation laws by applying fuzzy logic-based operator functions. The construction of the proposed flux-limiter is explored using a fuzzy modifier function, having a suitable intensity. The purpose of this article is to present an efficient finite volume flux-limited technique, derived from an entirely different subject of fuzzy mathematics, for tackling hyperbolic partial differential equations. Several standard test cases in one and two dimensions are solved numerically for demonstrating the robustness of the proposed new hybrid flux-limited scheme.

For details refer to https://doi.org/10.1002/fld.4948

An improved flux limiter using fuzzy modifiers for Hyperbolic Conservation Laws

Ruchika Lochab and **Vivek Kumar***

Abstract: The objective of the work in this paper is to computationally tackle a range of problems in hyperbolic conservation laws, which is an interesting branch of computational fluid dynamics. For the simulation of issues in hyperbolic conservation laws, this work explores the concept of fuzzy logic-based operators. This research presents a unique mixture of fuzzy sets and logic with a new branch of conservation laws from fluid dynamics. The approach considers a computational procedure based on the reconstruction of several high-order numerical methods termed as flux-limited methods using some fuzzy logic operators. With the aid of fuzzy modifiers, these flux limiters are further modified. This approach results in improved convergence of approximations and maintains the problem's basic properties to be solved. Additionally, to ensure improved results, modified flux-limited methods are imposed on some famous test problems. The application results are provided wherever required. The work has demonstrated that it is possible to use such technique and apply it to complex areas of computational fluid dynamics to produce a more straightforward approach to studying other topics like flux-limited methods and hence opens up an exciting gateway for future work.

For details refer to https://doi.org/10.1016/j.matcom.2020.09.012

**Corresponding Author*

BIOGRAPHY

PROF. A. S. RAO

Department of Applied Physics

Prof. A. S. Rao is working as a faculty in the Department of Applied Physics, Delhi Technological University, New Delhi, India since July 2012. He received his Ph.D degrees in Physics in the year 1993 from S.V. University, Tirupati, Andhra Pradesh. He has a total of 30 years of teaching and research experience in his career. He received three best teacher awards for three consecutive academic years i.e., 2008-09, 2009-10 and 2010-11 from K L University, Vijayawada, Andhra Pradesh, before joining in DTU. He has guided 14 students for Ph.D. and 4 students for M. Tech degrees. Currently he is guiding 13 students for Ph.D. program. Besides this, he is also acting as mentor for three Post-Doctoral fellows. He has handled nearly 2.5 crore worth of sponsored projects (as PI, Co-PI and Mentor) funded by ISRO and DST. He has published nearly 150 research papers in Scopus Indexed International Journals and nearly 130 papers in national and international conferences. He is delivered invited & oral talks in India and abroad. Prof. Rao is acting as resource person for academic talks in various Indian universities/colleges. Prof. Rao received Four Commendable Research Award for Excellence in Research by DTU. His research interests are photoluminescence studies of rare earth doped glasses, phosphors and nanophosphors for photonic and bio-photonic applications; measurement of trace gases and aerosols to understand the radiation budget and global warming process. He is a lead guest editor for American Journal of Physics and Applications. He received an invitation from Materials Science Research India, and Journal of Modern Mechanical Engineering and Technology Journals to act as an Editorial Board member. His h-index as reported by Google Scholar is 37.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	05

1. Ravita and **A. S. Rao**, "Effective energy transfer from Dy^{3+} to Tb^{3+} ions in thermally stable KZABS glasses for intense green emitting device applications", *Journal of Luminescence*, vol. 239, pp. 118325, 2021. Impact Factor: 3.599.
2. M. Kumar and **A. S. Rao**, "Influence of Tb^{3+} ions concentration and temperature on lithium bismuth alumino borosilicate glasses for green photonic device applications", *Optical Materials*, vol. 120, pp. 111439, 2021. Impact Factor: 3.080.
3. Y. Tayal and **A. S. Rao**, "Spectroscopic analysis of Dy^{3+} ions activated borosilicate glasses for photonic device applications", *Optical Materials*, vol. 117, pp. 111112, 2021. Impact Factor: 3.080.
4. R. Bajaj, **A. S. Rao** and G. V. Prakash, "Linear and nonlinear photoluminescence from thermally stable $KYF_4:Eu^{3+}$ cubic nanocrystals", *Journal of Alloys and Compounds*, vol. 885, pp. 160893, 2021. Impact Factor: 5.316.
5. S. Kaur, V. Katyal, V. Plakkot, N. Deopa, A. Prasad and **A. S. Rao**, "Radiative emission analysis of Sm^{3+} ions doped borosilicate glasses for visible orange photonic devices", *Journal of Non-Crystalline Solids*, vol. 572, pp. 121106, 2021. Impact Factor: 3.531.

Effective energy transfer from Dy^{3+} to Tb^{3+} ions in thermally stable KZABS glasses for intense green emitting device applications

Ravita and **A. S. Rao***

Abstract: Potassium Zinc Alumino Borosilicate (KZABS) glasses co-doped with Dy^{3+}/Tb^{3+} ions have been synthesized by employing a sudden melt quenching technique. To check the luminescence behavior, the as prepared glasses were characterized by employing spectroscopic tools like photoluminescence (PL) excitation and emission, temperature dependent PL and PL decay to see the energy transfer between Dy^{3+} and Tb^{3+} ions and optimum green emission suitable for photonic applications. The XRD spectra reveals the amorphous nature of the as prepared KZABS glasses. PL spectral features show optimum green emission and confirms energy transfer from Dy^{3+} to Tb^{3+} ions. With the help of temperature dependent PL, glasses were found to be thermally stable. The decay profiles recorded show bi-exponential nature and demonstrates the energy transfer that took place from Dy^{3+} to Tb^{3+} ions. The Inokuti- Hirayama (I–H) model confirms the interaction involved in energy transfer process as dipole-dipole in nature. The CIE coordinates are found to be shifting gradually towards intense green region with increase in activator concentration (Tb^{3+}) under the optimized sensitizer (Dy^{3+}) concentration. It is also observed that, the CIE coordinates shifting towards intense green region when the as prepared KZABS glasses are excited with suitable excitation wavelengths of both sensitizer and activator. All the studies finally reveal the superiority of Dy^{3+}/Tb^{3+} co-doped KZABS glasses for their usage in green emitting photonic device applications such as w-LEDs and display devices.

For details refer to https://doi.org/10.1016/j.jlumin.2021.118325

Influence of Tb^{3+} ions concentration and temperature on lithium bismuth alumino borosilicate glasses for green photonic device applications

Mohit Kumar and **A. S. Rao***

Abstract: Lithium bismuth alumino borosilicate (LiBiAlBSi) glasses doped with various concentrations of trivalent terbium (Tb^{3+}) ions were prepared to explore their physical, optical, and photoluminescence (PL) characteristics features. Diffraction pattern recorded for an undoped as well as doped (1.5 mol% of Tb^{3+}) LiBiAlBSi glass ascertained the amorphous nature. Absorption spectra reveal several peaks in n-UV and blue regions. The indirect optical band gap for Tb^{3+} doped LiBiAlBSi glasses was found in the 3.16-3.46 eV range. PL measurements such as emission (under 378 nm excitation) and excitation (under 542 nm emission) were recorded to study the usage of the as-prepared glasses for green photonic device applications. PL emission spectra reveal four emission bands of Tb^{3+} ions originating from the excited level of $^5D_4$ to $^7F_{J\,(=3,4,5,6)}$ levels. The intensity of the emission peak observed in the green region at 542 nm ($^5D_4 \rightarrow {}^7F_5$) escalates up to 1.5 mol% of Tb^{3+} ion concentration and declines beyond due to concentration quenching. Dexter theory applied to the PL emission spectral features reveals dipole-dipole interaction among Tb^{3+} ions responsible for the transfer of energy and thereby concentration quenching. The CIE coordinates and CCT values calculated for the as-prepared glasses are closure to the values of intense green emission given by the European Broadcasting Union illuminant. The experimental lifetime values () measured for the intense green emission ($^5D_4 \rightarrow {}^7F_5$) are reducing with the upsurge in the content of Tb^{3+} ions in the titled glasses. Correlation of values with the PL emission spectral data facilitate the estimation of radiative properties. Relatively high activation energy value estimated from the temperature-dependent PL show the thermal stability of the optimized glass. The PL (excitation, emission, decay, temperature-dependent) studies along with colorimetric studies confirm the aptness of the LBiAlBSiTb15 glass for photonic applications such as laser and tricolour w-LEDs as a green emitting component.

For details refer to https://doi.org/10.1016/j.optmat.2021.111439

**Corresponding Author*

Spectroscopic analysis of Dy^{3+} ions activated borosilicate glasses for photonic device applications

Yasha Tayal and **A. S. Rao***

Abstract: A new series of optically translucent borosilicate glasses activated with varying concentrations of Dy^{3+} ions were fabricated by employing melt quenching method. Spectral investigations were conducted by recording the absorption, photoluminescent (PL) excitation and PL emission for Dy^{3+} activated borosilicate glasses. The absorption spectral information was exposed to Judd-Ofelt (J-O) analysis to calculate various radiative properties such as transition probability, total transition probability, branching ratios and radiative lifetimes of the as synthesized glasses. The excitation spectrum recorded under 483 nm emission wavelength possess a sharp peak at 348 nm in 0.1 mol% of Dy^{3+} ions doped borosilicate glass. Emission spectra recorded for all the Dy^{3+} ions activated borosilicate glasses under 348 nm intense excitation wavelength exhibit two potential peaks in visible region at 483 nm ($^4F_{9/2} \rightarrow {}^6H_{15/2}$) and 575 nm ($^4F_{9/2} \rightarrow {}^6H_{13/2}$). The emission centered at 483 nm is most prominent. Radiative properties measured from the absorption spectral feature were correlated with emission spectral information to estimate emission cross-section, gain bandwidth and optical gain parameters to understand the utility of the as synthesized glasses as photonic devices. The CIE coordinates measured for all the titled glasses are in good proximity with the white light coordinates of CIE 1931 diagram.

For details refer to https://doi.org/10.1016/j.optmat.2021.111112

Linear and nonlinear photoluminescence from thermally stable $KYF_4:Eu^{3+}$ cubic nanocrystals+

Rajat Bajaj, **A. S. Rao*** and G. Vijaya Prakash

Abstract: This paper deals with the synthesis of cubic phase $KYF_4:Eu^{3+}$ nanophosphors via wet chemical route. Morphological studies such as XRD, SEM and EDAX mapping were done to ascertain shape, size and composition of the as prepared nanophosphors. Debye Scherrer formula applied to the XRD spectral features of the as prepared nanophosphors reveals the average size in the range 3–4 nm. The JCPDS data analysis for $KYF_4:Eu^{3+}$ nanophosphors confirm cubic structure with lattice constant a = b = c = 5.448 Å and $\alpha = \beta = \gamma = 90$ °. The SEM EDAX image mapping clearly demonstrates the uniform distribution of all the constituent elements. Up-conversion (UC) studies carried out using 800 nm femtosecond laser produces peaks at 576, 590, 612, 650, 700 nm pertaining to the transitions $^5D_0 \rightarrow {}^7F_j$ (J = 0, 1, 2, 3, 4) respectively. In addition to this, three higher order peaks are also observed at 523, 531, 552 nm pertaining to $^5D_1 \rightarrow {}^7F_j$ (J = 0, 1, 2) transitions respectively. Down-shifting (DS) studies under 393 nm and 405 nm excitation were recorded to understand the utility of the as prepared phosphors for lighting applications. These nanophosphors are capable of emitting visible emission under UV/NIR excitations. The laser power dependence studies conducted on UC and DS reveals the excitation process as two photon and single photon respectively. DS temperature dependent PL spectral revels good thermal stability for the as prepared phosphor. The interesting results obtained allows us to contemplate that the as prepared $KYF_4:Eu^{3+}$ nanophosphors are useful for bio-imaging (through UC) as well as lighting applications (through DS).

For details refer to https://doi.org/10.1016/j.jallcom.2021.160893

**Corresponding Author*
+Eligible for Certificate only

Radiative emission analysis of Sm^{3+} ions doped borosilicate glasses for visible orange photonic devices+

Sumandeep Kaur, Vaibhav Katyal, Vaishakh Plakkot, Nisha Deopa, Aman Prasad and **A. S. Rao***

Abstract: Sm^{3+} ions doped borosilicate glasses with variable concentration of Sm^{3+} ions (0.5 to 2.5 mol%) in steps of 0.5 mol% have been synthesized by using melt quench method. The X-ray diffraction (XRD), Fourier Transform Infrared (FT-IR) measurements were done for structure analysis. Broad hump in XRD determine the amorphous nature of the as prepared glass. The absorption spectra observed in UV-vis-NIR range and band gap has been determined to be in 3.011-3.020 eV range for all the prepared glasses. The photoluminescent (PL) excitation reveals 402 nm intense excitation peak and strong emission at around 600 nm as observed from PL spectral measurements. The colorimetric properties were studied to realize the utility of the glasses reported in this article for orange colour photonic device applications. The chromaticity diagram reveals orange emission with 0.594, 0.404 CIE coordinates. The PL decay spectral studies were utilised to acknowledge the type of energy transfer mechanism and illustrated dipole-dipole interaction between Sm^{3+} ions.

For details refer to https://doi.org/10.1016/j.jnoncrysol.2021.121106

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

MR. ARYAN

Department of Applied Physics

Mr. Aryan is currently working as a full-time research scholar in the Laser and Spectroscopy Lab in the Department of Applied Physics, Delhi Technological University, Delhi, India. He did his M.Sc. in Physics from Delhi Technological University and B.Sc. in Physics from Delhi University. Delhi, India. He started his research work during his masters thesis at Laser and Spectroscopy lab, DTU. His field of interest is Green Synthesis of Nanoparticle and has published a research paper on Green Synthesis of Silver Nanoparticles.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **Aryan**, Ruby and M. S. Mehata, "Green synthesis of silver nanoparticles using *Kalanchoe pinnata* leaves (life plant) and their antibacterial and photocatalytic activities", *Chemical Physics Letters*, vol. 778, pp. 138760, 2021. Impact Factor: 2.328.

Green synthesis of silver nanoparticles using *Kalanchoe pinnata* leaves (life plant) and their antibacterial and photocatalytic activities

Aryan, Ruby and Mohan Singh Mehata

Abstract: Silver nanoparticles (AgNPs) were synthesized via green synthesis using a new herbal plant *Kalanchoe pinnata* (known as life plant) leaves. Effects of physicochemical parameters like temperature, pH and concentration on AgNPs were examined, and the absorption spectra were observed due to strong surface plasmon resonance. The crystalline nature and stability of AgNPs were confirmed by XRD pattern and zeta potential, respectively. The morphology of AgNPs was studied using FESEM and HRTEM. AgNPs showed antibacterial activity against the gram-negative *E. Coli* bacteria and photocatalytic activity in the degradation of rhodamine B dye with a reaction rate constant of 0.042 min^{-1}.

For details refer to https://doi.org/10.1016/j.cplett.2021.138760

BIOGRAPHY

MR. BHAVYA KUMAR

Department of Applied Physics

Mr. Bhavya Kumar received the B.Sc. degree in Physics (Hons.) from Delhi University, Delhi, India, in 2013 and the M.Sc. degree in Physics from Panjab University, Chandigarh, India, in 2017. He is currently pursuing a Ph.D. degree with the Department of Applied Physics, Delhi Technological University (Formerly Delhi College of Engineering), New Delhi, India. He has authored around 07 papers in different reputed international journals and conferences. He is currently working on the effects of different structural parameters on the static, analog/RF, and wireless performance of FinFETs and exploring the new channel materials that can further upgrade the nanoscaled device performances. His research interests include modeling and simulation study of nanoscale semiconductor devices and their ULSI switching applications. He is a Student Member of IEEE.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **B. Kumar** and R. Chaujar, "TCAD Temperature Analysis of Gate Stack Gate All Around (GS-GAA) FinFET for Improved RF and Wireless Performance", *Silicon*, vol. 13, pp. 3741–3753, 2021. Impact Factor: 2.670.

TCAD Temperature Analysis of Gate Stack Gate All Around (GS-GAA) FinFET for Improved RF and Wireless Performance

Bhavya Kumar and Rishu Chaujar

Abstract: In this article, we investigated the impact of temperature variation on DC, analog, RF, and wireless performance of Gate Stack Gate All Around (GS-GAA) FinFET using SILVACO Atlas 3D simulator. The GAA structure introduction enhances the switching ratio (I_{on}/I_{off}) by ~152.37% and reduces the subthreshold swing (SS) by ~6.5%. At gate voltage (V_{gs}) ~ 0.725 V, the GS-GAA FinFET device exhibits the ZTC (Zero-Temperature-Coefficient) bias point, i.e., the effect of temperature on drain current gets nullified. DC parameters such as leakage current (I_{off}), on current (I_{on}), SS, and threshold voltage (V_{th}) deteriorate with the rise in temperature. The enhancement in temperature degrades the RF and analog performance of the device by suppressing the parameters like transconductance (g_m), device efficiency (TGF), cut-off frequency (f_T), gain frequency product (GFP), gain-bandwidth product (GBP), etc. The device's wireless performance is analyzed using linearity and harmonic distortion parameters such as gm_3, gm_2, 1-dB compression point, IIP3, VIP3, VIP2, IMD3, HD3, and HD2, and it shows significant improvement as the temperature increases from 300 K to 500 K.

For details refer to https://doi.org/10.1007/s12633-021-01040-4

BIOGRAPHY

MS. DEEPALI

Department of Applied Physics

Ms. Deepali is currently pursuing her doctoral degree in Department of Applied Physics, Delhi Technological University (DTU), Delhi, India. She has received her graduation and post-graduation (B.Tech and M.Tech) degree in Nanotechnology from Amity University, Noida, India. She has completed her bachelors thesis on energy harvesting application from Amity University and masterss thesis on Density Functional Theory (DFT) from National Physical Laboratory, Delhi, India. She developed her interest in experimental as well as theoretical research and her area of interest includes electronic and optical properties of semiconductors for optoelectronic application. She is currently working on luminescent materials focusing on w-LED and solar cell applications at Luminescent Material Research Lab (LMRL), DTU. She has published one paper and attended various national and international conferences related to her research.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **Deepali**, R. Bisi, Vandana, H. Kaur and M. Jayasimhadri, "Structural and spectroscopic properties of Sm^{3+}-doped $NaBaB_9O_{15}$ phosphor for optoelectronic device applications", *Journal of Materials Science: Materials in Electronics*, vol. 32, pp. 1650–1658, 2021. Impact Factor: 2.478.

Structural and spectroscopic properties of Sm^{3+}-doped $NaBaB_9O_{15}$ phosphor for optoelectronic device applications

Deepali, Ruchira Bisi, Vandana, Harpreet Kaur and M. Jayasimhadri

Abstract: Sm^{3+}-doped $NaBaB_9O_{15}$ phosphor was prepared using high-temperature solid-state reaction technique. The crystal structure and purity of the phase were analysed with X-ray diffraction (XRD) and pure phase obtained by sintering the sample at 800 °C. The Fourier transform infrared (FT-IR) spectra demonstrated the absorption band of the borates with stretching and vibrational modes of BO_3 and BO_4 units. The field emission scanning electron microscope (FE-SEM) images revealed the morphology and agglomerated structure of the micron size particles. The spectroscopic studies include photoluminescence excitation (PLE) and emission spectra of the $NaBaB_9O_{15}$: Sm^{3+} phosphors. Upon exciting as-synthesized phosphor with near UV light, three dominating peaks observed at 560, 594, and 640 nm wavelength. Furthermore, the emission spectra for varying the concentration of Sm^{3+} ions were measured to ascertain the optimum concentration of the dopant ion. The maximum intensity achieved with the 0.8 mol% of Sm^{3+} ion concentration at 594 nm and concentration quenching takes place beyond it. The chromaticity coordinates indicate the intense orangish-red emission of the as-prepared phosphor. Therefore, all these studies depict that the as-synthesized borate-based phosphor can be utilized for various optical device applications.

For details refer to https://doi.org/10.1007/s10854-020-04934-y

BIOGRAPHY

DR. HARPREET KAUR

Department of Applied Physics

Dr. Harpreet Kaur, who joined as a research scholar in Department of Applied Physics to work in the year 2016. She has recently completed her PhD on the thesis entitled Optimization of Luminescent Features in Multicolor Emitting Rare Earth Doped Alkaline Earth Vanadate Phosphor for Solid State Lighting Applications in Department of Applied Physics, Delhi Technological University (DTU). She has completed her B.Sc. (H) and M.Sc. in Physics with first division from University of Delhi and Jamia Millia Islamia, respectively. She has submitted the Ph.D. thesis on 8th October, 2021. During her Ph.D. tenure, she has published her research work in 09 internationally reputed scientific journals. She has presented her work in several national and international conferences and received best poster as well as best oral presentation award in the year 2019 and 2021, respectively. She has also received two Commendable Research Awards from DTU in the consecutive years (2020 and 2021).

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **H. Kaur** and M. Jayasimhadri, "Spectroscopic and color tunable studies in Dy^{3+}/Eu^{3+}co-doped calcium-bismuth-vanadate phosphor for lighting applications", *Solid State Sciences*, vol. 122, pp. 106776, 2021. Impact Factor: 3.059.
2. **H. Kaur** and M. Jayasimhadri, "Development of deep red–emitting $CaBiVO_5:Pr^{3+}$ phosphor for multifunctional optoelectronic applications", *Journal of the American Ceramic Society*, vol. 104, no. 11, pp. 5764-5775, 2021. Impact Factor: 3.784.

Spectroscopic and color tunable studies in Dy^{3+}/Eu^{3+}co-doped calcium-bismuth-vanadate phosphor for lighting applications

Harpreet Kaur and M. Jayasimhadri

Abstract: The present article describes about the citrate-gel synthesis and luminescent properties of Dy^{3+} activated and Dy^{3+}/Eu^{3+} bi-activated calcium bismuth vanadate (CBV) phosphor. Structural and morphological characterizations indicate the phase purity, size and shape of the as-prepared CBV phosphors. The emission and energy transfer properties in Dy^{3+} doped and Dy^{3+}/Eu^{3+} co-doped CBV phosphors have been studied extensively. In this regard, Dy^{3+}/Eu^{3+} co-doped CBV phosphors were pumped by near-ultraviolet (n-UV) light (387 nm) and the maximum energy transfer efficiency value of 87.5% is observed. Dexter and Reisfeld's approximation applied to the emission spectra specifies electric dipolar-dipolar interaction to be accountable for Dy^{3+} to Eu^{3+} energy transfer. In CBV: Dy^{3+} phosphors, codoping with Eu^{3+} ions facilitate the red component that ensues warm white light emission under n-UV/blue light excitation. Moreover, Dy^{3+}/Eu^{3+} co-doped CBV phosphor exhibits flexible color tunability with increasing Eu^{3+} concentration under different excitations. The significant accomplishments like warm white light emission and controllable spectral composition in Dy^{3+}/Eu^{3+} co-doped CBV phosphor by altering the excitation energy and co-dopant (Eu^{3+}) concentration designate it as a potential candidate in the domain of lighting and display devices.

For details refer to https://doi.org/10.1016/j.solidstatesciences.2021.106776

Development of deep red–emitting $CaBiVO_5:Pr^{3+}$ phosphor for multifunctional optoelectronic applications

Harpreet Kaur and Mula Jayasimhadri

Abstract: Orthorhombic Pr^{3+}-doped calcium bismuth vanadate (CBV: Pr^{3+}) phosphors have been synthesized successfully via a citrate-gel method. The single-phase formation of CBV: Pr^{3+} phosphor has been endorsed by X-ray diffraction (XRD) analysis. The scanning electron microscopy (SEM) image reveals dense-particle packaging with the quasi-spherical shape for the prepared CBV: Pr^{3+} phosphors. Under blue light excitation, CBV: Pr^{3+} phosphors exhibit intense red emission bands located at 608 and 656 nm wavelengths, overlapping with the absorption spectrum of P_R phytochrome, which is present in plants. To achieve the maximum red intensity, the Pr^{3+} ion concentration is optimized to be 1.25 mol% in the CBV host, after which the emission intensity ceases due to concentration quenching. Dexter's theory disclosed the possibility of d-d multipolar interaction among Pr^{3+} ions at higher concentrations of Pr^{3+} ions in the CBV host. The CIE coordinates are found to be positioned in the pure red region for CBV: Pr^{3+} phosphor and in the proximity of red-emitting commercial phosphor. The temperature-dependent spectral studies manifest substantial thermal stability of the as-synthesized phosphor. All the studies mentioned above specify the tremendous potentiality of thermally stable CBV: Pr^{3+} phosphor in agricultural lighting and w-LED applications.

For details refer to https://doi.org/10.1111/jace.17951

BIOGRAPHY

DR. M. JAYASIMHADRI

Department of Applied Physics

Dr. Jayasimhadri Mula is an Assistant Professor in the Department of Applied Physics, Delhi Technological University, Delhi, India. He has more than 16 years of teaching and research experience. He has received M.Sc. and Ph.D. from Sri Venkateswara University (SVU), Tirupati, Andhra Pradesh, India. He has worked as a Postdoctoral Research Associate for around four years in the prestigious institutes at South Korea and also visited twice Changwon National University, South Korea as a Visiting Research Professor. He has received several awards and honours in recognition of his outstanding contribution in Physical Sciences. To name a few, Junior Scientist of the Year by National Environmental Science academy, FCT Postdoctoral Fellowship from Portuguese Government, Brain Korea (BK21) Postdoctoral Fellowship from South Korea Government, Young Scientist in Physical Sciences by SERB-DST, Government of India, Outstanding Scientist Award by VIFRA, Bharat Vikas Award by ISR India and Commendable Research Award for Excellence in Research by DTU for the last consecutive four years. Also, Dr. Jayasimhadri has been featured in the list of "Top 2% Scientists in the World" prepared by Stanford University, USA". Six students have completed their Ph.D. Degrees under his supervision and also handled sponsored research projects worth of more than Fifty Lakhs. His research interest includes Optical/Fluorescent Spectroscopy and Development of Rare Earth doped Materials for Optoelectronic Applications/Luminescent Devices. He has published more than 110 research papers in Internationally reputed Scopus Indexed Journals and also presented more than 100 research papers work in several national and international conferences. His h-index as reported by Google Scholar is 38; i10-index: 77, and Citations are 3930.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	05

1. H. Kaur and **M. Jayasimhadri**, "Development of deep red–emitting $CaBiVO_5:Pr^{3+}$ phosphor for multifunctional optoelectronic applications", *Journal of the American Ceramic Society*, vol. 104, no. 11, pp. 5764-5775, 2021. Impact Factor: 3.784.
2. S. Pradhan, H. Kaur and **M. Jayasimhadri**, "Photoluminescence and thermal sensing properties of Er^{3+} doped silicate based phosphors for multifunctional optoelectronic device applications", *Ceramics International*, vol. 47, no. 19, pp. 27694-27701, 2021. Impact Factor: 4.527.
3. R. Jain, R. Sinha, M. K. Sahu and **M. Jayasimhadri**, "Synthesis and optimization of photoluminescence properties in potential reddish orange emitting niobate phosphor for photonic device applications", *Luminescence*, vol. 36, no. 6, pp. 1444-1451, 2021. Impact Factor: 2.464.
4. H. Kaur and **M. Jayasimhadri**, "Spectroscopic and color tunable studies in Dy^{3+}/Eu^{3+}co-doped calcium-bismuth-vanadate phosphor for lighting applications", *Solid State Sciences*, vol. 122, pp. 106776, 2021. Impact Factor: 3.059.
5. Deepali, R. Bisi, Vandana, H. Kaur and **M. Jayasimhadri**, "Structural and spectroscopic properties of Sm^{3+}-doped $NaBaB_9O_{15}$ phosphor for optoelectronic device applications", *Journal of Materials Science: Materials in Electronics*, vol. 32, pp. 1650–1658, 2021. Impact Factor: 2.478.

Development of deep red–emitting $CaBiVO_5:Pr^{3+}$ phosphor for multifunctional optoelectronic applications

Harpreet Kaur and **Mula Jayasimhadri***

Abstract: Orthorhombic Pr^{3+}-doped calcium bismuth vanadate (CBV: Pr^{3+}) phosphors have been synthesized successfully via a citrate-gel method. The single-phase formation of CBV: Pr^{3+} phosphor has been endorsed by X-ray diffraction (XRD) analysis. The scanning electron microscopy (SEM) image reveals dense-particle packaging with the quasi-spherical shape for the prepared CBV: Pr^{3+} phosphors. Under blue light excitation, CBV: Pr^{3+} phosphors exhibit intense red emission bands located at 608 and 656 nm wavelengths, overlapping with the absorption spectrum of P_R phytochrome, which is present in plants. To achieve the maximum red intensity, the Pr^{3+} ion concentration is optimized to be 1.25 mol% in the CBV host, after which the emission intensity ceases due to concentration quenching. Dexter's theory disclosed the possibility of d-d multipolar interaction among Pr^{3+} ions at higher concentrations of Pr^{3+} ions in the CBV host. The CIE coordinates are found to be positioned in the pure red region for CBV: Pr^{3+} phosphor and in the proximity of red-emitting commercial phosphor. The temperature-dependent spectral studies manifest substantial thermal stability of the as-synthesized phosphor. All the studies mentioned above specify the tremendous potentiality of thermally stable CBV: Pr^{3+} phosphor in agricultural lighting and w-LED applications.

For details refer to https://doi.org/10.1111/jace.17951

Photoluminescence and thermal sensing properties of Er^{3+} doped silicate based phosphors for multifunctional optoelectronic device applications

Subhajit Pradhan, Harpreet Kaur and **M. Jayasimhadri***

Abstract: Single phase Er^{3+} activated Na_2CaSiO_4 (NCSO) phosphors were synthesized successfully via sol-gel technique. As-synthesized NCSO: Er^{3+} samples have been characterized using various techniques to explore crystallinity, morphology, photoluminescence (PL) features, thermal sensing properties and thermal stability. An intense green emission peak has been observed at 558 nm under 379 nm (near-UV) excitation for NCSO: Er^{3+} phosphors. Moreover, the Er^{3+} ions concentration has been optimized at 6.0 mol% in NCSO host lattice to achieve maximum intensity, beyond which the emission intensity reduces due to concentration quenching. Temperature-dependent PL studies indicate excellent thermal stability as the emission intensity persists up to 71% and 66% of the room temperature intensity at 383 K and 423 K, respectively. The chromaticity coordinates (0.328, 0.654) under 379 nm excitation for the optimized NCSO: Er^{3+} phosphor situated in the green region. Further, the superior temperature sensing behaviour of the proposed phosphor is highly expected from the obtained relative sensitivity value of 1.88% K^{-1}. Above mentioned results indicate the potentiality of the green emitting NCSO: Er^{3+} phosphor for multifunctional optoelectronic devices.

For details refer to https://doi.org/10.1016/j.ceramint.2021.06.194

*Corresponding Author

Synthesis and optimization of photoluminescence properties in potential reddish orange emitting niobate phosphor for photonic device applications

Rakshit Jain, Rachna Sinha, Mukesh K. Sahu and **Mula Jayasimhadri***

Abstract: A series of samarium ions (Sm^{3+}) activated barium sodium niobate ($Ba_2NaNb_5O_{15}$) samples have been successfully synthesized via employing a solid-state reaction technique. Single phase, crystalline tetragonal $Ba_2NaNb_5O_{15}$ were formed and the crystallite size of the prepared sample varied with doping of Sm^{3+} ions. The scanning electron microscopy (SEM) images of $Ba_2NaNb_5O_{15}$:Sm^{3+} illustrate that the particles possess a non-uniform spherical structure with some agglomeration. The prepared $Ba_2NaNb_5O_{15}$:Sm^{3+} phosphors were efficiently excited with near-ultraviolet (n-UV) (406 nm) and emit strong visible emission peaks in the range 550–725 nm. The phenomenon of concentration quenching was detected after $x = 0.10$ mol of Sm^{3+} ions concentration for $Ba_2NaNb_5O_{15}$, which arises due to non-radiative energy transfer through dipole–dipole interaction among activator ions. Colour coordinates (0.586, 0.412) for the optimized phosphor lies in the visible reddish orange region. A bi-exponential decay behaviour was observed for the photoluminescence decay curve of the optimized phosphor sample with an average decay time in milliseconds. The temperature dependent emission intensity confirms that the $Ba_{2-x}NaNb_5O_{15}$:xSm^{3+} ($x = 0.10$ mol) phosphor exhibits adequate thermal stability having high value of activation energy ($\Delta E = 0.201$ eV). The comprehensive study and analysis of the as-prepared samples suggest that the intense reddish orange emitting thermally stable $Ba_2NaNb_5O_{15}$:Sm^{3+} phosphor can act as a potential luminescent material in phosphor coated lighting, solar cells and other photonic devices.

For details refer to https://doi.org/10.1002/bio.4085

Spectroscopic and color tunable studies in Dy^{3+}/Eu^{3+}co-doped calcium-bismuth-vanadate phosphor for lighting applications+

Harpreet Kaur and **M. Jayasimhadri***

Abstract: The present article describes about the citrate-gel synthesis and luminescent properties of Dy^{3+} activated and Dy^{3+}/Eu^{3+} bi-activated calcium bismuth vanadate (CBV) phosphor. Structural and morphological characterizations indicate the phase purity, size and shape of the as-prepared CBV phosphors. The emission and energy transfer properties in Dy^{3+} doped and Dy^{3+}/Eu^{3+} co-doped CBV phosphors have been studied extensively. In this regard, Dy^{3+}/Eu^{3+} co-doped CBV phosphors were pumped by near-ultraviolet (n-UV) light (387 nm) and the maximum energy transfer efficiency value of 87.5% is observed. Dexter and Reisfeld's approximation applied to the emission spectra specifies electric dipolar-dipolar interaction to be accountable for Dy^{3+} to Eu^{3+} energy transfer. In CBV: Dy^{3+} phosphors, codoping with Eu^{3+} ions facilitate the red component that ensues warm white light emission under n-UV/blue light excitation. Moreover, Dy^{3+}/Eu^{3+} co-doped CBV phosphor exhibits flexible color tunability with increasing Eu^{3+} concentration under different excitations. The significant accomplishments like warm white light emission and controllable spectral composition in Dy^{3+}/Eu^{3+} co-doped CBV phosphor by altering the excitation energy and co-dopant (Eu^{3+}) concentration designate it as a potential candidate in the domain of lighting and display devices.

For details refer to https://doi.org/10.1016/j.solidstatesciences.2021.106776

**Corresponding Author*
+Eligible for Certificate only

Structural and spectroscopic properties of Sm^{3+}-doped $NaBaB_9O_{15}$ phosphor for optoelectronic device applications+

Deepali, Ruchira Bisi, Vandana, Harpreet Kaur and **M. Jayasimhadri***

Abstract: Sm^{3+}-doped $NaBaB_9O_{15}$ phosphor was prepared using high-temperature solid-state reaction technique. The crystal structure and purity of the phase were analysed with X-ray diffraction (XRD) and pure phase obtained by sintering the sample at 800 °C. The Fourier transform infrared (FT-IR) spectra demonstrated the absorption band of the borates with stretching and vibrational modes of BO_3 and BO_4 units. The field emission scanning electron microscope (FE-SEM) images revealed the morphology and agglomerated structure of the micron size particles. The spectroscopic studies include photoluminescence excitation (PLE) and emission spectra of the $NaBaB_9O_{15}$: Sm^{3+} phosphors. Upon exciting as-synthesized phosphor with near UV light, three dominating peaks observed at 560, 594, and 640 nm wavelength. Furthermore, the emission spectra for varying the concentration of Sm^{3+} ions were measured to ascertain the optimum concentration of the dopant ion. The maximum intensity achieved with the 0.8 mol% of Sm^{3+} ion concentration at 594 nm and concentration quenching takes place beyond it. The chromaticity coordinates indicate the intense orangish-red emission of the as-prepared phosphor. Therefore, all these studies depict that the as-synthesized borate-based phosphor can be utilized for various optical device applications.

For details refer to https://doi.org/10.1007/s10854-020-04934-y

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

DR. MOHAN SINGH MEHATA

Department of Applied Physics

Dr. Mohan Singh Mehata received his Ph.D. from Kumaun University (1995-2002). He is a recipient of a research fellowship of Michigan Technological University, USA (2003), DST Young Scientist fellowship (2004), Postdoctoral fellowships of Hokkaido University (2004 & 2005), UCOST-Young Scientist Award (2007), Japan Society for the Promotion of Science (JSPS, Japan) Postdoctoral Fellowship (2007-09), Research Associate of Carnegie Mellon University, USA (2009-10), Visiting Professorship of Chinese Academy of Science (CAS, China, 2014 & 2015) and National Chiao Tung University, Taiwan (2019). He is the author and co-author of more than 100 research papers and conference proceedings, including 11 as a single author and three in Nature Publishing Group (NPG). He has filed three patents, which has been published. He received about two crore rupees funding for his research, which includes five major research projects of DST (2004-07), DAE-BRNS (2012-16), DST (2012-17), DST-RFBR (2017-19) and SERB-DST (2016-20). His current research interest is to develop and explore semiconductor/metal nanoparticles/quantum dots and 2D materials with a view of their applications as optical sensors, photocatlyst, optoelectronic devices, OLEDs, QLEDs, etc.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	12

1. **M. S. Mehata**, "An efficient excited-state proton transfer fluorescence quenching based probe (7-hydroxyquinoline) for sensing trivalent cations in aqueous environment", *Journal of Molecular Liquids*, vol. 326, pp. 115379, 2021. Impact Factor: 6.165.
2. **M. S. Mehata**, "Green route synthesis of silver nanoparticles using plants/ginger extracts with enhanced surface plasmon resonance and degradation of textile dye", *Materials Science and Engineering: B*, vol. 273, pp. 115418, 2021. Impact Factor: 4.051.
3. **M. S. Mehata**, M. K. Singh, K. Awasthi, P. Sharma, S. Rana, and N. Ohta, "Temperature-Dependent Electric Field-Induced Optical Transitions of 2D Molybdenum Disulfide (MoS_2) Thin Films: Temperature-Dependent Electroabsorption and Absorption", *Journal of Physical Chemistry*, vol. 125, no. 48, pp. 26566–26574, 2021. Impact Factor: 4.126.
4. N. Fatma, **M. S. Mehata**, N. Pandeya and S. Pant, "Experimental and theoretical interpretations of spectral behavior of 6-methoxyflavone", *Journal of Photochemistry and Photobiology A: Chemistry*, vol. 404, pp. 112945, 2021. Impact Factor: 4.291.
5. Aryan, Ruby and **M. S. Mehata**, "Green synthesis of silver nanoparticles using *Kalanchoe pinnata* leaves (life plant) and their antibacterial and photocatalytic activities", *Chemical Physics Letters*, vol. 778, pp. 138760, 2021. Impact Factor: 2.328.
6. V. S. Meena and **M. S. Mehata**, "Investigation of grown ZnS film on HgCdTe substrate for passivation of infrared photodetector", *Thin Solid Films*, vol. 731, pp. 138751, 2021. Impact Factor: 2.183.
7. V. Sharma and **M. S. Mehata**, "Rapid optical sensor for recognition of explosive 2,4,6-TNP traces in water through fluorescent ZnSe quantum dots", *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, vol. 260, pp. 119937, 2021. Impact Factor: 4098.
8. S. Husain, **M. S. Mehata**, N. Pandey, H. Mishra and S. Panta, "Reinvestigation of the photophysics of 3-aminobenzoic acid in neat and mixed binary solvents", *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, vol. 247, pp. 119100, 2021. Impact Factor: 4.098.

9. N. Pandey, **M. S. Mehata**, S. Pant and N. Tewari, "Structural, Electronic and NLO properties of 6-aminoquinoline: A DFT/TD-DFT study", *Journal of Fluorescence*, vol. 31, no. 6, pp. 1719-1729, 2021. Impact Factor: 2.217.
10. **M. S. Mehata** and S. Biswas, "Synthesis of fluorescent graphene quantum dots from graphene oxide and their application in fabrication of GQDs@AgNPs nanohybrids and sensing of H_2O_2", *Ceramics International*, vol. 47, no. 13, pp. 19063-19072, 2021. Impact Factor: 4.527.
11. V. Sharma and **M. S. Mehata**, "Synthesis of photoactivated highly fluorescent Mn^{2+}-doped ZnSe quantum dots as effective lead sensor in drinking water", *Materials Research Bulletin*, vol. 134, pp. 111121, 2021. Impact Factor: 4.641.
12. M. K. Singh and **M. S. Mehata**, "Temperature-dependent photoluminescence and decay times of different phases of grown TiO_2 nanoparticles: Carrier dynamics and trap states", *Ceramics International*, vol. 47, no. 23, pp. 32534-32544, 2021. Impact Factor: 4.527.

An efficient excited-state proton transfer fluorescence quenching based probe (7-hydroxyquinoline) for sensing trivalent cations in aqueous environment

Mohan Singh Mehata

Abstract: 7-hydroxyquinoline (7-HQ) exists as enol and keto forms and is interconverted through isomerization resulting in the 402 nm along with 327 nm absorption band in water. Upon excitation, an enormous Stoke shifted green fluorescence (FL) is observed without the contribution of normal FL of 7-HQ. This is due to a fast proton transfer reaction in the first excited-state, which relaxed in 2.60 ns ± 0.01 ns. An efficient FL quenching is observed in the presence of selected metal ions at 400 nm excitation. The Stern-Volmer (S-V) plots of FL quenching are nearly linear, and the slopes of the S-V plots are different in two different regions of Al^{3+} ions concentrations. In contrast, the FL lifetime is roughly constant and is independent in the Al^{3+} or Fe^{3+} ions concentration. Based on the steady-state and time-resolved results, the mechanism of quenching is predominantly static. The presence of metal ions inhibited keto formation and tautomerization, supporting the hydrogen-bonding between 7-HQ and water instead of forming zwitterion species in the ground and excited states. With substantially higher quenching constant, single exponential FL decay, linear change in absorbance, and commercial availability demonstrate this probe as a potential candidate for real-world applications.

For details refer to https://doi.org/10.1016/j.molliq.2021.115379

Green route synthesis of silver nanoparticles using plants/ ginger extracts with enhanced surface plasmon resonance and degradation of textile dye

Mohan Singh Mehata

Abstract: Silver nanoparticles (AgNPs) of 10–20 nm sized were synthesized via eco-friendly and cost-effective green methods using ginger (*Zingiber officinale*) extract and exhibit an excellent crystalline structure. The AgNPs show absorption maximum at around 407 nm at an optimal pH of 10, hence exhibits a strong surface plasmon resonance (SPR), which arises when the interaction of free electron oscillation of AgNPs is in resonance with the frequency of light interacted. AgNPs growth could be controlled by changing environmental factors such as pH, temperature, reaction time and concentration. The development of AgNPs using ginger extract is much higher as compared to tulsi (*Ocimum sanctum*) and neem (*Azadirachta indica*), plant nectar (honey), pomegranate peel extracts and fructose. In the presence of catalyst AgNPs, the absolute absorption intensity (absorbance) of textile dye, methylene blue (MB) is reduced dramatically by sodium borohydride ($NaBH_4$). The absorbance of MB diminished 99.9% and the solution became colorless (in 10 min). Thus, the hazardous dye is degraded faster by AgNPs than the metal oxides/NPs used so far. Note that most medicinal plant extracts used in the present study are quite helpful for several diseases, including coronavirus (Covid-19).

For details refer to https://doi.org/10.1016/j.mseb.2021.115418

Temperature-Dependent Electric Field-Induced Optical Transitions of 2D Molybdenum Disulfide (MoS^2) Thin Films: Temperature-Dependent Electroabsorption and Absorption+

Mohan Singh Mehata, Mrityunjay Kumar Singh, Kamlesh Awasthi, Prateek Sharma, Shailesh Rana, and Nobuhiro Ohta

Abstract: Two-dimensional (2D) layered MoS_2 nanosheets (NSs) possess many unique properties and hold great potential for various applications. Herein, MoS_2 NSs were synthesized by a hydrothermal method. The as-synthesized MoS_2 NSs are crystalline and layered. Absorption and electroabsorption (E-A) spectra of MoS_2 doped in a poly(methyl methacrylate) (PMMA) thin film were measured at different temperatures (290–40 K). The E-A spectra detected at the second harmonic of the modulation frequency of the applied electric field were analyzed using an integral method by considering the Stark effect as a dominant feature. The absorption spectra consist of seven transitions, among which five transitions are contributed to the E-A spectra. It is found that the changes in the electric dipole moment and polarizability of each transition determined at different temperatures increase substantially with decreasing temperature. Electronic resonance states identified for low-energy excitonic bands of MoS_2 NSs showed prominence E-A signals. The study is essential to understand the electronic structure in the photoexcited state, which is important for applications of MoS_2 NSs to optoelectronic devices.
For details refer to https://doi.org/10.1021/acs.jpcc.1c06706

Experimental and theoretical interpretations of spectral behavior of 6-methoxyflavone+

Nisha Fatma, **Mohan Singh Mehata***, Nupur Pandeya and Sanjay Pant

Abstract: The present work emphasizes on the experimental and computational analysis of the solvatochromic behavior of 6-methoxyflavone (6MF). The steady-state absorption and fluorescence spectra were observed in certain polar protic, polar aprotic and non-polar/weakly polar solvents to examine their solvatochromism and determine the electrical dipole moment. Bathochromic shift in fluorescence spectra with solvent polarity was ascribed to intramolecular charge transfer (ICT) interaction. Calculations based on various solvent correlation techniques denote that the excited singlet-state dipole moment value is higher than the ground-state counterpart, hence indicates substantial redistribution of π-electron density in the excited state. Quantum chemical investigations were performed using density functional theory (DFT) and time-dependent density functional theory (TD-DFT), respectively, in vacuum and solvents. The vertical transitions, along with the bright singlet states and HOMO-LUMO, were obtained from the DFT/TD-DFT calculations. The experimentally calculated ground and excited state dipole moments and different photophysical parameters adequately reflect the values obtained from computational methods. Multiple linear regression (MLR) method based on Kamlet-Taft and Catalan solvent parameters demonstrate that the photophysical behavior of 6MF is attributed to both specific and non-specific solute-solvent interactions. Thus, the study helps to demonstrate the sensing ability of 6MF towards organic solvents and the charge transfer/hydrogen donor/acceptor properties of complex systems.

For details refer to https://doi.org/10.1016/j.jphotochem.2020.112945

*Corresponding Author
+Eligible for Certificate only

Green synthesis of silver nanoparticles using *Kalanchoe pinnata* leaves (life plant) and their antibacterial and photocatalytic activities+

Aryan, Ruby and **Mohan Singh Mehata***

Abstract: Silver nanoparticles (AgNPs) were synthesized via green synthesis using a new herbal plant *Kalanchoe pinnata* (known as life plant) leaves. Effects of physicochemical parameters like temperature, pH and concentration on AgNPs were examined, and the absorption spectra were observed due to strong surface plasmon resonance. The crystalline nature and stability of AgNPs were confirmed by XRD pattern and zeta potential, respectively. The morphology of AgNPs was studied using FESEM and HRTEM. AgNPs showed antibacterial activity against the gram-negative *E. Coli* bacteria and photocatalytic activity in the degradation of rhodamine B dye with a reaction rate constant of 0.042 min^{-1}.

For details refer to https://doi.org/10.1016/j.cplett.2021.138760

Investigation of grown ZnS film on HgCdTe substrate for passivation of infrared photodetector+

Vijay Singh Meena and **Mohan Singh Mehata***

Abstract: Zinc sulfide (ZnS) thin films were developed on the mercury cadmium telluride (HgCdTe) substrate using the thermal evaporation technique and investigated with X-ray diffraction, energy dispersive analysis of X-rays, atomic force microscopy (AFM) and capacitance-voltage (C-V). The obtained results confirm that the films have a cubic zinc-blend structure with (111) preferred orientation and nearly stoichiometric composition. The AFM measurement reveals that the film is uniform, densely packed and has a smooth surface or very low roughness. The C-V measurement of a ZnS/HgCdTe based metal-insulator-semiconductor device provides the utility of ZnS thin film as a passivation layer for the HgCdTe substrate. The evaluated fixed-charge density, slow state density and fast state density of the device are 4.98×10^{10} cm^{-2}, 4.22×10^{10} cm^{-2} and 5.32×10^{11} cm^{-2} eV^{-1}, respectively. Thus, the grown ZnS thin film could be used as a suitable passivation agent in HgCdTe-based infrared detector fabrication.

For details refer to https://doi.org/10.1016/j.tsf.2021.138751

Rapid optical sensor for recognition of explosive 2,4,6-TNP traces in water through fluorescent ZnSe quantum dots+

Vineet Sharma and **Mohan Singh Mehata***

Abstract: In this report, blue fluorescent zinc selenide quantum dots (ZnSe QDs) were synthesized using 3-mercaptopropionic acid through a direct aqueous route at a lower temperature of 70 °C. The photoluminescence (PL) characteristics of ZnSe QDs have been employed to recognize nitroaromatic compounds, i.e., traces of 2,4,6-TNP (picric acid) in water. The sensing of nitroaromatic compounds was performed via fluorescence techniques. The PL band of ZnSe QDs observed at 490 nm is selectively quenched with an increasing concentration of picric acid in DI water and river water. For the proposed sensing probe, the Stern-Volmer (S-V) plot shows linearity over the range of 2.0 µM–0.25 mM with the detection limit of 12.4×10^{-6} M without any interference effect of other nitroaromatic compounds. The plausible mechanism of PL quenching is considered as the inner filter effect, based on absorption, PL and PL lifetimes.

For details refer to https://doi.org/10.1016/j.saa.2021.119937

**Corresponding Author*
+Eligible for Certificate only

Reinvestigation of the photophysics of 3-aminobenzoic acid in neat and mixed binary solvents+

Shahid Husain, **Mohan Singh Mehata***, Nupur Pandey, Hirdyesh Mishra and Sanjay Panta

Abstract: The present study elucidates the reinvestigation of the photophysical behavior of 3-aminobenzoic acid (3ABA) in solvents of different polarities using the steady-state spectroscopic techniques. Kamlet-Taft and Catalan solvatochromic models have been used to analyze the solvatochromic changes in neat solvents. The hydrogen bond donating ability of the solvent was found to be the main parameter affecting the spectral behavior of 3ABA. The solvatochromic characteristics of 3ABA have also been examined in binary solvent mixtures viz. acetonitrile (ACN)-methanol (MeOH) and benzene (BEN)-MeOH using the concept of preferential solvation. The preferential solvation of 3ABA shows unusual behavior for BEN-MeOH binary mixture and described unnoticed sigmoidal behavior in the ground state and synergistic impact in the excited state. Besides, the 3ABA was studied theoretically by quantum chemical calculations using (HF) Hartree-Fock and (DFT/B3LYP) density functional theories and its electronic absorption bands have been assigned by time-dependent density functional theory (TD-DFT). The effect of solvents on 3ABA was considered using a IEF-PCM-TDDFT (integral equation formalism of the polarizable continuum model- TDDFT) method. Thus, the theoretical results were found to be closer to the experimental results.

For details refer to https://doi.org/10.1016/j.saa.2020.119100

Structural, Electronic and NLO Properties of 6-aminoquinoline: A DFT/TD-DFT Study+

Vineet Sharma and **Mohan Singh Mehata***

Abstract: A computational study based on the DFT/TD-DFT approach was performed to explore various properties of 6-aminoquinoline (6AQ). The geometrical parameters, molecular orbitals (MOs), electronic spectra, electrostatic potential, molecular surface, reactivity parameters and thermodynamic properties of 6AQ were explored. The absorption and emission spectra of 6AQ in solvents have been estimated by TD-DFT coupled with the PCM model and correlated with the available experimental results. Depending on the solvents, the computed absorption maxima of 6AQ were noticed between 327 nm – 340 nm and ascribed to S0→S1 transition. The simulated emission maxima were obtained between 389 to 407 nm and ascribed to S1→S0 transition. On increasing the solvent polarity, both the emission and absorption maxima showed a bathochromic shift. The LUMO and HOMO were localized on the entire molecule. It was observed that the lowest excited state is possibly the $\pi \rightarrow \pi*$ charge-transfer (CT) state. The natural bonding orbital (NBO) study points out that ICT plays a significant role in stabilizing the molecular system. Moreover, the NLO (nonlinear optical) properties (polarizability, first-order hyperpolarizability and dipole moment) were computed using different hybrid functionals. The estimated values indicate that 6AQ can be considered a desirable molecule for further studies of the NLO applications.

For details refer to https://doi.org/10.1007/s10895-021-02788-z

Synthesis of fluorescent graphene quantum dots from graphene oxide and their application in fabrication of GQDs@AgNPs nanohybrids and sensing of H_2O_2

Mohan Singh Mehata and Supriya Biswas

Abstract: Graphene oxide (GO) with hydrophilic properties supports the scalable production of highly desirable material graphene. GO nanosheets were prepared with a modified Hummers method, whereas the oxidative cutting technique was used to synthesize graphene quantum dots (GQDs). The surface and structural morphology of both GO and GQDs were examined and compared. In GO, photoluminescence originated mainly due to the conductive electrons present in the sp^2 localized sites and the excimer formation. In contrast, in GQDs, PL

**Corresponding Author*
+Eligible for Certificate only

is increased due to numerous defects present on their surfaces. The pH plays a crucial role in tuning the blue and green PL of GQDs hence the optical properties. The developed GQDs with functional groups act as a solo reducing and stabilizing agent in producing the GQDs-silver nanoparticles (GQDs@AgNPs) hybrid structure, which exhibits strong surface plasmon resonance along with GQDs absorption. Further, GQDs alone support sensing of hydrogen peroxide (H_2O_2) in an aqueous medium, thus acting as a sensing probe like the GQDs@AgNPs nanohybrids.

For details refer to https://doi.org/10.1016/j.ceramint.2021.03.252

Synthesis of photoactivated highly fluorescent Mn^{2+}-doped ZnSe quantum dots as effective lead sensor in drinking water+

Vineet Sharma and **Mohan Singh Mehata***

Abstract: In this work, manganese doped zinc selenide (Mn@ZnSe) quantum dots (QDs) were prepared via a direct aqueous route. The X-ray diffraction pattern reveals the crystalline cubic zinc blende structure of QDs. With Mn^{2+} doping, a new high-intensity orange photoluminescence (PL) band centered at around 580 nm obtained owing to $^4T_1 \rightarrow {}^6A_1$ of Mn^{2+} ion transitions (for orange QLEDs). The freshly prepared water-dispersible QDs were treated under the UV-radiation for the photoactivation process, which enhanced the PL quantum efficiency from 5 % to 17.3 %. The response of QDs towards different metals was recorded in terms of absorption, PL and PL-lifetime. Among the numerous metals, Pb^{2+} shows strong PL quenching and the corresponding Stern-Volmer plot showed linearity with the detection limits of 29.8×10^{-6} M in ultrapure water. The developed Mn@ZnSe QDs could act as a non-toxic sensor to sense hazardous lead in drinking water.

For details refer to https://doi.org/10.1016/j.materresbull.2020.111121

Temperature-dependent photoluminescence and decay times of different phases of grown TiO_2 nanoparticles: Carrier dynamics and trap states+

Mrityunjay Kumar Singh and **Mohan Singh Mehata***

Abstract: Three different phases, namely anatase, mixed and rutile phases of TiO_2 nanoparticles (NPs) were developed with varying temperatures from 400 to 900 °C and confirmed using various characterization techniques. The XRD analysis of TiO_2 NPs in temperature range of 290 to 77 K with no significant changes predict the thermally stable NPs. Photoinduced carrier dynamics of TiO_2 NPs were investigated by the temperature dependence (TD) photoluminescence (PL) and TD time-resolved PL (TRPL) decays. With varying temperatures from 290 to 77 K, the anatase phase exhibits an additional and dominant 530 nm PL band. However, the mixed and rutile phases show three well-resolved PL bands, including 420 nm, 530 nm and near-infrared (NIR) bands at 820 nm at a lower temperature. Again, 530 nm band dominated for mixed-phase.

In contrast, for the rutile phase, the 820 nm band dominated at <100 K. The PL lifetime of the 420 nm band is nearly a single exponential for all the phases. And is also true for the 530 and 820 nm PL bands, but bi-exponential for ≤100 K. Both the PL and TRPL results predict the presence of trap states in TiO_2 NPs for anatase and rutile phases. The PL is originated due to donor-acceptor recombination, whereas oxygen vacancies served as donor and hydroxyl groups serve as accepter sites. The NIR band is attributed to the trapped electrons in rutile TiO_2, which recombine with free holes and intrinsic defects. Also, the trapped electrons were generated in one of two ways: direct trapping or trap-to-trap hopping. The carrier dynamic in NPs depends on the trap states as the photoexcited carriers transfer into surface sites which competes with non-radiative and radiative recombinations during the relaxation process. Thus, the findings show that the trap states in TiO_2 can significantly influence TiO_2 photocatalytic activity when exposed to appropriate light.

For details refer to https://doi.org/10.1016/j.ceramint.2021.08.147

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

MR. MOHIT MANN

Department of Applied Physics

Mr. Mohit Mann has done B.Sc. (H) Physics from University of Delhi in 2014. He has completed M.Sc. Applied Physics in 2017 with specialization in Atmospheric Science. He had worked as Junior Research Fellow (JRF) in DRDO for two years. At present, he is pursuing PhD on work entitled "Photoluminescence properties of certain rare earth ions doped fluoroborate glasses for photonic application" under the supervision of Prof. A.S. Rao in the Department of Applied Physics, DTU. He has published 5 papers in SCI indexed Journals of high repute.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **M. Mann**, A. S. Rao and R. C. Sharma, "Remote mid IR Photoacoustic Spectroscopy for the detection of panel", *Chemical Physics Letters*, vol. 765, pp. 138231, 2021. Impact Factor: 2.328.

Remote mid IR Photoacoustic Spectroscopy for the detection of panel

M. Mann, A. S. Rao and R. C. Sharma

Abstract: Standoff photoacoustic detection of explosives using quantum cascade laser has been studied. The laser beam has been focused on to the target molecules adsorbed on metallic surfaces. A 25 kHz microphone, a resonator cavity in form of a cylinder, and a parabolic acoustic reflector have been used to demonstrate the method. The experimental results have been compared with the theoretical calculations in three different experimental conditions. The photoacoustic signals have been found to decrease with increase in the standoff range. The sensitivity of 2.0 µg/cm^2 has been achieved at ~4.0 m.

For details refer to https://doi.org/10.1016/j.cplett.2020.138231

BIOGRAPHY

DR. MRITYUNJAY KUMAR SINGH

Department of Applied Physics

Dr. Mrityunjay Kumar Singh has completed his Ph.D. and M.Tech. degree from Delhi Technological University (DTU), Delhi, India. He did his B. Tech in Electronics and Communication Engineering from Shri Ramswaroop Memorial College of Engineering and Management, Lucknow, Uttar Pradesh, India. He visited National Chiao Tung University (2019), Taiwan, as visiting scholar for collaborative research work during his Ph.D. program. He received the Commendable Research Award for two consecutive years (2019 & 2020) for research excellence. He qualified GATE (Two times) in Electronic and Communication Engineering. Currently, he has published five research papers in internationally reputed SCI/SCIE journals.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **M. K. Singh** and M. S. Mehata, "Temperature-dependent photoluminescence and decay times of different phases of grown TiO_2 nanoparticles: Carrier dynamics and trap states", *Ceramics International*, vol. 47, no. 23, pp. 32534-32544, 2021. Impact Factor: 4.527.

Temperature-dependent photoluminescence and decay times of different phases of grown TiO_2 nanoparticles: Carrier dynamics and trap states

Mrityunjay Kumar Singh and Mohan Singh Mehata

Abstract: Three different phases, namely anatase, mixed and rutile phases of TiO_2 nanoparticles (NPs) were developed with varying temperatures from 400 to 900 °C and confirmed using various characterization techniques. The XRD analysis of TiO_2 NPs in temperature range of 290 to 77 K with no significant changes predict the thermally stable NPs. Photoinduced carrier dynamics of TiO_2 NPs were investigated by the temperature dependence (TD) photoluminescence (PL) and TD time-resolved PL (TRPL) decays. With varying temperatures from 290 to 77 K, the anatase phase exhibits an additional and dominant 530 nm PL band. However, the mixed and rutile phases show three well-resolved PL bands, including 420 nm, 530 nm and near-infrared (NIR) bands at 820 nm at a lower temperature. Again, 530 nm band dominated for mixed-phase.

In contrast, for the rutile phase, the 820 nm band dominated at <100 K. The PL lifetime of the 420 nm band is nearly a single exponential for all the phases. And is also true for the 530 and 820 nm PL bands, but bi-exponential for ≤100 K. Both the PL and TRPL results predict the presence of trap states in TiO_2 NPs for anatase and rutile phases. The PL is originated due to donor-acceptor recombination, whereas oxygen vacancies served as donor and hydroxyl groups serve as accepter sites. The NIR band is attributed to the trapped electrons in rutile TiO_2, which recombine with free holes and intrinsic defects. Also, the trapped electrons were generated in one of two ways: direct trapping or trap-to-trap hopping. The carrier dynamic in NPs depends on the trap states as the photoexcited carriers transfer into surface sites which competes with non-radiative and radiative recombinations during the relaxation process. Thus, the findings show that the trap states in TiO_2 can significantly influence TiO_2 photocatalytic activity when exposed to appropriate light.

For details refer to https://doi.org/10.1016/j.ceramint.2021.08.147

BIOGRAPHY

DR. MUKHTIYAR SINGH

Department of Applied Physics

Dr. Mukhtiyar Singh is working in inter-disciplinary areas of condensed matter physics with a broad research interest in the first principles-based designing of new materials and understanding their properties using state-of-the-art density functional theory (DFT). My prime focus is on spintronics and energy materials, topological insulators, low dimensional systems, and quantum information science.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. R. Kumar, A. Vij and **M. Singh**, "Defects assisted luminescence in *m*-HfO_2 nanocrystals: An experimental and theoretical study", *Optik*, vol. 248, pp. 16812, 2021. Impact Factor: 2.443.

Defects assisted luminescence in *m*-HfO_2 nanocrystals: An experimental and theoretical study

Rajesh Kumar, Ankush Vij and **Mukhtiyar Singh***

Abstract: We report here the photoluminescence (PL) and thermoluminescence (TL) of single phase monoclinic (m)-HfO_2 nanocrystals. The m-HfO_2 shows broad PL in warm white region upon 325 nm excitation, which may be assigned to 4-fold (O_4) vacancies as predicted by first principles calculations. TL glow curve of gamma irradiated m-HfO_2 comprises of a main peak around 400 K along with a low intensity peak at 480 K, and detailed kinetic analysis confirms the presence of two kinds of metastable traps (0.86 and 1.60 eV). The carrier concentration in shallow traps (0.86 eV) were found relatively much higher than deep traps (1.60 eV), which augurs well for stronger TL signal at 400 K.

For details refer to https://doi.org/10.1016/j.ijleo.2021.168121

**Corresponding Author*

BIOGRAPHY

PROF. NITIN KUMAR PURI

Department of Applied Physics

Prof. Nitin Kumar Puri is currently working as Professor in the discipline of Engineering Physics, Department of Applied Physics, Delhi Technological University. He is associated with DTU from last 11.5 years and has teaching & research experience of more than 15 years. He is currently having the responsibility of Associate Dean (Outreach and Extension Activities) in Centre for Extension and Field Outreach. He has completed his doctorate degree in Experimental Atomic Physics from Cyclotron Laboratory, Panjab University, Chandigarh. He has worked as an Engineer in R&D division in HongHua Company Ltd, China. He has been awarded various research grants of approx. Rs. 1 cr from different funding agencies viz: SERB-DST, BRNS, UGC-DAE (Govt. of India). He has supervised about 37 Master's & 7 Ph.D. students. Currently 7 Ph.D. students are pursuing their research under his supervision. He has delivered many invited talks and has more than 115 research publications in peer-reviewed journals and conferences of national and international repute. He has worked as Chairman & Vice-Chairman of working Group-III for International Nuclear Security Education Network (INSEN) as an Indian Representative at International Atomic Energy Agency (IAEA), Vienna. His current research interests include â€œNanomaterials based Sensing devices for Healthcare & Environmental Applicationsâ.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. S. K. Jha, M. Sharma, **N. K. Puri** and B. K. Kuanr, "Effect of oxygen growth-pressure on microstructural and magnetic properties of pulse laser deposited epitaxial YIG thin films", *Journal of Alloys and Compounds*, vol. 889, pp. 161741, 2021. Impact Factor: 5.316.

Effect of oxygen growth-pressure on microstructural and magnetic properties of pulse laser deposited epitaxial YIG thin films

Saroj Kumar Jha, Monika Sharma, **Nitin K. Puri*** and Bijoy K. Kuanr

Abstract: We investigated the effect of oxygen growth-pressure on the structural and magnetic properties of epitaxial YIG thin films. YIG films were grown on single crystalline GGG substrates with (111) orientations by pulse laser deposition technique. In-situ oxygen-gas pressure variations in the range of 0.0025–0.15 mbar was adopted to demonstrate the perfect growth. Structural analysis confirmed that the films were single crystalline in nature. Atomic force microscopy analysis indicated that roughness of the films decreases with increase of oxygen pressure. Saturation magnetization was enhanced by a factor of 17% over increase of oxygen pressure. Through angular dependent ferromagnetic resonance (FMR) measurements along film's in-plane (-variation) and out-of-plane (θ-variation) geometries, resonance fields $[H_r(\theta_H, \varphi_H)]$and FMR linewidths $[\Delta H_r(\theta_H, \varphi_H)]$ were obtained. Using theoretical analysis important material parameters such as; saturation magnetization, gyromagnetic ratio, uniaxial anisotropy, cubic anisotropy and Gilbert damping were evaluated. We have obtained lowest Gilbert damping -4.37 x 10^{-5} for 0.15 mbar oxygen pressure deposited YIG film.

For details refer to https://doi.org/10.1016/j.jallcom.2021.161741

**Corresponding Author*

BIOGRAPHY

MR. RAJAT BAJAJ

Department of Applied Physics

Mr. Rajat Bajaj, research scholar working in the Department of Applied Physics, Delhi Technological University. His research topic is on Rare-Earth doped Nanophosphors for Photonics and Bio-Photonics applications. Till now, he had published 4 research papers in reputed journals.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Bajaj**, A. S. Rao and G. V. Prakash, "Linear and nonlinear photoluminescence from thermally stable $KYF_4:Eu^{3+}$ cubic nanocrystals", *Journal of Alloys and Compounds*, vol. 885, pp. 160893, 2021. Impact Factor: 5.316.

Linear and nonlinear photoluminescence from thermally stable $KYF_4:Eu^{3+}$ cubic nanocrystals

Rajat Bajaj, A. S. Rao and G. Vijaya Prakash

Abstract: This paper deals with the synthesis of cubic phase $KYF_4:Eu^{3+}$ nanophosphors via wet chemical route. Morphological studies such as XRD, SEM and EDAX mapping were done to ascertain shape, size and composition of the as prepared nanophosphors. Debye Scherrer formula applied to the XRD spectral features of the as prepared nanophosphors reveals the average size in the range 3–4 nm. The JCPDS data analysis for $KYF_4:Eu^{3+}$ nanophosphors confirm cubic structure with lattice constant a = b = c = 5.448 Å and α = β = γ = 90 °. The SEM EDAX image mapping clearly demonstrates the uniform distribution of all the constituent elements. Up-conversion (UC) studies carried out using 800 nm femtosecond laser produces peaks at 576, 590, 612, 650, 700 nm pertaining to the transitions $^5D_0 \rightarrow {}^7F_j$ (J = 0, 1, 2, 3, 4) respectively. In addition to this, three higher order peaks are also observed at 523, 531, 552 nm pertaining to $^5D_1 \rightarrow {}^7F_j$ (J = 0, 1, 2) transitions respectively. Down-shifting (DS) studies under 393 nm and 405 nm excitation were recorded to understand the utility of the as prepared phosphors for lighting applications. These nanophosphors are capable of emitting visible emission under UV/NIR excitations. The laser power dependence studies conducted on UC and DS reveals the excitation process as two photon and single photon respectively. DS temperature dependent PL spectral revels good thermal stability for the as prepared phosphor. The interesting results obtained allows us to contemplate that the as prepared $KYF_4:Eu^{3+}$ nanophosphors are useful for bio-imaging (through UC) as well as lighting applications (through DS).

For details refer to https://doi.org/10.1016/j.jallcom.2021.160893

BIOGRAPHY

PROF. RAVINDRA KUMAR SINHA

Department of Applied Physics

Prof. R. K. Sinha received M.Sc. Physics from IIT Kharagpur in 1984 and Ph.D. (Fiber Optics and Optoelectronics) from IIT Delhi in 1990. He did his Post-Doctoral Research at Osaka and Kobe university in Japan and at IISc Bangalore during 1989-1991. He has worked at BITS Pilani, REC/NIT Hamirpur H.P. and at DCE/DTU-Delhi. He has established TIFAC-Center of Relevance and Excellence in Fiber Optics and Optical Communication under Technology Vision 2020 Program, Conceptualized and Executed B.Tech. Engineering Physics, M.Tech. (MOCE) and M.Tech. (NST)) at DTU Delhi. Prof Sinha has published over 360 research papers in Journals (166) and Conference Proceedings (202) and 07 book chapters and 03 books, originated 05 patents, supervised 22 sponsored projects and 19 Doctoral thesis. He is the Fellow of International Society of Optics and Photonics (SPIE), Fellow of IETE and Fellow of OSI. He has served as Director of CSIR-CSIO Chandigarh, CEERI Pilani and IMTECH Chandigarh. He has mentored over 39 Technology development and transfer to the Industry. He is recipient of Gold-Skoch Award for Defence Technology 2020, CSIR Technology Award 2018, Fulbright-Nehru Fellowship 2013 as International Educational Administrator, Royal Academy of Engineering (UK) Fellowship 2008, JSPS Fellowship besides several awards for his research work.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. K. S. Modi, S. P. Singh, J. Kaur, U. Tiwari and **R. K. Sinha**, "All dielectric metasurface based tunable optical modulator: Design and analysis", *Photonics and Nanostructures - Fundamentals and Applications*, vol. 43, pp. 100881, 2021. Impact Factor: 3.008.
2. A. Thakur, P. Kumar, S. M. Thalluri, **R. K. Sinha** and P. Devi, "Flexible polypyrrole activated micro-porous paper-based photoanode for photoelectrochemical water splitting", *International Journal of Hydrogen Energy*, vol. 46, no. 12, pp. 8444-8453, 2021. Impact Factor: 5.816.
3. T. S. Saini and **R. K. Sinha**, "Mid-infrared supercontinuum generation in soft-glass specialty optical fibers: A review", *Progress in Quantum Electronics*, vol. 78, pp. 100342, 2021. Impact Factor: 12.250.

All dielectric metasurface based tunable optical modulator: Design and analysis

Keshav Samrat Modi, Satya Pratap Singh, Jasleen Kaur, Umesh Tiwari and **Ravindra Kumar Sinha***

Abstract: In this article, we propose the design and analysis of all-dielectric metasurface based tunable optical modulator. The metasurface structure consists of split silicon arcs mounted over the indium tin oxide layer and the silica substrate. The nematic liquid crystal is used for tuning the Fano resonance peak of the metasurface and is filled between two indium tin oxide layers. The numerical investigation of the proposed metasurface for

electro-optic modulation shows the modulator has a broadband tunability of 25 nm and modulation depth of 90 %. We have also numerically investigated the variation of the Fano resonance peak arising due to the fabrication non-uniformities in the thickness, width and the split gap of the silicon arc.

For details refer to https://doi.org/10.1016/j.photonics.2020.100881

Flexible polypyrrole activated micro-porous paper-based photoanode for photoelectrochemical water splitting

Anupma Thakur, Praveen Kumar, Sitaramanjaneya Mouli Thalluri, **Ravindra Kumar Sinha*** and Pooja Devi

Abstract: We herein demonstrate polypyrrole decorated micro-porous laboratory filter paper (PFP) as photoanode (PA) for efficient and stable water splitting. The straddling band position with water redox and the measured band gap of ~1.98 eV, make these PFP-PAs effective for water splitting reactions. The results manifest excellent photo-anodic PEC activity of these PFP-PAs, yielding a photocurrent density of ~9.5 mA/cm^2 (at 1.23 V vs. RHE) in a three-electrode configuration. The incident photon-to-current efficiency (IPCE) and applied bias photon-to-current efficiency (ABPE) was measured to be 43.19% and ~1%, respectively. Moreover, the robustness of these flexible PFP-PAs was visualized by the provided stability for more than ~160 min in alkaline conditions. The current study provides a proof-of-concept for the realization of a cost-effective, flexible, and efficient paper-based artificial catalyst (like a natural leaf) for solar-driven water splitting.

For details refer to https://doi.org/10.1016/j.ijhydene.2020.12.044

Mid-infrared supercontinuum generation in soft-glass specialty optical fibers: A review

Than Singh Saini and **Ravindra Kumar Sinha***

Abstract: Mid-infrared region (2–20 μm) is an important region of electromagnetic spectrum. Most of the molecules including CH_4, CO, NO, NO_2, C_6H_6, TNT, NH_3, SF_6, HNO_3, greenhouse gas radiation etc. have their fundamental vibrations in this domain. Thus, the mid-infrared region is known as 'molecular fingerprint region' and desirable to get the signature of these molecules. Tellurite and chalcogenide glasses have the advantages of a wide transparency window (up to ~20 μm) and very high optical nonlinearities, making them decent candidates for the mid-infrared supercontinuum generation. Photonic crystal fibers provide the wavelength-scale periodic arrangement of microstructure along their length. The core of the photonic crystal fibers and two-dimensional photonic crystal based on diverse geometries and the materials, permitting supercontinuum generation due to various nonlinear effects in an enormously broad spectral range. In this review paper, we report the recent developments in the field of mid-infrared supercontinuum generation in both the tellurite and chalcogenide glass state-of-the-art optical fibers. Particular attention is paid to the mid-infrared supercontinuum generation in the step-index, suspended-core, tapered, and photonic crystal fibers or microstructured optical fibers in tellurite and chalcogenide glasses. The coherence property of mid-infrared supercontinuum generation in all-normal dispersion engineered specialty optical fibers is also reviewed.

For details refer to https://doi.org/10.1016/j.pquantelec.2021.100342

Corresponding Author

BIOGRAPHY

PROF. RINKU SHARMA

Department of Applied Physics

Prof. Rinku Sharma is working in Department of Applied Physics since 2012 and is Head of the Department. Her past affiliations include Assistant Professor, Head of department of Applied Sciences and Director in Guru Tegh Bahadur Institute of Technology affiliated to GGSIP University. Prof. Rinku Sharma did her masters in Experimental Nuclear Physics in 1994 and Doctorate in Atomic, Molecular and LASER Physics from the Department of Physics and Astrophysics, University of Delhi in the year 1999. Prof. Rinku has experience of more than 26 years in the field of Education and Research. Her research interests mainly include collisions in Intense Short Laser Pulses, Atomic structure calculations for multi-electron atoms and ions using Configuration Interaction Technique, Electron impact Excitation Collision Strengths and Rate Coefficients having application in Astrophysics, Plasma Physics and Nuclear Fusion Reactors, THz Radiation Emission and linear and non-linear properties of low dimensional structures such as Quantum dots. Prof. Rinku Sharma has more than 70 Research Publications in International Journals and peer reviewed conference proceedings. She is a member of many professional societies.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Sharma** and A. Goyal, "Excitation energies, transition data of SXR, HXR, EUV and far-UV spectral lines with partition function, thermodynamic parameters and level population for W LXVII and W XLIX", *Journal of Electron Spectroscopy and Related Phenomena*, vol. 246, pp. 147009, 2021. Impact Factor: 1.957.

Excitation energies, transition data of SXR, HXR, EUV and far-UV spectral lines with partition function, thermodynamic parameters and level population for W LXVII and W XLIX

Rinku Sharma and Arun Goyal

Abstract: We present excitation energies, emitted photon wavelength during the transition from upper level to lower level, lifetimes, transitions rates and other transition parameters for first fine structure 200 levels of W LXVII and W XLIX by using Multi-Configuration Dirac-Fock (MCDF) scheme in our calculations. We endorse that contributions of relativistic effects QED and Breit corrections in energies of levels are significant. We have also shown that our results of energies from both, Flexible Atomic Code (FAC) and General Purpose Atomic Structure Package (GRASP) matches with each other and also with NIST and other experimentally measured and theoretically calculated results. We have predicted all soft x-ray (SXR), hard x-ray (HXR), extreme ultraviolet (EUV) and far UV transitions from ground state in W LXVII and W XLIX. Furthermore, we have also provided relative population for first five excited states, partition function and thermodynamic quantities for both W LXVII and W XLIX and studied their variations with temperature. Besides, detailed new atomic data and thermodynamic data of W LXVII and W XLIX which are not published so far in the literature have been reported and can be advantageous in the field of modelling of fusion and astrophysical plasmas, cell biology and microscopic imaging.

For details refer to https://doi.org/10.1016/j.elspec.2020.147009

BIOGRAPHY

PROF. RISHU CHAUJAR

Department of Applied Physics

Dr. Rishu Chaujar is presently working as a Professor in Department of Applied Physics and Associate Dean (Acad-PG), Delhi Technological University; and is involved in teaching the B.Tech, M.Sc. and M.Tech courses. Her doctoral research involves modeling, design and simulation of Sub-100nm gate engineered Grooved Gate/ Concave MOSFET for RFIC design and wireless applications, FinFETs, Tunnel FETs, Nanowires, HEMT structures modeling for high performance sensing, biomedical and wireless applications; and Solar Cell Modeling and Design. She has authored or co-authored more than 300 papers in various reputed international and national journals and conferences. She has supervised around 16 M.Tech/M.Sc. students and 7 Ph.D students. She has been awarded the PREMIER RESEARCH AWARD in 2018 and COMMENDABLE RESEARCH AWARD for excellence in research, Delhi Technological University, 2018, 2019, 2020 and 2021. She has also been awarded the Excellence in Teaching Award, Delhi Technological University in 2020. She has supervised several National and International research projects. She is a reviewer of various reputed international journals. She is a Fellow of IETE, a Life member of NASI and members of various international professional societies.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	06

1. B. Kumar and **R. Chaujar** , "Analog and RF Performance Evaluation of Junctionless Accumulation Mode (JAM) Gate Stack Gate All Around (GS-GAA) FinFET", *Silicon*, vol. 13, pp. 919–927, 2021. Impact Factor: 2.670.
2. M. P. Kashyap, S. Saini and **R. Chaujar**, "Analysis of a Novel Nanoscale Vacuum Channel TF-FinFET", *Silicon*, vol. 13, pp. 3257–3269, 2021. Impact Factor: 2.670.
3. M. P. Kashyap and **R. Chaujar**, "Gate Oxide Variability Analysis of a Novel 3 nm Truncated Fin–FinFET for High Circuitry Performance", *Silicon*, vol. 13, pp. 3249–3256, 2021. Impact Factor: 2.670.
4. S. Sharma and **R. Chaujar**, "Band gap and gate metal engineering of novel hetero-material InAs/GaAs-based JLTFET for improved wireless applications", *Journal of Materials Science: Materials in Electronics*, vol. 32, pp. 3155–3166, 2021. Impact Factor: 2.478.
5. S. Sharma and **R. Chaujar**, "Performance enhancement in a novel amalgamation of arsenide/antimonide tunneling interface with charge plasma junctionless-TFET", *AEU - International Journal of Electronics and Communications*, vol. 133, pp. 153669, 2021. Impact Factor: 3.183.
6. B. Kumar and **R. Chaujar**, "TCAD Temperature Analysis of Gate Stack Gate All Around (GS-GAA) FinFET for Improved RF and Wireless Performance", *Silicon*, vol. 13, pp. 3741–3753, 2021. Impact Factor: 2.670.

Analog and RF Performance Evaluation of Junctionless Accumulation Mode (JAM) Gate Stack Gate All Around (GS-GAA) FinFET

Bhavya Kumar and **Rishu Chaujar***

Abstract: This work presents the analog and RF performance evaluation of Junctionless Accumulation Mode (JAM) Gate Stack Gate All Around (GS-GAA) FinFET, and the results acquired have been compared with conventional FinFET and GAA FinFET. It has been observed that in comparison to conventional FinFET, leakage current (I_{off}) reduces by almost thirty times for the GS-GAA FinFET configuration. Thus, revamping the threshold voltage (V_{th}), switching ratio (I_{on}/I_{off}), and subthreshold slope (SS) of the proposed device. Also, major analog parameters like transconductance (g_m), transconductance generation factor (TGF) enhances considerably with early voltage (V_{EA}) and intrinsic gain (A_v) increased by over two times in magnitude for the GS-GAA FinFET configuration. Furthermore, several important RF parameters have been explored, and the outcome of the study is that the GS-GAA FinFET configuration shows superior RF performance. In GS-GAA FinFET configuration, the gain frequency product (GFP) and gain transconductance frequency product (GTFP) amplified by over two times in magnitude with minimal decrease in the cut-off frequency (f_T) and maximum oscillation frequency (f_{max}). Thus, the proposed GS-GAA FinFET device can be looked upon as an appealing option for high-frequency analog/RF applications.

For details refer to https://doi.org/10.1007/s12633-020-00910-7

Analysis of a Novel Nanoscale Vacuum Channel TF-FinFET

Mridul Prakash Kashyap, Sanmveg Saini and **Rishu Chaujar***

Abstract: Concerned work is solely dedicated to the optimized characteristics of Nanoscale vacuum channel TF (Truncated fin)-FinFET at gate length of 7 nm. NVCTF-FinFET has its own benefit, due to high immune to noise and temperature as compared to TF-FinFET. The working of device stood perfectly well in case of NVCTF-FinFET. When tested, we end up with 3 times less current variation w.r.t temperature, 3 times more efficiency, 10^4 times more amplifying power analysed at corresponding peak values. These results evident the performance enhancement of NVCTF-FinFET, if seen from analog point of view. When studied from the perspective of linearity for RFIC designs, we end up with enhancement in some figure of merits such as 3.5 times in 1-dB compression point, 4 times more IP3, 10^2 times in HD3 and around 10^5 times in IMD3 at corresponding peak values. As NVCTF-FinFET provided descent switching ratio and V_{th} at input voltage (<2 V), which could lead these transistors beyond Moore's law. These simulation difference ultimately made NVCTF-FinFET, a significant candidate to high speed and noise reduction System on chip (SOCs) operations in outer space.

For details refer to https://doi.org/10.1007/s12633-021-01103-6

Gate Oxide Variability Analysis of a Novel 3 nm Truncated Fin–FinFET for High Circuitry Performance

Mridul Prakash Kashyap and **Rishu Chaujar***

Abstract: In this work, we examined the analog and circuitry amplifying capacity of our novel 3 nm Truncated Fin Junctionless bulk FinFET (n-type) with two different oxide thicknesses at this small scale of gate length. Both oxide widths of high K-material HfO_2 have their own individual benefits, due to high gate controllability as compared to conventional FinFETs having SiO_2 as a gate oxide. The device works best with Tox = 1 nm in terms of power amplification. When tested with this width of gate oxide, we end up with increase of 59.18%, 7.22%

**Corresponding Author*

and 12.11 times at corresponding peak values of Unilateral power gain (G_u), IP3 and f_{max}. This actually evident the enhanced performance of TF-FinFET for A.C applications at this high range of frequency of the input signal. When device tested at Tox = 1 nm, we end up with the increase of 45%, 21.45%, 16% and decrease of 65% at the corresponding peak values of Intrinsic delay (t_i), Transconductance (g_m), Drain current (I_D) and OFF-state current (I_{OFF}). These results of simulation also showed the compatibility of TF-FinFET in terms of high-performance analog application. After these analyses, we can expect a strong potential for wide variety of applications to high-speed System on chip from this device.

For details refer to https://doi.org/10.1007/s12633-020-00734-5

Band gap and gate metal engineering of novel hetero-material InAs/GaAs-based JLTFET for improved wireless applications+

Samriti Sharma and **Rishu Chaujar***

Abstract: This paper investigates the reliability of a dual metal gate-hetero-material junctionless tunnel FET (DMG-HJLTFET), by using a novel combination of III–V compound semiconducting materials, InAs (lower bandgap) in the source region and GaAs (higher bandgap) in the channel and drain regions. We applied bandgap engineering and dual material gate engineering to improve the linearity metrics and distortion parameters by optimizing an appropriate lower work function tunnel gate toward the source and higher work function supplementary gate toward the drain and compared all the results with SMG (single metal gate)-HJLTFET and Si-JLTFET. The DMG-HJLTFET showed marked improvements in terms of I_{ON}, I_{ON}/I_{OFF}, SS, *g*m, gm3, VIP2, VIP3, and 1-dB compression point. The input power, IIP3 of DMG-HJLTFET, is 158% greater than SMG-HJLTFET and is 154.7% greater than Si-JLTFET. The distortion power, IMD3 of DMG-HJLTFET, is 171.8% and 20.5% lower than SMG-HJLTFET and Si-JLTFET, respectively, thereby making it suitable for low-power distortion-free wireless communication systems.

For details refer to https://doi.org/10.1007/s10854-020-05064-1

Performance enhancement in a novel amalgamation of arsenide/antimonide tunneling interface with charge plasma junctionless-TFET+

Samriti Sharma and **Rishu Chaujar***

Abstract: In this article, a novel combination of an arsenide/antimonide tunneling interface using binary (InAs) and ternary (AlGaSb) compound semiconducting materials and junctionless tunnel field effect transistor (JLFET) has been explored to induce a charge-plasma based tunable bandgap source/channel (S/C) interface. The hetero-material JLTFET (H-JLTFET) depicts superior performance than conventional homo-material Si JLTFET in terms of DC characteristics showing ~128 and ~1.27×10^8 times higher I_{ON} and I_{ON}/I_{OFF} along with ~10^{-6} times, ~50%, and 88% lower I_{OFF}, V_{th}, and SS. The superior performance is attributed to the conduction band local minimum induced at the channel yielding to narrower tunneling barrier width at an optimized Al-mole fraction (0.15) of AlGaSb. Furthermore, 77 times higher g_m of H-JLTFET led to 5×10^6 and 205 times higher device efficiency and f_T along with ~66% reduction in the parasitic capacitance making it favorable for high-speed switching applications as compared to Si JLTFET.

For details refer to https://doi.org/10.1016/j.aeue.2021.153669

**Corresponding Author*
+Eligible for Certificate only

TCAD Temperature Analysis of Gate Stack Gate All Around (GS-GAA) FinFET for Improved RF and Wireless Performance+

Bhavya Kumar and **Rishu Chaujar***

Abstract: In this article, we investigated the impact of temperature variation on DC, analog, RF, and wireless performance of Gate Stack Gate All Around (GS-GAA) FinFET using SILVACO Atlas 3D simulator. The GAA structure introduction enhances the switching ratio (I_{on}/I_{off}) by ~152.37% and reduces the subthreshold swing (SS) by ~6.5%. At gate voltage (V_{gs}) ~ 0.725 V, the GS-GAA FinFET device exhibits the ZTC (Zero-Temperature-Coefficient) bias point, i.e., the effect of temperature on drain current gets nullified. DC parameters such as leakage current (I_{off}), on current (I_{on}), SS, and threshold voltage (V_{th}) deteriorate with the rise in temperature. The enhancement in temperature degrades the RF and analog performance of the device by suppressing the parameters like transconductance (g_m), device efficiency (TGF), cut-off frequency (f_T), gain frequency product (GFP), gain-bandwidth product (GBP), etc. The device's wireless performance is analyzed using linearity and harmonic distortion parameters such as gm_3, gm_2, 1-dB compression point, IIP3, VIP3, VIP2, IMD3, HD3, and HD2, and it shows significant improvement as the temperature increases from 300 K to 500 K.

For details refer to https://doi.org/10.1007/s12633-021-01040-4

*Corresponding Author
+Eligible for Certificate only

BIOGRAPHY

DR. S. SHANKAR SUBRAMANIAN

Department of Applied Physics

Dr. S. Shankar Subramanian, has completed his Ph.D. from Department of Applied Physics, Delhi Technological University in 2020. He has published more than 20 publications in reputed journals and attended several national and international conferences.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **S. Shankar**, O. P. Thakur and M. Jayasimhadri, "Significant improvements in dielectric, impedance, multiferroic and magnetoelectric properties of $(1-x)Co_{0.5}Ni_{0.5}Fe_2O_4-xBaTiO_3$ bulk composites (x = 0, 0.10 and 0.20)", *Journal of Materials Science: Materials in Electronics*, vol. 32, pp. 16706–16714, 2021. Impact Factor: 2.478.

2. **S. Shankar**, O. P. Thakur and M. Jayasimhadri, "Strong enhancement in structural, dielectric, impedance and magnetoelectric properties of $NdMnO_3$ - $BaTiO_3$ multiferroic composites", *Materials Chemistry and Physics*, vol. 270, pp. 124856, 2021. Impact Factor: 4.094.

Significant improvements in dielectric, impedance, multiferroic and magnetoelectric properties of $(1-x)Co_{0.5}Ni_{0.5}Fe_2O_4-xBaTiO_3$ bulk composites ($x = 0$, 0.10 and 0.20)

S. Shankar, O. P. Thakur and M. Jayasimhadri

Abstract: The present article describes about the citrate-gel synthesis and luminescent properties of Dy^{3+} activated and Dy^{3+}/Eu^{3+} bi-activated calcium bismuth vanadate (CBV) phosphor. Structural and morphological characterizations indicate the phase purity, size and shape of the as-prepared CBV phosphors. The emission and energy transfer properties in Dy^{3+} doped and Dy^{3+}/Eu^{3+} co-doped CBV phosphors have been studied extensively. In this regard, Dy^{3+}/Eu^{3+} co-doped CBV phosphors were pumped by near-ultraviolet (n-UV) light (387 nm) and the maximum energy transfer efficiency value of 87.5% is observed. Dexter and Reisfeld's approximation applied to the emission spectra specifies electric dipolar-dipolar interaction to be accountable for Dy^{3+} to Eu^{3+} energy transfer. In CBV: Dy^{3+} phosphors, codoping with Eu^{3+} ions facilitate the red component that ensues warm white light emission under n-UV/blue light excitation. Moreover, Dy^{3+}/Eu^{3+} co-doped CBV phosphor exhibits flexible color tunability with increasing Eu^{3+} concentration under different excitations. The significant accomplishments like warm white light emission and controllable spectral composition in Dy^{3+}/Eu^{3+} co-doped CBV phosphor by altering the excitation energy and co-dopant (Eu^{3+}) concentration designate it as a potential candidate in the domain of lighting and display devices.

For details refer to https://doi.org/10.1007/s10854-021-06227-4

Strong enhancement in structural, dielectric, impedance and magnetoelectric properties of $NdMnO_3$ - $BaTiO_3$ multiferroic composites

S. Shankar, O. P. Thakur and M. Jayasimhadri

Abstract: Multiferroic composites are advantageous from technological perspective because of their flexible electrical and magnetic properties. The multiferroic composites of $(1-x)NdMnO_3 - (x)BaTiO_3$ ($x = 0$, 0.1 and 0.2) were synthesized via solid state reaction method. The structural analysis from XRD studies of $(1-x)NdMnO_3$-$(x)BaTiO_3$ exhibits distinct peaks of orthorhombic $NdMnO_3$ (NMO) and tetragonal $BaTiO_3$ (BT) phases with absence of any other impurity phases in the composites. The frequency variation of dielectric measurements reveals step-like decrease and confirm Maxwell-Wagner Polarization associated with improved conducting nature in NMO-BT composites. The NMO-20BT composite exhibited giant dielectric behavior owing from lattice stability and hopping mechanism. The impedance measurements confirm improved resistivity in NMO-BT composites and confirm thermally activated non-Debye type conduction behavior in NMO-BT in them. The occurrence of saturated ferroelectric polarization composites along with enhanced remnant magnetization and improved magnetoelectric coupling in NMO-20BT composite due to lattice stability establishes multiferroism in NMO-BT composites.

For details refer to https://doi.org/10.1016/j.matchemphys.2021.124856

BIOGRAPHY

MS. SAMRITI SHARMA

Department of Applied Physics

Ms. Samriti Sharma is a research scholar in Applied Physics Department of Delhi Technological University. New Delhi, India. She did her M.Sc (Physics) in 2013 from Guru Nanak Dev University, Punjab. Her research area involves modeling, design, and simulation of â…¢-â…¤compound semiconducting hetero-material based tunnelling interfaced Junction-less Tunnel FET device for Analog/RF and wireless applications. She has published research papers in international journals (Springer, Elsevier etc.) and conference proceedings.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **S. Sharma** and R. Chaujar, "Band gap and gate metal engineering of novel hetero-material InAs/GaAs-based JLTFET for improved wireless applications", *Journal of Materials Science: Materials in Electronics*, vol. 32, pp. 3155–3166, 2021. Impact Factor: 2.478.

2. **S. Sharma** and R. Chaujar, "Performance enhancement in a novel amalgamation of arsenide/antimonide tunneling interface with charge plasma junctionless-TFET", *AEU - International Journal of Electronics and Communications*, vol. 133, pp. 153669, 2021. Impact Factor: 3.183.

Band gap and gate metal engineering of novel hetero-material InAs/GaAs-based JLTFET for improved wireless applications

Samriti Sharma and Rishu Chaujar

Abstract: This paper investigates the reliability of a dual metal gate-hetero-material junctionless tunnel FET (DMG-HJLTFET), by using a novel combination of III–V compound semiconducting materials, InAs (lower bandgap) in the source region and GaAs (higher bandgap) in the channel and drain regions. We applied bandgap engineering and dual material gate engineering to improve the linearity metrics and distortion parameters by optimizing an appropriate lower work function tunnel gate toward the source and higher work function supplementary gate toward the drain and compared all the results with SMG (single metal gate)-HJLTFET and Si-JLTFET. The DMG-HJLTFET showed marked improvements in terms of I_{ON}, I_{ON}/I_{OFF}, SS, *g*m, *g*m3, VIP2, VIP3, and 1-dB compression point. The input power, IIP3 of DMG-HJLTFET, is 158% greater than SMG-HJLTFET and is 154.7% greater than Si-JLTFET. The distortion power, IMD3 of DMG-HJLTFET, is 171.8% and 20.5% lower than SMG-HJLTFET and Si-JLTFET, respectively, thereby making it suitable for low-power distortion-free wireless communication systems.

For details refer to https://doi.org/10.1007/s10854-020-05064-1

Performance enhancement in a novel amalgamation of arsenide/antimonide tunneling interface with charge plasma junctionless-TFET

Samriti Sharma and Rishu Chaujar

Abstract: In this article, a novel combination of an arsenide/antimonide tunneling interface using binary (InAs) and ternary (AlGaSb) compound semiconducting materials and junctionless tunnel field effect transistor (JLFET) has been explored to induce a charge-plasma based tunable bandgap source/channel (S/C) interface. The hetero-material JLTFET (H-JLTFET) depicts superior performance than conventional homo-material Si JLTFET in terms of DC characteristics showing ~128 and ~1.27×10^8 times higher I_{ON} and I_{ON}/I_{OFF} along with ~10^{-6} times, ~50%, and 88% lower I_{OFF}, V_{th}, and SS. The superior performance is attributed to the conduction band local minimum induced at the channel yielding to narrower tunneling barrier width at an optimized Al-mole fraction (0.15) of AlGaSb. Furthermore, 77 times higher g_m of H-JLTFET led to 5×10^6 and 205 times higher device efficiency and f_T along with ~66% reduction in the parasitic capacitance making it favorable for high-speed switching applications as compared to Si JLTFET.

For details refer to https://doi.org/10.1016/j.aeue.2021.153669

BIOGRAPHY

DR. SUMANDEEP KAUR

Department of Applied Physics

Dr. Sumandeep Kaur is CSIR-Research Associate working under the mentorship of Prof. A.S. Rao in Department of Applied Physics, Delhi Technological University, Delhi, India. She is working on Synthesis and Characterization of Up-Conversion Nano-Phosphors for Bio-Photonic Applications in Materials and Atmospheric Science (MASR) laboratory since 2020. She have been awarded with doctorate degree on the work entitled Structural and Luminescent properties of Rare Earth activated Calcium Aluminozincate phosphor for Solid State lighting applications in 2019. She have been awarded with three Research Excellence Award in the year 2018, 2019 and 2020. During her research tenure, she has presented her research work in national and international conferences and received two Best Poster Awards in the year 2017 and 2018. She has 33 publications in SCI indexed high impact journal of international repute. She has completed M.Sc. (Physics) and B.Sc. (H) Physics with first division from University of Delhi in 2011 and 2009, respectively. She had qualified NET in 2014 and GATE in 2013.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Kaur**, V. Katyal, V. Plakkot, N. Deopa, A. Prasad and A. S. Rao, "Radiative emission analysis of Sm^{3+} ions doped borosilicate glasses for visible orange photonic devices", *Journal of Non-Crystalline Solids*, vol. 572, pp. 121106, 2021. Impact Factor: 3.531.

Radiative emission analysis of Sm^{3+} ions doped borosilicate glasses for visible orange photonic devices

Sumandeep Kaur, Vaibhav Katyal, Vaishakh Plakkot, Nisha Deopa, Aman Prasad and A. S. Rao

Abstract: Sm^{3+} ions doped borosilicate glasses with variable concentration of Sm^{3+} ions (0.5 to 2.5 mol%) in steps of 0.5 mol% have been synthesized by using melt quench method. The X-ray diffraction (XRD), Fourier Transform Infrared (FT-IR) measurements were done for structure analysis. Broad hump in XRD determine the amorphous nature of the as prepared glass. The absorption spectra observed in UV-vis-NIR range and band gap has been determined to be in 3.011-3.020 eV range for all the prepared glasses. The photoluminescent (PL) excitation reveals 402 nm intense excitation peak and strong emission at around 600 nm as observed from PL spectral measurements. The colorimetric properties were studied to realize the utility of the glasses reported in this article for orange colour photonic device applications. The chromaticity diagram reveals orange emission with 0.594, 0.404 CIE coordinates. The PL decay spectral studies were utilised to acknowledge the type of energy transfer mechanism and illustrated dipole-dipole interaction between Sm^{3+} ions.

For details refer to https://doi.org/10.1016/j.jnoncrysol.2021.121106

BIOGRAPHY

PROF. SURESH C. SHARMA

Department of Applied Physics

Dr. Suresh C. Sharma has been working as Professor at Department of Applied Physics, Delhi Technological University (DTU), Delhi, India and also has administrative responsibility of Dean (Acad-PG). He was awarded the Young Scientist project as a Principal Investigator by the Dept. of Science and Technology (DST), Govt. of India for 2years (1997-99). He was a Monbusho Postdoctoral Fellow under Japanese Govt. fellowship, Deptt. of Physics, Faculty of Science, Ehime University, Matsuyama, Japan from October 1997 to March 1999. In addition, he has been a JSPS (Invitation) Postdoctoral Fellow and visiting researcher from May 2004 to October 2005 with Centre for Atomic and Molecular Technologies (CAMT), Osaka University, Japan. Also, he was awarded Senior Research Associate under the Scientist's Pool Scheme by CSIR, Govt. of India for 3 years (1999-2002). He established Plasma and Nano-simulation research Lab. He has guided 14 Ph.D. students and several M.Tech & B.Tech students. He has published 186 research papers in Journals of International & National repute and Proceedings of International & National Conferences. He was awarded commendable Research Award for Excellence in Research by DTU for 4 consecutive years i.e., March 2018; March 2019; March 2020 and Feb 5, 2021. He is a Member of the American Physical Society (APS), USA; Sr. Member of the Institute of Electrical and Electronics Engineers (IEEE), USA and many more.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. P. Rao, S. Kumar, R. Raman, S. Vinayak and **S. C. Sharma**, "Amorphous to crystalline transformation of indium sulphide powders on thermal treatment: Studies by x-ray photoelectron spectroscopy and Raman spectroscopy", *Journal of Electron Spectroscopy and Related Phenomena*, vol. 252, pp. 147119, 2021. Impact Factor: 1.957.
2. N. Gupta, R. Gupta and **S. C. Sharma**, "Investigations on the effect of process parameters on the growth of vertically oriented graphene sheet in plasma-enhanced chemical vapour deposition system", *Contributions to Plasma Physics*, vol. 61, no. 9, pp. e202100069, 2021. Impact Factor: 1.563.
3. J. Sharma, **S. C. Sharma** and A. Gahlot, "Kinetic theory of effect of dust charge fluctuations on the parametric decay of lower hybrid wave instability by relativistic runaway electrons in tokamak", *Physics of Plasmas*, vol. 28, no. 4, pp. 043701, 2021. Impact Factor: 2.023.

Amorphous to crystalline transformation of indium sulphide powders on thermal treatment: Studies by x-ray photoelectron spectroscopy and Raman spectroscopy

Pritty Rao, Sanjiv Kumar, R. Raman, Seema Vinayak and **Suresh C. Sharma***

Abstract: Amorphous, partially crystalline and polycrystalline indium sulphide (In_2S_3) obtained on the heat treatment of wet-chemically synthesized In_2S_3 powders, at 373, 523 and 673 K temperatures respectively in argon atmosphere have been examined by X-ray photoelectron spectroscopy (XPS) and Raman spectroscopy. The binding energies of In(3d) and S(2p) electrons decrease on the transformation of the compound from its amorphous to polycrystalline (β-In_2S_3) state. The co-existence of amorphous and crystalline phases in the

partially crystalline material is conclusively demonstrated by the occurrence of as many peaks in the In(3d) electron spectrum. The XPS measurements also indicate the prevalence of β-In_2S_3 in subtle amounts in the amorphous In_2S_3 powder and a certain content of amorphous In_2S_3 in the material heat treated at 673 K. The higher binding energies of In $3d_{5/2}$ electrons (446 eV) and S $2p_{3/2}$ electrons (163.3 eV) in amorphous In_2S_3 can be attributed to the lack of extra-atomic relaxation. The relative shifts of the binding energies suggest that the bonding is more ionic in the crystalline phase. The polycrystalline material has Raman spectrum typical of β-In_2S_3 indicating a crystal ordering initially with the formation of InS_4 tetrahedra and subsequently with, InS_6 octahedra as the temperature of the treatment is increased to 673 K. The Raman spectrum, too, points to the prevalence of a certain amorphicity in the compound.

For details refer to https://doi.org/10.1016/j.elspec.2021.147119

Investigations on the effect of process parameters on the growth of vertically oriented graphene sheet in plasma-enhanced chemical vapour deposition system

Neha Gupta, Ravi Gupta and **Suresh C. Sharma***

Abstract: A multistage numerical model comprising the plasma kinetics and surface deposition sub-models is developed to study the influence of process parameters, namely, total gas pressure and input plasma power on the plasma chemistry and growth characteristics of vertically oriented graphene sheets (VOGS) grown in the plasma-enhanced chemical vapour deposition system containing the $Ar+H_2+C_2H_2$ reactive gas mixture. The spectral and spatial distributions of temperature and number densities, respectively, of plasma species, that is, charged and neutral species in the plasma reactor, are examined using inductively coupled plasma module of COMSOL Multiphysics 5.2 modelling suite. The numerical data from the computational plasma model are fed as the input parameters for the surface deposition model, and from the simulation results, it is found that there is a significant drop in the densities of various plasma species as one goes from the bulk plasma region to the substrate surface. The significant loss of the energetic electrons is observed in the plasma region at high pressure (for constant input power) and low input power (for constant gas pressure). At low pressure, the carbon species generate at higher rates on the catalyst nanoislands surface, thus enhancing the growth and surface density of VOGS. However, it is found that VOGS growth rate increases when input plasma power is raised from 100 to 300 W and decreases with further increase in the plasma power. A good comparison of the model outcomes with the available experimental results confirms the adequacy of the present model.

For details refer to https://doi.org/10.1002/ctpp.202100069

Kinetic theory of effect of dust charge fluctuations on the parametric decay of lower hybrid wave instability by relativistic runaway electrons in tokamak

Jyotsna Sharma, **Suresh C. Sharma*** and Ajay Gahlot

Abstract: Dust charge fluctuation effect on the parametric decay of lower hybrid wave instability by relativistic runaway electrons is studied in a tokamak using kinetic treatment. Parametric upconversion of lower hybrid pump waves into relativistic runaway electron mode and upper sideband mode is described. A ponderomotive force is exerted on the runaway electrons by lower hybrid pump wave possessing large amplitude and upper sideband wave, which drives the runaway electron mode. The coupling of the oscillatory velocity of electrons with density perturbations produces nonlinear density perturbations on the upper sideband frequency. As a result, runaway generation is enhanced by a lower hybrid wave and the growth rate of the instability is measured as the square of the amplitude of the pump wave. Moreover, the presence of dust charge fluctuations and their number density in the tokamak have an appreciable effect on the growth rate of lower hybrid wave instabilities, which in turn affects the actual performance of the ITER due to the potential safety and operational issues.

For details refer to https://doi.org/10.1063/5.0041282

Corresponding Author

BIOGRAPHY

MR. VIJAY SINGH MEENA

Department of Applied Physics

Mr. Vijay Singh Meena did his M. Sc. Physics (Microwave Electronics) from University of Rajasthan, Jaipur in 2004. He joined Solid State Physics Laboratory, DRDO, Delhi on Feb 21, 2005 and presently he has the position of Technical Officer in this organization. He also received another degree of M. Sc. Physics (Solid state Physics) in 2007 from MP Bhoj Open University, Bhopal during this tenure. At SSPL, he is attached with the IR device fabrication division which is involved in the development of HgCdTe based infrared devices. His research area is study of various thin films (passivation, metallization, growth of indium bumps and Anti reflection coating) used in IR detector fabrication. During his research career he has been graced by various awards (DRTC and Technology Group Award) for IR detector technology development. Also, he is co-author of many research papers of IR detector technology. He had participated in various training courses and conferences. Currently he is pursuing his PhD degree (part-time: started from 2017) from Department of Applied Physics, DTU, Delhi under the supervision of Dr. Mohan Singh Mehata (Assistant Professor). His research-topic is Investigation of thin films properties for HgCdTe based infrared detector. He has published a research paper having the detail (Title: Investigation of grown ZnS film on HgCdTe substrate for passivation of infrared photodetectors, Journal detail: Thin Solid Films 731 (2021) 138751, Impact factor: 2.183) in Year-2021.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **V. S. Meena** and M. S. Mehata, "Investigation of grown ZnS film on HgCdTe substrate for passivation of infrared photodetector", *Thin Solid Films*, vol. 731, pp. 138751, 2021. Impact Factor: 2.183.

Investigation of grown ZnS film on HgCdTe substrate for passivation of infrared photodetector

Vijay Singh Meena and Mohan Singh Mehata

Abstract: Zinc sulfide (ZnS) thin films were developed on the mercury cadmium telluride (HgCdTe) substrate using the thermal evaporation technique and investigated with X-ray diffraction, energy dispersive analysis of X-rays, atomic force microscopy (AFM) and capacitance-voltage (C-V). The obtained results confirm that the films have a cubic zinc-blend structure with (111) preferred orientation and nearly stoichiometric composition. The AFM measurement reveals that the film is uniform, densely packed and has a smooth surface or very low roughness. The C-V measurement of a ZnS/HgCdTe based metal-insulator-semiconductor device provides the utility of ZnS thin film as a passivation layer for the HgCdTe substrate. The evaluated fixed-charge density, slow state density and fast state density of the device are 4.98×10^{10} cm^{-2}, 4.22×10^{10} cm^{-2} and 5.32×10^{11} cm^{-2} eV^{-1}, respectively. Thus, the grown ZnS thin film could be used as a suitable passivation agent in HgCdTe-based infrared detector fabrication.

For details refer to https://doi.org/10.1016/j.tsf.2021.138751

BIOGRAPHY

DR. VINEET SHARMA

Department of Applied Physics

Dr. Vineet Sharma has completed Ph.D. from Department of Applied Physics, Delhi Technological University (DTU), Delhi, India. He did his M.Sc. in Condensed Matter Physics from Deenbandhu Chhotu Ram University of Science and Technology, Murthal, Sonipat, Haryana, India and Bachelor of Science in Physics from Keshav Mahavidyalaya Delhi University, Delhi, India. He started his research in Nanotechnology during his master thesis work. After the completion of his masterâ€™s, he worked as a Junior Research Fellow in SERB-DST sponsored project in Laser-spectroscopy Lab, Department of Applied Physics, DTU Delhi, India. He qualified JEST and GATE exams in Physics. Currently, he has published four (4) research papers in internationally reputed SCI/SCIE journals and also one (1) patent has been published.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **V. Sharma** and M. S. Mehata, "Rapid optical sensor for recognition of explosive 2,4,6-TNP traces in water through fluorescent ZnSe quantum dots", *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, vol. 260, pp. 119937, 2021. Impact Factor: 4098.
2. **V. Sharma** and M. S. Mehata, "Synthesis of photoactivated highly fluorescent Mn^{2+}-doped ZnSe quantum dots as effective lead sensor in drinking water", *Materials Research Bulletin*, vol. 134, pp. 111121, 2021. Impact Factor: 4.641.

Rapid optical sensor for recognition of explosive 2,4,6-TNP traces in water through fluorescent ZnSe quantum dots

Vineet Sharma and Mohan Singh Mehata

Abstract: In this report, blue fluorescent zinc selenide quantum dots (ZnSe QDs) were synthesized using 3-mercaptopropionic acid through a direct aqueous route at a lower temperature of 70 °C. The photoluminescence (PL) characteristics of ZnSe QDs have been employed to recognize nitroaromatic compounds, i.e., traces of 2,4,6-TNP (picric acid) in water. The sensing of nitroaromatic compounds was performed via fluorescence techniques. The PL band of ZnSe QDs observed at 490 nm is selectively quenched with an increasing concentration of picric acid in DI water and river water. For the proposed sensing probe, the Stern-Volmer (S-V) plot shows linearity over the range of 2.0 µM–0.25 mM with the detection limit of 12.4×10^{-6} M without any interference effect of other nitroaromatic compounds. The plausible mechanism of PL quenching is considered as the inner filter effect, based on absorption, PL and PL lifetimes.

For details refer to https://doi.org/10.1016/j.saa.2021.119937

Synthesis of photoactivated highly fluorescent Mn^{2+}-doped ZnSe quantum dots as effective lead sensor in drinking water

Vineet Sharma and Mohan Singh Mehata

Abstract: In this work, manganese doped zinc selenide (Mn@ZnSe) quantum dots (QDs) were prepared via a direct aqueous route. The X-ray diffraction pattern reveals the crystalline cubic zinc blende structure of QDs. With Mn^{2+} doping, a new high-intensity orange photoluminescence (PL) band centered at around 580 nm obtained owing to $^4T_1 \rightarrow {}^6A_1$ of Mn^{2+} ion transitions (for orange QLEDs). The freshly prepared water-dispersible QDs were treated under the UV-radiation for the photoactivation process, which enhanced the PL quantum efficiency from 5 % to 17.3 %. The response of QDs towards different metals was recorded in terms of absorption, PL and PL-lifetime. Among the numerous metals, Pb^{2+} shows strong PL quenching and the corresponding Stern-Volmer plot showed linearity with the detection limits of 29.8×10^{-6} M in ultrapure water. The developed Mn@ZnSe QDs could act as a non-toxic sensor to sense hazardous lead in drinking water.

For details refer to https://doi.org/10.1016/j.materresbull.2020.111121

BIOGRAPHY

DR. VINOD SINGH

Department of Applied Physics

Dr. Vinod Singh is currently Associate Director of Human Resource Development Centre (HRDC) and Associate Professor in the Department of Applied Physics, Delhi Technological University, Delhi. He joined DCE as a Lecturer in Physics in 2003 at the age of 23 years and has the teaching, research and academic administrative experience of more than 18 years. He received his Ph.D. degree from Indian Institute of Technology (IIT) Delhi. He was honored with the University Gold Medal in both the B.Sc. and M.Sc. (Physics) and also honored with Bhamashah Award (Gold Medal), presented by Sir V.S. Naipaul, Nobel Laureate. He is an active researcher currently supervising eight Ph.D. scholars and has published a patent (granted) and several research papers in international peer reviewed journals of high repute including Nature publishing group. His broad areas of research include material science, sensors, 2D materials, functional nanomaterials and their size dependent properties and applications. He was honored with best presentation award by Bharat Ratan Prof. C. N. R. Rao in Nano India 2017 conference. He has been awarded the Research Excellence Award for excellence in research in two consecutive years, 2018 and 2019 by DTU. He has delivered more than 10 invited talks in international and national academic events. He is the Principal Investigator of the two sponsored research projects. He was the convener of a reputed International Conference on Atomic, Molecular, Optical and Nano Physics with Applications (CAMNP-2019) and is the editor of Springerâ€™s proceedings in physics for CAMNP-2019. He is the editorial board member of Frontiers in Sensors.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. S. Sharma, S. Saini, M. Khangembam and **V. Singh**, "Nanomaterials-Based Biosensors for COVID-19 Detection—A Review, *IEEE Sensors Journal*, vol. 21, no. 5, pp. 5598 – 5611, 2021. Impact Factor: 3.301.

Nanomaterials-Based Biosensors for COVID-19 Detection—A Review

Sakshi Sharma, Sonakshi Saini, Maya Khangembam and **Vinod Singh***

Abstract: This review paper discusses the properties of nanomaterials, namely graphene, molybdenum disulfide, carbon nanotubes, and quantum dots for unique sensing applications. Based on the specific analyte to be detected and the functionalization techniques that are employed, some noteworthy sensors that have been developed are discussed. Further, biocompatible sensors fabricated from these materials capable of detecting specific chemical compounds are also highlighted for COVID-19 detection purposes, which can aid in efficient and reliable sensing as well as timely diagnosis.

For details refer to https://doi.org/10.1109/JSEN.2020.3036748

**Corresponding Author*

BIOGRAPHY

DR. YOGITA KALRA

Department of Applied Physics

Dr. Yogita Kalra is working as an Assistant Professor with the Department of Applied Physics, Delhi Technological University (DTU), Delhi since 2010. Prior to joining DTU, she has worked as lecturer in Gargi College, University of Delhi in 2006-2007 and Bharti Vidyapeeth College of Engineering, Guru Gobind Singh Indraprastha University from 2008 to 2010. She did her M.Sc. in Physics from the Indian Institute of Technology (IIT), Delhi, India in 2001. In 2007, she received her Ph.D. degree from the Department of Applied Physics, University of Delhi, India. Her research interests mainly include design of all optical integrated devices, optical nanoantennas and nanophotonic devices based on photonic crystals and meta-materials. She is the coordinator of the Technology Information, Forecasting and Assessment Council (TIFAC)–Centre of Relevance and Excellence (CORE) in Fiber Optics and Optical Communication, DTU under Mission Reach program of Technology Vision 2020.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. R. Ranga, **Y. Kalra** and K. Kishor, "Design of hourglass nanoantenna for magnetic field enhancement", *Optics Communications*, vol. 481, pp. 126511, 2021. Impact Factor: 2.310.

Design of hourglass nanoantenna for magnetic field enhancement

Ritika Ranga, **Yogita Kalra*** and Kamal Kishor

Abstract: In this paper we report a novel design of hourglass nanoantenna for the enhancement of magnetic field in the near infrared region. The designed hourglass nanoantenna has been thoroughly analysed by varying various geometrical parameters to find their effect on magnetics field enhancement. Also, different materials have been considered for the nanoantenna, to investigate the significance of the choice of the material effect on magnetic field enhancement. The proposed structure can prove to be a good alternative for the enhancement of magnetic field as compared to the various paramagnetic and ferromagnetic materials, having weak magnetic properties in the optical regime.

For details refer to https://doi.org/10.1016/j.optcom.2020.126511

**Corresponding Author*

BIOGRAPHY

DR. ANCHITA KALSI

Department of Biotechnology

Dr. Anchita Kalsi has been keenly interested in environmental biotechnology, exploring potential of microbes for various applications. Her doctoral research focuses on bioremediation of explosive contaminated soil and sediments using eco-friendly methods for sustainable remediation solutions.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **A. Kalsi**, S. M. Celin, P. Bhanot, S. Sahai and J. G. Sharma, "A novel egg shell-based bio formulation for remediation of RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) contaminated soil", *Journal of Hazardous Materials*, vol. 401, pp. 123346, 2021. Impact Factor: 10.588.
2. **A. Kalsi**, S. M. Celina, S. Sharma, S. Sahai and J. G. Sharma, "Bioaugmentation for remediation of octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) contaminated soil using a clay based bioformulation", *Journal of Hazardous Materials*, vol. 420, pp. 126575, 2021. Impact Factor: 10.588.

A novel egg shell-based bio formulation for remediation of RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) contaminated soil

Anchita Kalsi, S. Mary Celin, Pallvi Bhanot, Sandeep Sahai and Jai Gopal Sharma

Abstract: Environmental contamination by secondary explosive has been posing threat to human health and the ecosystem. We investigated the potential of a novel bioformulation developed from poultry waste for the bioremediation of hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) contaminated soils. Eggshells and additives immobilized with an indigenous explosive degrading microbe *Janibacter cremeus* were utilized for the development of the wettable powder bioformulation. Treatments carried out under unsaturated and saturated soil conditions resulted in 62 and 73 % removal of RDX respectively in 35 days meeting the soil clean up goals. The saturated treatment sets exhibited better microbial growth during the study in terms of live cell count and total enzyme activity. The bacteria, *J. cremeus* was observed to exhibit significant release of nitrite under both unsaturated as well as saturated conditions. Mass spectrometric studies showed that, both the conditions lead to the formation of nitroso-derivatives of RDX. But under saturated condition, an intermediate, 5-hydroxy-4-nitro-2,4-diazapentanal was observed which is a precursor to 4-nitro-2,4-diazabuatnal ultimately leading to mineralization. An accessible bio resource from poultry waste when used as a carrier for explosive degrading microbe has proven effective for *in situ* remediation of explosive contaminated soils.

For details refer to https://doi.org/10.1016/j.jhazmat.2020.123346

Bioaugmentation for remediation of octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) contaminated soil using a clay based bioformulation

Anchita Kalsi, S. Mary Celina, Satyawati Sharma, Sandeep Sahai and Jai Gopal Sharma

Abstract: Bioaugmentation is an important remediation strategy for hazardous organic compounds. A microcosm study was conducted to evaluate the remediation of soils contaminated with hazardous high explosive, Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) using an eco-friendly bioformulation. Janibacter cremeus, an enriched indigenous soil bacterium isolated from the explosive contaminated site was immobilized in a mixture of calcite and cocopeat for bioaugmentation. The developed bioformulation showed a consistent viability for 150 days, at 4 °C storage conditions. HMX at field concentrations was degraded in microcosms for 35 days under unsaturated (aerobic) and saturated (anoxic) moisture conditions. Negligible degradation was observed under unsaturated moisture conditions, whereas, saturated conditions led to substantial decrease in HMX. Mass spectrometric (MS) analysis revealed the formation of nitroso derivatives of HMX during the anoxic degradation. Also, observed was the presence of 5-hydroxy-4-nitro-2,4-diazapentanal, a precursor of 4- nitro-2,4-diazabutanal, which eventually could be mineralized. An inexpensive and natural carrier when chosen for immobilization of explosive degrading microbes was found to be effective in the in situ remediation of explosive.

For details refer to https://doi.org/10.1016/j.jhazmat.2021.126575

BIOGRAPHY

PROF. BANSI DHAR MALHOTRA

Department of Biotechnology

Dr. Bansi D. Malhotra received the Ph.D. degree from the University of Delhi, New Delhi, in 1980. He is currently a SERB Distinguished Fellow (Government of India) with the Department of Biotechnology, Delhi Technological University, New Delhi, India. He has published more than 300 articles in refereed international journals, has filed 12 patents, and has recently co-authored textbooks. His current research activities include biosensors, bio-fuel cells, conducting polymers, elf-assembled monolayers, nano-biotechnology, biomedical engineering, and biomolecular electronics. He is a Fellow of the Indian National Science Academy and the National Academy of Sciences, India. He is also an Academician of the Asia Pacific Academy of Materials. He was a recipient of the National Research Development Corporation Award 2005 for invention on blood glucose biochemical analyzer.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. U. Saha, K. Todi and **B. D. Malhotra**, "Emerging DNA-based multifunctional nano-biomaterials towards electrochemical sensing applications", *Nanoscale*, vol. 13, no. 23, pp. 10305-10319, 2021. Impact Factor: 7.790.
2. S. Kumar, N. Gupta and **B. D. Malhotra**, "Ultrasensitive biosensing platform based on yttria doped zirconia-reduced graphene oxide nanocomposite for detection of salivary oral cancer biomarker", *Bioelectrochemistry*, vol. 140, pp. 107799, 2021. Impact Factor: 5.373.

Emerging DNA-based multifunctional nano-biomaterials towards electrochemical sensing applications

Udiptya Saha, Keshav Todi and **Bansi D. Malhotra***

Abstract: DNA is known to be ubiquitous in nature as it is the controlling unit for genetic information storage in most living organisms. Lately, there has been a surge in studies relating to the use of DNA as a biomaterial for various biomedical applications such as biosensing, therapeutics, and drug delivery. The role of DNA as a bioreceptor in biosensors has been known for a long time. DNA-based biosensors are gradually evolving into highly sophisticated and sensitive molecular devices. The current realization of DNA-based biosensors embraces the unique structural and functional properties of DNA in the form of a biopolymer. The interesting properties of DNA, such as self-assembly, programmability, catalytic activity, dynamic behavior, and precise molecular recognition, have led to the emergence of innovative DNA assembly based electrochemical biosensors. This review article aims to cover the recent progress in the field of DNA-based electrochemical (EC) biosensors. It commences with an introduction to electrochemical biosensors and elucidates the advantages of integrating DNA-based materials into them. Besides this, we discuss the principles of EC biosensors based on different types of DNA-based materials. The article concludes by highlighting the outlook and importance of this interesting field for biomedical developments.

For details refer to https://doi.org/10.1039/D1NR02409D

Ultrasensitive biosensing platform based on yttria doped zirconia-reduced graphene oxide nanocomposite for detection of salivary oral cancer biomarker

Suveen Kumar, Niharika Gupta and **Bansi D. Malhotra***

Abstract: Herein, we report results of the studies relating to the fabrication of yttria-doped zirconia-reduced graphene oxide nanocomposite (nYZR) based biosensing platform for detection of salivary CYFRA-21-1 biomarker. The nYZR nanocomposite was hydrothermally synthesized and amine-functionalized using 3-aminopropyl triethoxysilane (APTES). This functionalized nanocomposite (APTES/nYZR) was electrophoretically deposited (45 V; 3 min) onto pre-hydrolyzed indium tin oxide (ITO) coated glass substrate (APTES/nYZR/ITO) followed by biofunctionalization via covalent immobilization of the anti-CYFRA-21-1 antibodies (anti-CYFRA-21-1/APTES/nYZR/ITO). The synthesized nanomaterial and the fabricated electrodes were characterized to investigate crystal structure, morphology and electrochemical properties via X-ray diffraction, Fourier transform infrared spectroscopy, scanning electron microscopy, transmission electron microscopy, cyclic voltammetry, differential pulse voltammetry and electrochemical impedance spectroscopy. The fabricated biosensing electrode (BSA/anti-CYFRA-21-1/APTES/nYZR/ITO) has an operating shelf life of 56 days and can be used to detect salivary CYFRA-21-1 biomarker concentration as low as 7.2 pg mL^{-1} with wide linear detection range of 0.01-50 ng mL^{-1}. This work opens new opportunities to explore the electrochemical behavior of nanostructured yttria stabilized zirconia (YSZ) and its composites at room temperature and its utility in developing biosensors and other electrochemical devices.

For details refer to https://doi.org/ 10.1016/j.bioelechem.2021.107799

*Corresponding Author

BIOGRAPHY

PROF. JAI GOPAL SHARMA

Department of Biotechnology

Porf. Jai Gopal Sharma is working as a Professor in the Department of Biotechnology. He had completed his M.Sc. (Meerut University, UP), Ph.D. (University of Delhi) and PDF (Kyoto University, Japan. His area of research interest Aquaculture, larvi culture, fish nutrition, water quality management, aquatic ecology, water pollution, radiation biology, UVB radiation, bioenergy, nanobiotechnology, environment impact assessment, biosensors, enzyme technology, industrial application of enzymes and bioremediation Prof. Jai Gopal Sharma is Ph.D. in Zoology from University of Delhi, Delhi and also worked as Post Doctoral Fellow at Kyoto University, Japan for two years (2001-2003). He has 25 years of research experience to his credit. He is the recipient of various awards and honours of several scientific organizations and is running two major projects.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **J. G. Sharma**, A. Singh, A. Begum, Sonia, V. H. Krishna and R. Chakrabarti, "The impact of Achyranthes aspera seeds and leaves supplemented feeds on the survival, growth, immune system and specific genes involved in immunostimulation in Clarias batrachus fry challenged with Aeromonas hydrophila in pond conditions", *Fish & Shellfish Immunology*, vol. 118, pp. 11-18, 2021. Impact Factor: 4.581.
2. L. Kumar, R. Kaur and **J. G. Sharma**, "The efficiency of zeolites in water treatment for combating ammonia – An experimental study on Yamuna River water & treated sewage effluents", *Inorganic Chemistry Communication*, vol. 134, pp. 108978, 2021. Impact Factor: 2.495.

The impact of Achyranthes aspera seeds and leaves supplemented feeds on the survival, growth, immune system and specific genes involved in immunostimulation in Clarias batrachus fry challenged with Aeromonas hydrophila in pond conditions

Jai Gopal Sharma, Amarjeet Singh, Ajima Begum, Sonia, Vungarala Hari Krishna and Rina Chakrabarti

Abstract: The present study was conducted to evaluate the effect of dietary inclusion of Achyranthes aspera seeds and leaves on the immune system of magur Clarias batrachus challenged with Aeromonas hydrophila in pond conditions. Magur fry (0.51 ± 0.032 g) were cultured in hapas set inside a pond and were fed with three feeds. Two experimental feeds FS1 and FS2 were supplemented with 0.5% seeds and leaves of A. aspera, respectively and FC3 was the control one. After 90 days of feeding, fish were challenged with A. hydrophila. In FC3, 70% fish died within 48 h of challenge, while 25 and 30% mortality were recorded in FS1 and FL2, respectively. The cumulative mortality rates were 70, 45 and 35% in FC3, FL2 and FS1, respectively. The average weight and specific growth rate of magur were significantly higher in FS1 compared to others. Serum lysozyme, myeloperoxidase, nitric oxide synthase and superoxide dismutase levels were significantly higher in FS1 compared to others. Thiobarbituric acid reactive substances and carbonyl protein levels were significantly lower in FS1 compared to others. In liver and head kidney of FS1 and FS2 fed magur, the iNOS, SOD-C, TNF-α, Cytochrome c, Caspase 9 were up-regulated. Caspase 3 was also significantly up-regulated in FS1 and it was followed by FL2 treatment. A. aspera incorporated feeds improved the immune system of fish and gave protection against bacteria even in the pond conditions.

For details refer to https://doi.org/10.1016/j.fsi.2021.08.026

The efficiency of zeolites in water treatment for combating ammonia – An experimental study on Yamuna River water & treated sewage effluents

Lokesh Kumar, Raminder Kaur and **Jai Gopal Sharma***

Abstract: This study was meant to study the effectiveness of natural and synthetic zeolites in water treatment for combating ammonia nitrogen so that specific zeolites could be utilized at waterworks and sewage disposal works. In this study, three different zeolites were utilized in their pristine state, namely natural clinoptilolite, natural mordenite, and synthetic zeolites 4A. We examined the zeolites for their ammonia removal capacity. We performed experimental studies on synthetically prepared ammonia water, the Yamuna River water, and municipally treated sewage effluents by using Jar Test Apparatus at 100 RPM. Ammonia nitrogen content was determined by nesslerization standard method using a spectrophotometer. It has been observed that all zeolites are significantly effective in treating ammonia nitrogen in artificially prepared ammonia nitrogen water without having competing ions interference. However, because competing ions interfere in natural water, its use limits ammonium ions removal. Based on the present study outcomes, the authors have suggested replacing sand media from Rapid Sand Filters and Slow Sand Filters with Mordenite and Clinoptilolite at municipal water treatment utilities to combat low amounts of ammonium ions.

For details refer to https://doi.org/10.1016/j.inoche.2021.108978

**Corresponding Author*

BIOGRAPHY

DR. KRITI BHANDARI

Department of Biotechnology

Dr. Kriti Bhandari, working as an Assistant Professor in Department of Biotechnology, Delhi Technological University since July 2014. She has also worked as an Assistant Professor in Department of Applied Sciences in Ajay Kumar Garg Engineering College, Ghaziabad for one year (2013-2014). She has completed her Ph.D. (in area of Biotechnology & Biochemical Engineering) from NIT Jaipur. She had qualified CSIR-JRF NET and GATE. She was selected for Canadian Commonwealth Graduate Exchange Program fellowship and carried out her research work in University of Saskatchewan, Canada. She secured first rank in JEE-2004 (Joint Entrance Exam) of M.Sc. Biotechnology/Microbiology from University of Rajasthan. She has published various research papers in National/International Journals and conferences. She is a reviewer of Chemical Engineering Communications Journal. She has also guided M.Tech. and B.Tech. students in their project work. She have been a active member during NBA, NAAC and ISO visit in DTU.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. R. Luthra, S. Kaur and **K. Bhandari**, "Applications of CRISPR as a potential therapeutic", *Life Sciences*, vol. 284, pp. 119908, 2021. Impact Factor: 5.037.

Applications of CRISPR as a potential therapeutic

Ritika Luthra, Simran Kaur and **Kriti Bhandari***

Abstract: Genetic disorders and congenital abnormalities are present in 2-5% of births all over the world and can cause up to 50% of all early childhood deaths. The establishment of sophisticated and controlled techniques for customizing DNA manipulation is significant for the therapeutic role in such disorders and further research on them. One such technique is CRISPR that is significant towards optimizing genome editing and therapies, metabolic fluxes as well as artificial genetic systems. CRISPR-Cas9 is a molecular appliance that is applied in the areas of genetic and protein engineering. The CRISPR-CAS system is an integral element of prokaryotic adaptive immunity that allows prokaryotic cells to identify and kill any foreign DNA. The Gene editing property of CRISPR finds various applications like diagnostics and therapeutics in cancer, neurodegenerative disorders, genetic diseases, blindness, etc. This review discusses applications of CRISPR as a therapeutic in various disorders including several genetic diseases (including sickle cell anemia, blindness, thalassemia, cystic fibrosis, hereditary tyrosinemia type I, duchenne muscular dystrophy, mitochondrial disorders), Cancer, Huntington's disease and viral infections (like HIV, COVID, etc.) along with the prospects concerning them. CRISPR-based therapy is also being researched and defined for COVID-19. The related mechanism of CRISPR has been discussed alongside highlighting challenges involved in therapeutic applications of CRISPR.

For details refer to https://doi.org/10.1016/j.lfs.2021.119908

**Corresponding Author*

BIOGRAPHY

MR. LAKHAN KUMAR

Department of Biotechnology

Mr. Lakhan Kumar is pursuing his Ph.D. at Department of Biotechnology, Delhi Technological University, Delhi, India. He works towards Environmental Sustainability. He has published more than 10 peer reviewed articles and book chapters in the area of Bioenergy, Bioprocess Engineering, Algal Biorefinery, and Remediation of Environmental Pollutants.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **L. Kumar**, V. Ragunathan, M. Chugh and N. Bharadvaja, "Nanomaterials for remediation of contaminants: a review", *Environmental Chemistry Letters*, vol. 19, pp. 3139–3163, 2021. Impact Factor: 9.027.

Nanomaterials for remediation of contaminants: a review

Lakhan Kumar, Venkataraghavan Ragunathan, Mohita Chugh and Navneeta Bharadvaja

Abstract: Environmental pollution is inducing short-term and long-term adverse effects on soil, air, water, and living organisms. Globally, more than 13.7 million persons died in 2016 due to living and working in an unhealthy environment according to the World Health Organization. In particular, air pollution caused more than six million deaths, while water pollution caused about 1.8 million deaths, calling for advanced methods of remediation. Nanosized materials, owing to their unique surface properties, exhibit remediation potential for a wide range of pollutants. Here, we review the impact of environmental degradation on human health, followed by conventional physicochemical and biological treatment strategies for remediation of environmental pollutants. Then, we present the synthesis, types, and application of nanomaterials in the degradation and monitoring of various pollutants. The environmental fate and behaviour of nanomaterials are also discussed.

For details refer to https://doi.org/10.1007/s10311-021-01212-z

BIOGRAPHY

MR. NAVNEET CHAUDHARY

Department of Biotechnology

Mr. Navneet Chaudhary is working as a Ph.D. research scholar (registration no. 2k18/PHD/BT/09), working under the supervision of Prof. Jai Gopal Sharma in the Department of Biotechnology at Delhi Technological University, New Delhi in collaboration with special Centre for Nanoscience at Jawaharlal Nehru University, New Delhi under the co-supervision of Dr. Pratima R. Solanki. He is doing Ph.D. research area on Nanomaterial based biosensors for the detection of antibiotics. He has also attended the prestigious senior research fellowship awarded by ICMR since 2019 to support his research work. In this direction, he had published several research work in reputed high impact journals. He have more than 4 years of research experience in the field of biosensors and molecular biology where he had worked on multiple projects and gained the knowledge in Electrochemical biosensor, optical biosensors, Bacterial culture, molecular biology, fluorescence microscopy, immunology and cell biology. He received his master degree in Biotechnology from Gautam Buddha University, greater Noida (Uttar Pradesh). He had presented his research work at the various conferences and got best poster award in a recent international conference.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **N. Chaudhary**, A. K. Yadav, J. G. Sharma and P. R. Solanki, "Designing and characterization of a highly sensitive and selective biosensing platform for ciprofloxacin detection utilizing lanthanum oxide nanoparticles", *Journal of Environmental Chemical Engineering*, vol. 9, no. 6, pp. 106771, 2021. Impact Factor: 5.909.

Designing and characterization of a highly sensitive and selective biosensing platform for ciprofloxacin detection utilizing lanthanum oxide nanoparticles

Navneet Chaudhary, Amit K. Yadav, Jai Gopal Sharma and Pratima R. Solanki

Abstract: The pervasive presence of antibiotics in food has severe health impacts due to the rise in antibiotic-resistant bacteria. Therefore, the fabrication of a reliable, sensitive, rapid, and selective platform for antibiotics detection is the required for healthcare services. Here, we aim to fabricate an electrochemical immunosensor based on lanthanum oxide nanoparticles (nLa_2O_3 NPs) for sensitive and selective determination of trace amounts of ciprofloxacin (CPX) antibiotic. Briefly, the synthesis of nLa_2O_3NPs was carried out via wet-chemical co-precipitation process and characterized with various techniques using X-ray diffraction, fourier transform infrared spectroscopy, Raman spectroscopy, contact angle, atomic force microscopy, transmission electron microscopy, and electrochemical methods. These nLa_2O_3 NPs were used for enhancing the electrochemical response of the immunosensor. Further, nLa_2O_3 NPs were functionalized by APTES and were deposited electrophoretically on the surface of ITO glass substrate, followed by immobilizing anti-CPX antibodies covalently via EDC-NHS chemistry. Blocking of the non-specific area was done with the help of BSA. The change in electrochemical response studies of the developed immunosensor (BSA/anti-CPX/APTES/nLa_2O_3/ITO) was monitored to detect CPX. Under optimized conditions, studies showed that the developed biosensor had a wide linear detection range of 0.001–0.5 ng/mL and 1–1000 ng/mL, with the sensitivities of 11.44 μA ng^{-1} mL cm^{-2} (R^2 = 0.968), and 7.88 μA ng^{-1} mL cm^{-2} (R^2 = 0.972), respectively and having lower detection limit of 0.001 ng/mL. The developed immunosensor showed good reproducibility, repeatability, sensitivity, and stability that was effectively explored to detect CPX in milk samples.

For details refer to https://doi.org/10.1016/j.jece.2021.106771

BIOGRAPHY

DR. NAVNEETA BHARADVAJA

Department of Biotechnology

Dr. Navneeta Bharadvaja research area of interest includes Establishment of plant cultures to obtain pharmaceutically important compounds, Selection of elite accessions for high yield of Secondary Metabolites of industrial importance, Phyto-remediation, Algal Biotechnology and Insilico approach.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. D. Bhardwaj and **N. Bharadvaja**, "Phycoremediation of effluents containing dyes and its prospects for value-added products: A review of opportunities", *Journal of Water Process Engineering*, vol. 41, pp. 102080, 2021. Impact Factor: 5.485.
2. H. Singh and **N. Bharadvaja**, "Treasuring the computational approach in medicinal plant research", *Progress in Biophysics and Molecular Biology*, vol. 164, pp. 19-32, 2021. Impact Factor: 3.667.
3. A. Roy and **N. Bharadvaja**, "Venom-Derived Bioactive Compounds as Potential Anticancer Agents: A Review", *International Journal of Peptide Research and Therapeutics*, vol. 27, pp. 129–147, 2021. Impact Factor: 1.931.

Phycoremediation of effluents containing dyes and its prospects for value-added products: A review of opportunities

Deepti Bhardwaj and **Navneeta Bharadvaja***

Abstract: Rapid urbanisation and industrialization have made significant increase in demand for water. Dyes are majorly organic compounds used by various industries as an identifier, colorant or for aesthetic purposes. Effluents discharged by such industries containing dyes may change the physical, chemical and biological properties of water in long run which causes adverse impacts on the ecosystem. While in humans and other aquatic animals, the dyes have toxic, carcinogenic and mutagenic effects. The treatment of dyes can be done by various methods like membrane filtration, ion exchange, photochemical oxidation, nanotechnological approaches and various other physicochemical methods. Plants and microorganisms like algae, fungi, and bacteria also play a vital role in remediation of dyes through enzymatic processes. Phytoremediation of dyes takes place under the influence of reductase enzyme which reduces the dye into simpler organic compounds. Algae are source of carbon sink in oceans and also help in remediation of pollutants present in water. Algal cells are useful feedstock for various sectors of our economy such as biofuels, microalgal biochar, nutraceuticals, microbial fuel cell for bioelectricity, phyconanoparticles for environmental and medical applications. This review article aims to discuss dyes, sustainability issues and ecotoxicity related to them. It will give an insight on various methods of

dye removal emphasising phytoremediation and factors responsible in its removal. The opportunities associated with the recovery of valuable products from algae would suggest it a sustainable approach in treatment of dyes present in effluents.

For details refer to https://doi.org/10.1016/j.jwpe.2021.102080

Treasuring the computational approach in medicinal plant research

Harshita Singh and **Navneeta Bharadvaja***

Abstract: Medicinal plants serve as a valuable source of secondary metabolites since time immemorial. Computational Research in 21st century is giving more attention to medicinal plants for new drug design as pharmacological screening of bioactive compound was time consuming and expensive. Computational methods such as Molecular Docking, Molecular Dynamic Simulation and Artificial intelligence are significant Insilico tools in medicinal plant research. Molecular docking approach exploits the mechanism of potential phytochemicals into the target active site to elucidate its interactions and biological therapeutic properties. MD simulation illuminates the dynamic behavior of biomolecules at atomic level with fine quality representation of biomolecules. Dramatical advancement in computer science is illustrating the biological mechanism via these tools in different diseases treatment. The advancement comprises speed, the system configuration, and other software upgradation to insights into the structural explanation and optimization of biomolecules. A probable shift from simulation to artificial intelligence has in fact accelerated the art of scientific study to a sky high. The most upgraded algorithm in artificial intelligence such as Artificial Neural Networks, Deep Neural Networks, Neuro-fuzzy Logic has provided a wide opportunity in easing the time required in classical experimental strategy. The notable progress in computer science technology has paved a pathway for understanding the pharmacological functions and creating a roadmap for drug design and development and other achievement in the field of medicinal plants research. This review focus on the development and overview in computational research moving from static molecular docking method to a range of dynamic simulation and an advanced artificial intelligence such as machine learning.

For details refer to https://doi.org/10.1016/j.pbiomolbio.2021.05.004

Venom-Derived Bioactive Compounds as Potential Anticancer Agents: A Review

Arpita Roy and **Navneeta Bharadvaja***

Abstract: Biologically active compounds with potential anticancer activity have been isolated from various animal sources. Recent research is focused on venoms from animal sources, since they specifically target cancer cells and are less toxic to normal tissues, thus making them a better alternative for prevention and management of cancer. Animals produce pharmacologically active compounds that are capable of protein synthesis inhibition, induction of angiogenesis and apoptosis. Over the past decades, venom has been identified as a potential source of therapeutic agents, including anti-cancer agents. Venoms are isolated from various animal sources such as wasp, honey bee and scorpion are composite mixtures of various peptides, protein, enzymes, toxins and non-proteinaceous secretions. They are natural compounds that act as a template and can be utilized for the development of new therapeutic agents against cancer. The objective of this review is to create a comprehensive resource of anticancer agents from venoms which would foster pharmacogenomic studies and the development of cost-effective cancer treatment. Information about different animal venoms has been compiled after a panoramic literature survey.

For details refer to https://doi.org/10.1007/s10989-020-10073-z

**Corresponding Author*

BIOGRAPHY

PROF. PRAVIR KUMAR

Department of Biotechnology

Dr. Pravir Kumar is working as a Head and Professor in the Department of Biotechnology at DTU. He has obtained MS degree from BHU, Varanasi and Ph.D. degree from J. W. Geothe University, Germany. He has spent several years in the Neurology Department at Tufts University School of Medicine, Boston, USA as a postdoctoral fellow. His area of expertise includes molecular chaperone and ubiquitin E3 ligase in neurodegenerative disorders. He is an editorial board member in the prestigious Nature Scientific report and reviewers of 30 leading Elsevier, Springer, BMC, and many others. He has published more than 80 papers in peer-reviewed journals and more than 120 abstracts in international symposium, proceedings and as invited speaker. Until now, he has guided 08 PhD completed and 08 pursuing, more than 50 M.Tech. students and more than 50 MS and BS levels.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	08

1. V. Oli, R. Gupta and **P. Kumar**, "FOXO and related transcription factors binding elements in the regulation of neurodegenerative disorders", *Journal of Chemical Neuroanatomy*, vol. 116, pp. 102012, 2021. Impact Factor: 3.052.
2. N. Malhotra, R. Gupta and **P. Kumar**, "Pharmacological relevance of CDK inhibitors in Alzheimer's disease", *Neurochemistry International*, vol. 148, pp. 105115, 2021. Impact Factor: 3.921.
3. R. Gupta, A. Jha, R. K. Ambasta and **P. Kumar**, "Regulatory mechanism of cyclins and cyclin-dependent kinases in post-mitotic neuronal cell division", *Life Sciences*, vol. 285, pp. 120006, 2021. Impact Factor: 5.037.
4. R. Gupta, D. Srivastava, M. Sahu, S. Tiwari, R. K. Ambasta and **P. Kumar**, "Artificial intelligence to deep learning: machine intelligence approach for drug discovery", *Molecular Diversity*, vol. 25, pages 1315–1360, 2021. Impact Factor: 2.943.
5. R. Gupta, R. K. Ambasta and **P. Kumar**, "Autophagy and apoptosis cascade: which is more prominent in neuronal death?", *Cellular and Molecular Life Sciences*, vol. 78, pp. 8001–8047, 2021. Impact Factor: 9.261.
6. R. Gupta, R. K. Ambasta and **P. Kumar**, "Histone deacetylase in neuropathology", *Advances in Clinical Chemistry*, vol. 104, pp. 151-231, 2021. Impact Factor: 5.394.
7. R. Gupta, M. Sahu, D. Srivastava, S. Tiwari, R. K. Ambasta and **P. Kumar**, "Post-translational modifications: Regulators of neurodegenerative proteinopathies", *Ageing Research Reviews*, vol. 68, pp. 101336, 2021. Impact Factor: 10.895.
8. S. Kumari, D. Advani, S. Sharma, R. K. Ambasta and **P. Kumar**, "Combinatorial therapy in tumor microenvironment: Where do we stand?", *Biochimica et Biophysica Acta (BBA) - Reviews on Cancer*, vol. 1876, no. 2, pp. 188585, 2021. Impact Factor: 10.680.

FOXO and related transcription factors binding elements in the regulation of neurodegenerative disorders

Vaibhav Oli, Rohan Gupta and **Pravir Kumar***

Abstract: Neurodegenerative diseases, such as Alzheimer's disease, Parkinson's disease, Huntington's disease, amyotrophic lateral sclerosis, and others, are characterized by progressive loss of neuronal cells, which causes memory impairment and cognitive decline. Mounting evidence demonstrated the possible implications of diverse biological processes, namely oxidative stress, mitochondrial dysfunction, aberrant cell cycle re-entry, post-translational modifications, protein aggregation, impaired proteasome dysfunction, autophagy, and many others that cause neuronal cell death. The condition worsens as there is no effective treatment for such diseases due to their complex pathogenesis and mechanism. Mounting evidence demonstrated the role of regulatory transcription factors, such as NFκβ, FoxO, Myc, CREB, and others that regulate the biological processes and diminish the disease progression and pathogenesis. Studies demonstrated that forkhead box O (FoxO) transcription factors had been implicated in the regulation of aging and longevity. Further, the functions of FoxO proteins are regulated by different post-translational modifications (PTMs), namely acetylation, and ubiquitination. Various studies concluded that FoxO proteins exert both neuroprotective and neurotoxic properties depending on their regulation mechanism and activity in the brain. Thus, understanding the nature of FoxO expression and activity in the brain will help develop effective therapeutic strategies. Herein, firstly, we discuss the role of FoxO protein in cell cycle regulation and cell proliferation, followed by the regulation of FoxO proteins through acetylation and ubiquitination. We also briefly explain the activity and expression pattern of FoxO proteins in the neuronal cells and explain the mechanism through which FoxO proteins are rescued from oxidative stress-induced neurotoxicity. Later on, we present a detailed view of the implication of FoxO proteins in neurodegenerative disease and FoxO proteins as an effective therapeutic target.

For details refer to https://doi.org/10.1016/j.jchemneu.2021.102012

Pharmacological relevance of CDK inhibitors in Alzheimer's disease

Nishtha Malhotra, RohanGupta and **Pravir Kumar***

Abstract: Evidence suggests that cell cycle activation plays a role in the pathophysiology of neurodegenerative diseases. Alzheimer's disease is a progressive, terminal neurodegenerative disease that affects memory and other important mental functions. Intracellular deposition of Tau protein, a hyperphosphorylated form of a microtubule-associated protein, and extracellular aggregation of Amyloid β protein, which manifests as neurofibrillary tangles (NFT) and senile plaques, respectively, characterize this condition. In recent years, however, several studies have concluded that cell cycle re-entry is one of the key causes of neuronal death in the pathogenesis of Alzheimer's disease. The eukaryotic cell cycle is well-coordinated machinery that performs critical functions in cell replenishment, such as DNA replication, cell creation, repair, and the birth of new daughter cells from the mother cell. The complex interplay between the levels of various cyclins and cyclin-dependent kinases (CDKs) at different checkpoints is needed for cell cycle synchronization. CDKIs (cyclin-dependent kinase inhibitors) prevent cyclin degradation and CDK inactivation. Different external and internal factors regulate them differently, and they have different tissue expression and developmental functions. The checkpoints ensure that the previous step is completed correctly before starting the new cell cycle phase, and they protect against the transfer of defects to the daughter cells. Due to the development of more selective and potent ATP-competitive CDK inhibitors, CDK inhibitors appear to be on the verge of having a clinical impact. This avenue is likely to yield new and effective medicines for the treatment of cancer and other neurodegenerative diseases. These new methods for recognizing CDK inhibitors may be used to create non-ATP-competitive agents that target CDK4, CDK5, and other CDKs that have been recognized as important therapeutic targets in Alzheimer's disease treatment.

For details refer to https://doi.org/10.1016/j.neuint.2021.105115

**Corresponding Author*

Regulatory mechanism of cyclins and cyclin-dependent kinases in post-mitotic neuronal cell division

Rohan Gupta, Ankita Jha, Rashmi K. Ambasta and **Pravir Kumar***

Abstract: Neurodegenerative diseases (NDDs) are the most common life-threatening disease of the central nervous system and it cause the progressive loss of neuronal cells. The exact mechanism of the disease's progression is not clear and thus line of treatment for NDDs is a baffling issue. During the progression of NDDs, oxidative stress and DNA damage play an important regulatory function, and ultimately induces neurodegeneration. Recently, aberrant cell cycle events have been demonstrated in the progression of different NDDs. However, the pertinent role of signaling mechanism, for instance, post-translational modifications, oxidative stress, DNA damage response pathway, JNK/p38 MAPK, MEK/ERK cascade, actively participated in the aberrant cell cycle reentry induced neuronal cell death. Mounting evidence has demonstrated that aberrant cell cycle re-entry is a major contributing factor in the pathogenesis of NDDs rather than a secondary phenomenon. In the brain of AD patients with mild cognitive impairment, post miotic cell division can be seen in the early stage of the disease. However, in the brain of PD patients, response to various neurotoxic signals, the cell cycle re-entry has been observed that causes neuronal apoptosis. On contrary, the contributing factors that leads to the induction of cell cycle events in mature neurons in HD and ALS brain pathology is remain unclear. Various pharmacological drugs have been developed to reduce the pathogenesis of NDDs, but they are still not helpful in eliminating the cause of these NDDs.

For details refer to https://doi.org/10.1016/j.lfs.2021.120006

Artificial intelligence to deep learning: machine intelligence approach for drug discovery+

Rohan Gupta, Devesh Srivastava, Mehar Sahu, Swati Tiwari, Rashmi K. Ambasta and **Pravir Kumar***

Abstract: Drug designing and development is an important area of research for pharmaceutical companies and chemical scientists. However, low efficacy, off-target delivery, time consumption, and high cost impose a hurdle and challenges that impact drug design and discovery. Further, complex and big data from genomics, proteomics, microarray data, and clinical trials also impose an obstacle in the drug discovery pipeline. Artificial intelligence and machine learning technology play a crucial role in drug discovery and development. In other words, artificial neural networks and deep learning algorithms have modernized the area. Machine learning and deep learning algorithms have been implemented in several drug discovery processes such as peptide synthesis, structure-based virtual screening, ligand-based virtual screening, toxicity prediction, drug monitoring and release, pharmacophore modeling, quantitative structure–activity relationship, drug repositioning, polypharmacology, and physiochemical activity. Evidence from the past strengthens the implementation of artificial intelligence and deep learning in this field. Moreover, novel data mining, curation, and management techniques provided critical support to recently developed modeling algorithms. In summary, artificial intelligence and deep learning advancements provide an excellent opportunity for rational drug design and discovery process, which will eventually impact mankind.

For details refer to https://doi.org/10.1007/s11030-021-10217-3

*Corresponding Author

Autophagy and apoptosis cascade: which is more prominent in neuronal death?+

Rohan Gupta, Rashmi K. Ambasta and **Pravir Kumar***

Abstract: Autophagy and apoptosis are two crucial self-destructive processes that maintain cellular homeostasis, which are characterized by their morphology and regulated through signal transduction mechanisms. These pathways determine the fate of cellular organelle and protein involved in human health and disease such as neurodegeneration, cancer, and cardiovascular disease. Cell death pathways share common molecular mechanisms, such as mitochondrial dysfunction, oxidative stress, calcium ion concentration, reactive oxygen species, and endoplasmic reticulum stress. Some key signaling molecules such as p53 and VEGF mediated angiogenic pathway exhibit cellular and molecular responses resulting in the triggering of apoptotic and autophagic pathways. Herein, based on previous studies, we describe the intricate relation between cell death pathways through their common genes and the role of various stress-causing agents. Further, extensive research on autophagy and apoptotic machinery excavates the implementation of selective biomarkers, for instance, mTOR, Bcl-2, BH3 family members, caspases, AMPK, PI3K/Akt/GSK3β, and p38/JNK/MAPK, in the pathogenesis and progression of neurodegenerative diseases. This molecular phenomenon will lead to the discovery of possible therapeutic biomolecules as a pharmacological intervention that are involved in the modulation of apoptosis and autophagy pathways. Moreover, we describe the potential role of micro-RNAs, long non-coding RNAs, and biomolecules as therapeutic agents that regulate cell death machinery to treat neurodegenerative diseases.

For details refer to https://doi.org/10.1007/s00018-021-04004-4

Histone deacetylase in neuropathology+

Rohan Gupta, Rashmi K. Ambasta and **Pravir Kumar***

Abstract: Neuroepigenetics, a new branch of epigenetics, plays an important role in the regulation of gene expression. Neuroepigenetics is associated with holistic neuronal function and helps in formation and maintenance of memory and learning processes. This includes neurodevelopment and neurodegenerative defects in which histone modification enzymes appear to play a crucial role. These modifications, carried out by acetyltransferases and deacetylases, regulate biologic and cellular processes such as apoptosis and autophagy, inflammatory response, mitochondrial dysfunction, cell-cycle progression and oxidative stress. Alterations in acetylation status of histone as well as non-histone substrates lead to transcriptional deregulation. Histone deacetylase decreases acetylation status and causes transcriptional repression of regulatory genes involved in neural plasticity, synaptogenesis, synaptic and neural plasticity, cognition and memory, and neural differentiation. Transcriptional deactivation in the brain results in development of neurodevelopmental and neurodegenerative disorders. Mounting evidence implicates histone deacetylase inhibitors as potential therapeutic targets to combat neurologic disorders. Recent studies have targeted naturally-occurring biomolecules and micro-RNAs to improve cognitive defects and memory. Multi-target drug ligands targeting HDAC have been developed and used in cell-culture and animal-models of neurologic disorders to ameliorate synaptic and cognitive dysfunction. Herein, we focus on the implications of histone deacetylase enzymes in neuropathology, their regulation of brain function and plausible involvement in the pathogenesis of neurologic defects.

For details refer to https://doi.org/10.1016/bs.acc.2020.09.004

**Corresponding Author*
+Eligible for Certificate only

Post-translational modifications: Regulators of neurodegenerative proteinopathies+

Rohan Gupta, Mehar Sahu, Devesh Srivastava, Swati Tiwari, Rashmi K. Ambasta and **Pravir Kumar***

Abstract: One of the hallmark features in the neurodegenerative disorders (NDDs) is the accumulation of aggregated and/or non-functional protein in the cellular milieu. Post-translational modifications (PTMs) are an essential regulator of non-functional protein aggregation in the pathogenesis of NDDs. Any alteration in the post-translational mechanism and the protein quality control system, for instance, molecular chaperone, ubiquitin-proteasome system, autophagy-lysosomal degradation pathway, enhances the accumulation of misfolded protein, which causes neuronal dysfunction. Post-translational modification plays many roles in protein turnover rate, accumulation of aggregate and can also help in the degradation of disease-causing toxic metabolites. PTMs such as acetylation, glycosylation, phosphorylation, ubiquitination, palmitoylation, SUMOylation, nitration, oxidation, and many others regulate protein homeostasis, which includes protein structure, functions and aggregation propensity. Different studies demonstrated the involvement of PTMs in the regulation of signaling cascades such as PI3K/Akt/GSK3β, MAPK cascade, AMPK pathway, and Wnt signaling pathway in the pathogenesis of NDDs. Further, mounting evidence suggests that targeting different PTMs with small chemical molecules, which acts as an inhibitor or activator, reverse misfolded protein accumulation and thus enhances the neuroprotection. Herein, we briefly discuss the protein aggregation and various domain structures of different proteins involved in the NDDs, indicating critical amino acid residues where PTMs occur. We also describe the implementation and involvement of various PTMs on signaling cascade and cellular processes in NDDs. Lastly, we implement our current understanding of the therapeutic importance of PTMs in neurodegeneration, along with emerging techniques targeting various PTMs.

For details refer to https://doi.org/10.1016/j.arr.2021.101336

Combinatorial therapy in tumor microenvironment: Where do we stand?+

Smita Kumari, Dia Advani, Sudhanshu Sharma, Rashmi K. Ambasta and **Pravir Kumar***

Abstract: The tumor microenvironment plays a pivotal role in tumor initiation and progression by creating a dynamic interaction with cancer cells. The tumor microenvironment consists of various cellular components, including endothelial cells, fibroblasts, pericytes, adipocytes, immune cells, cancer stem cells and vasculature, which provide a sustained environment for cancer cell proliferation. Currently, targeting tumor microenvironment is increasingly being explored as a novel approach to improve cancer therapeutics, as it influences the growth and expansion of malignant cells in various ways. Despite continuous advancements in targeted therapies for cancer treatment, drug resistance, toxicity and immune escape mechanisms are the basis of treatment failure and cancer escape. Targeting tumor microenvironment efficiently with approved drugs and combination therapy is the solution to this enduring challenge that involves combining more than one treatment modality such as chemotherapy, surgery, radiotherapy, immunotherapy and nanotherapy that can effectively and synergistically target the critical pathways associated with disease pathogenesis. This review shed light on the composition of the tumor microenvironment, interaction of different components within tumor microenvironment with tumor cells and associated hallmarks, the current status of combinatorial therapies being developed, and various growing advancements. Furthermore, computational tools can also be used to monitor the significance and outcome of therapies being developed. We addressed the perceived barriers and regulatory hurdles in developing a combinatorial regimen and evaluated the present status of these therapies in the clinic. The accumulating depth of knowledge about the tumor microenvironment in cancer may facilitate further development of effective treatment modalities. This review presents the tumor microenvironment as a sweeping landscape for developing novel cancer therapies.

For details refer to https://doi.org/10.1016/j.bbcan.2021.188585

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

MR. RAHUL KANDPAL

Department of Biotechnology

Mr. Rahul Kandpal is working on green eco-friendly technologies for making this world a better place. Bioelectrochemical Systems, particularly microbial fuel cells have the potential to generate clean energy from wastewaters by treating them and making them reusable. There is a need to reduce the MFC costs so that they may become scalable and be manufactured commercially in order to reach the end-user. Technologies like Biosensors, Microfluidics, 3D printing, Flexible and sustainable electronic materials, Biophotovoltaics, Lab on Chip Devices, and Carbon capture, storage and its utilization are also my research interests. He is pursuing Ph.D. School of Interdisciplinary Research from IIT Delhi, M.Tech in Biomedical Engineering form Delhi Technological University and B.Tech. in Biochemical Engineering, Bipin Tripathi Kumaon Institute of Technology Dwarahat.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Kandpal**, S. Nara, M. Shahadat, M. O. Ansari, A. Alshahri, S. W. Ali, S. Z. Ahammad and B. D. Malhotra, "Impedance spectroscopic study of biofilm formation on pencil lead graphite anode in microbial fuel cell", *Journal of the Taiwan Institute of Chemical Engineers*, vol. 128, pp. 114-123, 2021. Impact Factor: 5.876.

Impedance spectroscopic study of biofilm formation on pencil lead graphite anode in microbial fuel cell

Rahul Kandpal, Sharda Nara, Mohammad Shahadat, Mohammad Omaish Ansari, Ahmed Alshahri, Syed Wazed Ali, Shaikh Ziauddin Ahammad and Bansi Dhar Malhotra

Abstract:

Background - Nowadays, the development of biofilm on the cost-effective polymer-based substrate (anode) to be employed in a microbial fuel cell (MFC) is considered important. The present study deals with the formation of Bacillus subtilis 168 biofilm on a pencil lead graphite that was assessed in an MFC using electrochemical impedance spectroscopy (EIS).

Method - The cylindrical single-chambered MFC was designed by using an air-cathode supported stainless steel mesh as a cathode and pencil lead graphite as an anode. Cyclic Voltammetry (CV) and Scanning Electron Microscopy (SEM) were employed to investigate the biofilm formation. The monitoring of biofilm was conducted by impedance spectroscopy using a new Equivalent Electrical Circuit Model [R(QR)(Q[R(RQ)])]

For details refer to https://doi.org/10.1016/j.jtice.2021.09.002

BIOGRAPHY

MS. RITIKA LUTHRA

Department of Biotechnology

Ms. Ritika Luthra is a final year undergraduate student at Delhi Technological University, India pursuing B.Tech. in Biotechnology. She is a Department rank holder in fifth and sixth semesters and secured Department rank 3 in third and fourth semesters. She has written various papers on diverse topics and done internships for improving her understanding apart from the curriculum.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. **R. Luthra**, A. Roy, S. Pandit and R. Prasad, "Biotechnological methods for the production of ginsenosides", *South African Journal of Botany*, vol. 141, pp. 25-36, 2021. Impact Factor: 2.315.
2. **R. Luthra**, S. Datta & A. Roy, "Role of Different Peptides for Cancer Immunotherapy", *International Journal of Peptide Research and Therapeutics*, vol. 27, pp. 2777–2793, 2021. Impact Factor: 1.931.
3. **R. Luthra**, S. Kaur and K. Bhandari, "Applications of CRISPR as a potential therapeutic", *Life Sciences*, vol. 284, pp. 119908, 2021. Impact Factor: 5.037.

Biotechnological methods for the production of ginsenosides

Ritika Luthra, Arpita Roy, Soumya Pandit and Ram Prasad

Abstract: Ginsenosides are secondary metabolites that belong to the triterpenoid or saponin group. These occupy a unique place in the pharmaceutical sector, associated with the manufacturing of medicines and dietary supplements. These valuable secondary metabolites are predominantly used for the treatment of nervous and cardiac ailments. The conventional approaches for ginsenoside extraction are time-consuming and not feasible, and thus it has paved the way for the development of various biotechnological approaches, which would ameliorate the production and extraction process. This review delineates the biotechnological tools, such as conventional tissue culture, cell suspension culture, protoplast culture, polyploidy, in vitro mutagenesis, hairy root culture, that have been largely implemented for the enhanced production of ginsenosides. The use of bioreactors to scale up ginsenoside yield is also presented. The main aim of this review is to address the unexplored aspects and limitations of these biotechnological tools, so that a platform for the utilization of novel approaches can be established to further increase the production of ginsenosides in the near future.

For details refer to https://doi.org/10.3390/biom10040538

Role of Different Peptides for Cancer Immunotherapy

Ritika Luthra, Shreeja Datta and Arpita Roy

Abstract: Due to the enormous benefits derived from host immune response, immunotherapy has been regarded among the most effective methods for defending against cancers. Nevertheless, developing robust solutions with strong biosecurity as well as the potential to modulate immunogenicity in an effective manner, continues to be a challenge. Peptides' structural similarities to protein molecules endow them with tremendous ability to solve such issues by either specifically inducing immune responses or enhancing therapeutic effect. Peptide-based substances have a lot of potential as immunotherapeutic agents for treating a variety of cancers. The development of cancer vaccines as well as delivery mechanisms based on peptides by imitating the biological functions of protein having extremely specialized immuno-regulatory roles has been the subject of significant research. Thus, this review gives a systemic comprehension of cancer immunotherapy, role of the immune system, and how peptides pose a huge potential in cancer immunotherapeutic. The role of peptides as vaccine antigens and adjuvants, checkpoint blockades, in targeted delivery and in combinatorial therapies has been addressed. Recent research on the same has been summarised, which demonstrates their enormous advantages, thus allowing their clinical application for cancer immunotherapy in near future.

For details refer to https://doi.org/10.1007/s10989-021-10289-7

Applications of CRISPR as a potential therapeutic

Ritika Luthra, Simran Kaur and Kriti Bhandari

Abstract: Genetic disorders and congenital abnormalities are present in 2-5% of births all over the world and can cause up to 50% of all early childhood deaths. The establishment of sophisticated and controlled techniques for customizing DNA manipulation is significant for the therapeutic role in such disorders and further research on them. One such technique is CRISPR that is significant towards optimizing genome editing and therapies, metabolic fluxes as well as artificial genetic systems. CRISPR-Cas9 is a molecular appliance that is applied in the areas of genetic and protein engineering. The CRISPR-CAS system is an integral element of prokaryotic adaptive immunity that allows prokaryotic cells to identify and kill any foreign DNA. The Gene editing property of CRISPR finds various applications like diagnostics and therapeutics in cancer, neurodegenerative disorders, genetic diseases, blindness, etc. This review discusses applications of CRISPR as a therapeutic in various disorders including several genetic diseases (including sickle cell anemia, blindness, thalassemia, cystic fibrosis, hereditary tyrosinemia type I, duchenne muscular dystrophy, mitochondrial disorders), Cancer, Huntington's disease and viral infections (like HIV, COVID, etc.) along with the prospects concerning them. CRISPR-based therapy is also being researched and defined for COVID-19. The related mechanism of CRISPR has been discussed alongside highlighting challenges involved in therapeutic applications of CRISPR.

For details refer to https://doi.org/10.1016/j.lfs.2021.119908

BIOGRAPHY

MR. ROHAN GUPTA

Department of Biotechnology

Mr. Rohan Gupta is currently pursuing PhD from Department of Biotechnology, Delhi Technological University under the supervision of Prof. Pravir Kumar. His area of research interest is "Acetylation Mechanism and HDAC enzymes in neurodegenerative disease. He is highly ambitious in life and dedicated towards his research work. Before this he completed his Bachelors of Technology from Dr. B R Ambedkar National Institute of Technology, Jalandhar, Punjab and Masters of Technology from Delhi Technological University, Delhi. He is GATE qualified and receiving fellowship from DTU-JRF.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	05

1. **R. Gupta**, D. Srivastava, M. Sahu, S. Tiwari, R. K. Ambasta and P. Kumar, "Artificial intelligence to deep learning: machine intelligence approach for drug discovery", *Molecular Diversity*, vol. 25, pages 1315–1360, 2021. Impact Factor: 2.943.
2. **R. Gupta**, R. K. Ambasta and P. Kumar, "Autophagy and apoptosis cascade: which is more prominent in neuronal death?", *Cellular and Molecular Life Sciences*, vol. 78, pp. 8001–8047, 2021. Impact Factor: 9.261.
3. **R. Gupta**, R. K. Ambasta and P. Kumar, "Histone deacetylase in neuropathology", *Advances in Clinical Chemistry*, vol. 104, pp. 151-231, 2021. Impact Factor: 5.394.
4. **R. Gupta**, M. Sahu, D. Srivastava, S. Tiwari, R. K. Ambasta and P. Kumar, "Post-translational modifications: Regulators of neurodegenerative proteinopathies", *Ageing Research Reviews*, vol. 68, pp. 101336, 2021. Impact Factor: 10.895.
5. **R. Gupta**, A. Jha, R. K. Ambasta and P. Kumar, "Regulatory mechanism of cyclins and cyclin-dependent kinases in post-mitotic neuronal cell division", *Life Sciences*, vol. 285, pp. 120006, 2021. Impact Factor: 5.037.

Artificial intelligence to deep learning: machine intelligence approach for drug discovery

Rohan Gupta, Devesh Srivastava, Mehar Sahu, Swati Tiwari, Rashmi K. Ambasta and Pravir Kumar

Abstract: Drug designing and development is an important area of research for pharmaceutical companies and chemical scientists. However, low efficacy, off-target delivery, time consumption, and high cost impose a hurdle and challenges that impact drug design and discovery. Further, complex and big data from genomics, proteomics, microarray data, and clinical trials also impose an obstacle in the drug discovery pipeline. Artificial intelligence and machine learning technology play a crucial role in drug discovery and development. In other words, artificial neural networks and deep learning algorithms have modernized the area. Machine learning and deep learning algorithms have been implemented in several drug discovery processes such as peptide synthesis,

structure-based virtual screening, ligand-based virtual screening, toxicity prediction, drug monitoring and release, pharmacophore modeling, quantitative structure–activity relationship, drug repositioning, polypharmacology, and physiochemical activity. Evidence from the past strengthens the implementation of artificial intelligence and deep learning in this field. Moreover, novel data mining, curation, and management techniques provided critical support to recently developed modeling algorithms. In summary, artificial intelligence and deep learning advancements provide an excellent opportunity for rational drug design and discovery process, which will eventually impact mankind.

For details refer to https://doi.org/10.1007/s11030-021-10217-3

Autophagy and apoptosis cascade: which is more prominent in neuronal death?

Rohan Gupta, Rashmi K. Ambasta and Pravir Kumar

Abstract: Autophagy and apoptosis are two crucial self-destructive processes that maintain cellular homeostasis, which are characterized by their morphology and regulated through signal transduction mechanisms. These pathways determine the fate of cellular organelle and protein involved in human health and disease such as neurodegeneration, cancer, and cardiovascular disease. Cell death pathways share common molecular mechanisms, such as mitochondrial dysfunction, oxidative stress, calcium ion concentration, reactive oxygen species, and endoplasmic reticulum stress. Some key signaling molecules such as p53 and VEGF mediated angiogenic pathway exhibit cellular and molecular responses resulting in the triggering of apoptotic and autophagic pathways. Herein, based on previous studies, we describe the intricate relation between cell death pathways through their common genes and the role of various stress-causing agents. Further, extensive research on autophagy and apoptotic machinery excavates the implementation of selective biomarkers, for instance, mTOR, Bcl-2, BH3 family members, caspases, AMPK, PI3K/Akt/GSK3β, and p38/JNK/MAPK, in the pathogenesis and progression of neurodegenerative diseases. This molecular phenomenon will lead to the discovery of possible therapeutic biomolecules as a pharmacological intervention that are involved in the modulation of apoptosis and autophagy pathways. Moreover, we describe the potential role of micro-RNAs, long non-coding RNAs, and biomolecules as therapeutic agents that regulate cell death machinery to treat neurodegenerative diseases.

For details refer to https://doi.org/10.1007/s00018-021-04004-4

Histone deacetylase in neuropathology

Rohan Gupta, Rashmi K. Ambasta and Pravir Kumar

Abstract: Neuroepigenetics, a new branch of epigenetics, plays an important role in the regulation of gene expression. Neuroepigenetics is associated with holistic neuronal function and helps in formation and maintenance of memory and learning processes. This includes neurodevelopment and neurodegenerative defects in which histone modification enzymes appear to play a crucial role. These modifications, carried out by acetyltransferases and deacetylases, regulate biologic and cellular processes such as apoptosis and autophagy, inflammatory response, mitochondrial dysfunction, cell-cycle progression and oxidative stress. Alterations in acetylation status of histone as well as non-histone substrates lead to transcriptional deregulation. Histone deacetylase decreases acetylation status and causes transcriptional repression of regulatory genes involved in neural plasticity, synaptogenesis, synaptic and neural plasticity, cognition and memory, and neural differentiation. Transcriptional deactivation in the brain results in development of neurodevelopmental and neurodegenerative disorders. Mounting evidence implicates histone deacetylase inhibitors as potential therapeutic targets to combat neurologic disorders. Recent studies have targeted naturally-occurring biomolecules and micro-RNAs to improve cognitive defects and memory. Multi-target drug ligands targeting HDAC have been developed and used in cell-culture and animal-models of neurologic disorders to ameliorate synaptic and cognitive dysfunction. Herein, we focus on the implications of histone deacetylase enzymes in neuropathology, their regulation of brain function and plausible involvement in the pathogenesis of neurologic defects.

For details refer to https://doi.org/10.1016/bs.acc.2020.09.004

Post-translational modifications: Regulators of neurodegenerative proteinopathies+

Rohan Gupta, Mehar Sahu, Devesh Srivastava, Swati Tiwari, Rashmi K. Ambasta and Pravir Kumar

Abstract: One of the hallmark features in the neurodegenerative disorders (NDDs) is the accumulation of aggregated and/or non-functional protein in the cellular milieu. Post-translational modifications (PTMs) are an essential regulator of non-functional protein aggregation in the pathogenesis of NDDs. Any alteration in the post-translational mechanism and the protein quality control system, for instance, molecular chaperone, ubiquitin-proteasome system, autophagy-lysosomal degradation pathway, enhances the accumulation of misfolded protein, which causes neuronal dysfunction. Post-translational modification plays many roles in protein turnover rate, accumulation of aggregate and can also help in the degradation of disease-causing toxic metabolites. PTMs such as acetylation, glycosylation, phosphorylation, ubiquitination, palmitoylation, SUMOylation, nitration, oxidation, and many others regulate protein homeostasis, which includes protein structure, functions and aggregation propensity. Different studies demonstrated the involvement of PTMs in the regulation of signaling cascades such as PI3K/Akt/GSK3β, MAPK cascade, AMPK pathway, and Wnt signaling pathway in the pathogenesis of NDDs. Further, mounting evidence suggests that targeting different PTMs with small chemical molecules, which acts as an inhibitor or activator, reverse misfolded protein accumulation and thus enhances the neuroprotection. Herein, we briefly discuss the protein aggregation and various domain structures of different proteins involved in the NDDs, indicating critical amino acid residues where PTMs occur. We also describe the implementation and involvement of various PTMs on signaling cascade and cellular processes in NDDs. Lastly, we implement our current understanding of the therapeutic importance of PTMs in neurodegeneration, along with emerging techniques targeting various PTMs.

For details refer to https://doi.org/10.1016/j.arr.2021.101336

Regulatory mechanism of cyclins and cyclin-dependent kinases in post-mitotic neuronal cell division+

Rohan Gupta, Ankita Jha, Rashmi K. Ambasta and Pravir Kumar

Abstract: Neurodegenerative diseases (NDDs) are the most common life-threatening disease of the central nervous system and it cause the progressive loss of neuronal cells. The exact mechanism of the disease's progression is not clear and thus line of treatment for NDDs is a baffling issue. During the progression of NDDs, oxidative stress and DNA damage play an important regulatory function, and ultimately induces neurodegeneration. Recently, aberrant cell cycle events have been demonstrated in the progression of different NDDs. However, the pertinent role of signaling mechanism, for instance, post-translational modifications, oxidative stress, DNA damage response pathway, JNK/p38 MAPK, MEK/ERK cascade, actively participated in the aberrant cell cycle reentry induced neuronal cell death. Mounting evidence has demonstrated that aberrant cell cycle re-entry is a major contributing factor in the pathogenesis of NDDs rather than a secondary phenomenon. In the brain of AD patients with mild cognitive impairment, post miotic cell division can be seen in the early stage of the disease. However, in the brain of PD patients, response to various neurotoxic signals, the cell cycle re-entry has been observed that causes neuronal apoptosis. On contrary, the contributing factors that leads to the induction of cell cycle events in mature neurons in HD and ALS brain pathology is remain unclear. Various pharmacological drugs have been developed to reduce the pathogenesis of NDDs, but they are still not helpful in eliminating the cause of these NDDs.

For details refer to https://doi.org/10.1016/j.lfs.2021.120006

+Eligible for Certificate only

BIOGRAPHY

MS. SHREEJA DATTA

Department of Biotechnology

Ms. Shreeja Datta is a final year student of Delhi Technological University, pursuing B.Tech. in Biotechnology. Her research interest includes structural biology, nanobioelectronics and nanotechnology, plant biotechnology and computational biology, drug design and immunotherapeutics. She has completed courses on Behavioral Genetics, Science of Stem Cells, Bacteria and Chronic Infections, Drug Development and Non-communicable Diseases for improving my understanding in topics apart from the curriculum. She has contributed her research skills and aptitude in different research projects. She has also worked as a research trainee at University of Delhi, for a period of five months. She accomplished project on transcriptomic data analysis, SDS-PAGE and bioinformatic tools.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Datta** and A. Roy, "Antimicrobial Peptides as Potential Therapeutic Agents: A Review", *International Journal of Peptide Research and Therapeutics*, vol. 27, pp. 555–577, 2021. Impact Factor: 1.931.

Antimicrobial Peptides as Potential Therapeutic Agents: A Review

Shreeja Datta and Arpita Roy

Abstract: The growth of pathogens across the globe is developing at a very fast rate, thus turning into a worldwide health problem. Since, current treatment alternatives have failed to a large extent, novel antibiotics are highly in demand. Antimicrobial peptides (AMPs) have become a significant alternative in this scenario because of their wide-spectrum activity, rapid killing and often cell selectivity. They comprise diverse functional molecules with multifaceted properties, consisting of varied biological activity. Because of the different amino acids and elements in its structure, their action mechanism is specifically altered. Most of the AMPs have been derived from animals, plants and marine sources. They show therapeutic potential, yet, their use is limited because of their short plasma half-life. AMP production can be done at reasonable costs with the help of biotechnological methods. Thus, discovery of an efficient and long-lasting antimicrobial drugs is awaited as soon as these challenges are overcome. The market of antimicrobial peptides is growing at a fast rate. Bioactive peptides from natural sources open up new opportunities to discover lead molecules for management of various ailments. This systematic review centres around the antimicrobial activity, various properties, mechanism and sources of AMPs along with how these properties are exploited for the application of efficient and promising drug agents in pharmaceutical companies. Therefore, in this review information about antimicrobial activity, various properties, mechanism and sources of AMPs along with how these properties are exploited for the application of efficient and promising drug agents in pharmaceutical companies has been discussed.

For details refer to https://doi.org/10.1007/s10989-020-10110-x

BIOGRAPHY

MS. SIMRAN KAUR

Department of Biotechnology

Ms. Simran Kaur, is a final year student of Delhi technological University. She is currently pursuing B.Tech. in biotechnology. She has a keen interest in research and clinical studies in biotechnology. She wish to build a career in the same. Her research interest lies in applications of nanobiotechnology and mental health statistics.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Kaur** and A. Roy, "Bioremediation of heavy metals from wastewater using nanomaterials", *Environment, Development and Sustainability*, vol. 23, pp. 9617–9640, 2021. Impact Factor: 3.219.

Bioremediation of heavy metals from wastewater using nanomaterials

Simran Kaur and Arpita Roy

Abstract: One of the key reasons for water pollution is the existence of heavy metals in wastewater. Industrial wastewater and domestic sewage are one of the top reasons to cause water pollution. Increasing water pollution is a major concern for humans as it is not only affecting our health but also disturbing the economy and sustainable growth all around the world. Heavy metals affect human health as well as flora and fauna of the region because they are non-biodegradable. Heavy metals induce mutagenesis, cancer, and hereditary genetic disorders because they bind to the same sites in which essential metal ions bind and lead to the destabilization of structures and biomolecules. Conventional methods are well-established for the removal of heavy metals, but they have several drawbacks. Therefore, there is a requirement of alternative methods that can efficiently remove heavy metals. Nanoparticles hold immense potential, and they are used as adsorbents for heavy metal removal. Due to its unique properties like high selectivity and adsorption capacity, they are effective sorbents and extensively used for heavy metal removal from wastewater. This review addresses the significant issue of global wastewater crisis. Various methods of heavy metal remediation (HMR) and wastewater treatment are discussed including the application of microbes, plants, and nanoparticles in HMR. This review also highlights real-time applications and economic aspects of HMR. It has been concluded that the application of nanomaterials both, in the existing technologies and novel methods, will help in increasing efficiency, better operational costs, and enhanced outcomes.

For details refer to https://doi.org/10.1007/s10668-020-01078-1

BIOGRAPHY

MS. SMITA KUMARI

Department of Biotechnology

Ms. Smita Kumari is a highly motivated and energetic Ph.D. research scholar working under the supervision of Prof. Pravir Kumar in the Department of Biotechnology at Delhi Technological University. Her Ph.D. research area is Modulating Tumor Microenvironment using Combinatorial Therapy. She has qualified Junior Research Fellowship (JRF)/National Eligibility Test (NET) category-I and Graduate Aptitude Test in Engineering (GATE) in 2018. Currently, she is receiving a fellowship from the Department of Biotechnology (DBT), Govt. of India, as a JRF. She had also availed scholarship from BCIL (Biotechnology Consortium India Limited), Government of India. She has also published her research work in reputed journals. She has 6 yrs of industrial research experience in the oncology-based biotechnology industry, where she has worked on multiple projects. She gained experience in mammalian cell culture, molecular biology, fluorescence microscopy, biochemistry, immunology and cell biology.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Kumari**, D. Advani, S. Sharma, R. K. Ambasta and P. Kumar, "Combinatorial therapy in tumor microenvironment: Where do we stand?", *Biochimica et Biophysica Acta (BBA) - Reviews on Cancer*, vol. 1876, no. 2, pp. 188585, 2021. Impact Factor: 10.680.

Combinatorial therapy in tumor microenvironment: Where do we stand?

Smita Kumari, Dia Advani, Sudhanshu Sharma, Rashmi K. Ambasta and Pravir Kumar

Abstract: The tumor microenvironment plays a pivotal role in tumor initiation and progression by creating a dynamic interaction with cancer cells. The tumor microenvironment consists of various cellular components, including endothelial cells, fibroblasts, pericytes, adipocytes, immune cells, cancer stem cells and vasculature, which provide a sustained environment for cancer cell proliferation. Currently, targeting tumor microenvironment is increasingly being explored as a novel approach to improve cancer therapeutics, as it influences the growth and expansion of malignant cells in various ways. Despite continuous advancements in targeted therapies for cancer treatment, drug resistance, toxicity and immune escape mechanisms are the basis of treatment failure and cancer escape. Targeting tumor microenvironment efficiently with approved drugs and combination therapy is the solution to this enduring challenge that involves combining more than one treatment modality such as chemotherapy, surgery, radiotherapy, immunotherapy and nanotherapy that can effectively and synergistically target the critical pathways associated with disease pathogenesis. This review shed light on the composition of the tumor microenvironment, interaction of different components within tumor microenvironment with tumor cells and associated hallmarks, the current status of combinatorial therapies being developed, and various growing advancements. Furthermore, computational tools can also be used to monitor the significance and outcome of therapies being developed. We addressed the perceived barriers and regulatory hurdles in developing a combinatorial regimen and evaluated the present status of these therapies in the clinic. The accumulating depth of knowledge about the tumor microenvironment in cancer may facilitate further development of effective treatment modalities. This review presents the tumor microenvironment as a sweeping landscape for developing novel cancer therapies.

For details refer to https://doi.org/10.1016/j.bbcan.2021.188585

BIOGRAPHY

PROF. YASHA HASIJA

Department of Biotechnology

Prof. Yasha Hasija (B.Tech, M.Tech, Ph.D.) is a Professor at the Department of Biotechnology, and Associate Dean of Alumni Affairs, at Delhi Technological University. Her research interests include genome informatics, genome annotation, microbial informatics, integration of genome-scale data for systems biology, and personalized genomics. Several of her works have been published in international journals of high repute, and she has made noteworthy contributions in the area of biotechnology and bioinformatics as author and editor of notable books. Her expertise, through her book chapters and conference papers, is of significance to other academic scholarship and teaching. She is also on the Editorial Board of numerous international journals. Prof. Hasija's work has brought her recognition and several prestigious awards, including Human Gene Nomenclature Award at the Human Genome Meeting (2010), held at Montpellier, France. She is the Project Investigator for several research projects sponsored by the Government of India, including DST-SERB, CSIR-OSDD, and DBT. As Prof. Hasjia continues conducting research, her passion for finding the translational implications of her findings grows.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. R. Nayak and **Y. Hasija**, "A hitchhiker's guide to single-cell transcriptomics and data analysis pipelines", *Genomics*, vol. 113, no. 2, pp. 606-619, 2021. Impact Factor: 5.736.

A hitchhiker's guide to single-cell transcriptomics and data analysis pipelines

Richa Nayak and **Yasha Hasija***

Abstract: Single-cell transcriptomics (SCT) is a tour de force in the era of big omics data that has led to the accumulation of massive cellular transcription data at an astounding resolution of single cells. It provides valuable insights into cells previously unachieved by bulk cell analysis and is proving crucial in uncovering cellular heterogeneity, identifying rare cell populations, distinct cell-lineage trajectories, and mechanisms involved in complex cellular processes. SCT data is highly complex and necessitates advanced statistical and computational methods for analysis. This review provides a comprehensive overview of the steps in a typical SCT workflow, starting from experimental protocol to data analysis, deliberating various pipelines used. We discuss recent trends, challenges, machine learning methods for data analysis, and future prospects. We conclude by listing the multitude of scRNA-seq data applications and how it shall revolutionize our understanding of cellular biology and diseases.

For details refer to https://doi.org/10.1016/j.ygeno.2021.01.007

**Corresponding Author*

BIOGRAPHY

DR. MANVENDRA VERMA

Department of Civil Engineering

Dr. Manvendra Verma has completed B.Tech in civil Engineering from UPTU Lucknow in 2014, M.Tech in structural engineering from NIT Srinagar (J&K) in 2016. In August 2016, he joined the PhD program in the Department of Civil Engineering, DTU under the supervision of Prof. Nirendra dev, and completed in October 2021 with 5 SCI paper publication on the topic "Study on Behaviour of Geopolymer Concrete".

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **M. Verma** and Nirendra Dev, "Sodium hydroxide effect on the mechanical properties of flyash-slag based geopolymer concrete", *Structural Concrete*, vol. 22, pp. E368-E379, 2021. Impact Factor: 3.131.

Sodium hydroxide effect on the mechanical properties of flyash-slag based geopolymer concrete

Manvendra Verma and Nirendra Dev

Abstract: Geopolymer concrete is an innovative, sustainable, cementless, and eco-friendly concrete that directly reduces the carbon footprints due to the total replacement of the cement from the concrete. A very excessive amount of CO_2 produces in the production of cement. In the experimental investigation, analysis of the mechanical properties or engineering properties of the GPC of the different molarity of NaOH (8–16 M), and also different Na_2SiO_3/NaOH ratio (0.5–3.0) analyses in the destructive testing of the GPC. Examine the curing temperature effect on the engineering properties of the GPC. After the experimental investigation, oven-cured specimens got a higher engineering strength compared to the ambient-cured specimens of the same mix designs. The 14 M mix design got the optimum point for engineering strength among the various molar concentrated mix designs. In the case of the alkaline ratio, the 2.5 got the optimum point of the engineering strength among all ratios of the sodium silicate to sodium hydroxide. The highest compressive strength, splitting tensile, and flexural strength in the all mix designs got are 35.7 N/mm^2, 5.2 N/mm^2, and 5.6 N/mm^2 respectively at 56 days after oven-curing. Based on results, proposed the correlation equation between the splitting strength and compressive strength and equation between the flexural strength and compressive strength.

For details refer to https://doi.org/10.1002/suco.202000068

BIOGRAPHY

PROF. RAJU SARKAR

Department of Civil Engineering

Prof. Raju Sarkar currently works at the Department of Civil Engineering, Delhi Technological University. He is also Chair of Commission on Education and Outreach, International Association of Seismology and Physics of Earth Interior (IASPEI-IUGG). He is involved as PI/Co-PI/Co-I of number of research projects funded by ICSU, GCRF-UK, World Bank, RAS-UK, DHI-RGoB. He has keen interest on Geo-hazards Risk Managements, Seismology, Construction Engineering and Community Resilience, Vulnerability and Risk Assessment and Disaster Management Education.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	06

1. S. Saha, **R. Sarkar**, G. Thapa and J. Roy, "Modeling gully erosion susceptibility in Phuentsholing, Bhutan using deep learning and basic machine learning algorithms", *Environmental Earth Sciences*, vol. 80, no. 295, 2021. Impact Factor: 2.784.
2. T. K. Saha, S. Pal and **R. Sarkar**, "Prediction of wetland area and depth using linear regression model and artificial neural network based cellular automata", *Ecological Informatics*, vol. 62, pp. 101272, 2021. Impact Factor: 3.142.
3. M. Das, A. Das, **R. Sarkar**, S. Saha and P. Mandal, "Regional scenario of air pollution in lockdown due to COVID-19 pandemic: Evidence from major urban agglomerations of India", *Urban Climate*, vol. 37, pp. 100821, 2021. Impact Factor: 5.731.
4. M. Das, A. Das, **R. Sarkar**, P. Mandal, S. Saha and S. Ghosh, "Exploring short term spatio-temporal pattern of $PM_{2.5}$ and PM_{10} and their relationship with meteorological parameters during COVID-19 in Delhi", *Urban Climate*, vol. 39, pp. 100944, 2021. Impact Factor: 5.731.
5. M. Das, A. Das, B. Giri, **R. Sarkar** and S. Saha, "Habitat vulnerability in slum areas of India – What we learnt from COVID-19?", *International Journal of Disaster Risk Reduction*, vol. 65, pp. 102553, 2021. Impact Factor: 4.320.
6. M. Das, A. Das, S. Ghosh, **R. Sarkar** and S. Saha, "Spatio-temporal concentration of atmospheric particulate matter ($PM_{2.5}$) during pandemic: A study on most polluted cities of indo-gangetic plain", *Urban Climate*, vol. 35, pp. 100758, 2021. Impact Factor: 5.731.

Modeling gully erosion susceptibility in Phuentsholing, Bhutan using deep learning and basic machine learning algorithms

Sunil Saha, **Raju Sarkar***, Gautam Thapa and Jagabandhu Roy

Abstract: The present study attempts to demarcate the areas susceptible to gully erosion in Phuentsholing, Bhutan, using Deep Learning CNN (convolution neural network) and artificial neuron network (ANN), Support Vector Machine (SVM) and maximum entropy, three basic machine learning techniques in the GIS setting. Application of deep learning technique is new in the field of gully erosion. Considering the 240 gully pixels and seventeen gully erosion conditioning factors (GECFs), the gully erosion susceptibility maps (GESMs) were prepared. Out of the 240 gully pixels, 70% were used as training datasets and 30% were used as validation datasets for modeling and judging the GESMs. The GECFs were selected based on the previous literatures and multi-collinearity test. The importance of the GECFs was assessed by the chi-square attribute evaluation (CSEA) and random forest (RF) methods. Finally, applying the receiver operating characteristics' area under curve (AUC-ROC), RMSE, MAE and R-index, the robustness of the GESMs was evaluated and compared. The GESMs were classified using natural break classification method into very high, high, moderate, low and very low susceptible classes. Nearly, 20% of the study area has very high susceptibility to gully erosion. As per the results of CSEA and RF methods, sand concentration, land use\cover and altitudes have the largest contribution in making the area very susceptible to gully erosion. Results of the validation techniques recognized the entire selected model as accurate and robust. Among the selected models, the capability of CNN model (AUC = 0.910, MAE = 0.029, RMSE = 0.171 for training data and AUC = 0.929, MAE = 0.089, RMSE = 0.299 for testing data) in predicting the gully erosion susceptibility is higher than other models. The produced GESMs will be helpful to the researchers as well as decision makers in establishing gully erosion management strategies.

For details refer to https://doi.org/10.1007/s12665-021-09599-2

Prediction of wetland area and depth using linear regression model and artificial neural network based cellular automata

Tamal Kanti Saha, Swades Pal and **Raju Sarkar***

Abstract: Wetlands are an integral part of the socio-ecological setup of the earth, but their fast transformation beg careful consideration. In this regard, the flood plain wetlands of the Atreyee river basin of India and Bangladesh are not exceptional. The main goal of this study is the mapping of the floodplain wetlands, along with arriving at predictions of their area up to 2039 using the advanced technique of artificial neural network based cellular automata (ANN-CA). Apart from this, prediction of wetland depth using linear regression model is another aim of the present research work. The analysis is executed using 27 Landsat images and Digital Elevation Model (DEM). Results reveal that the present wetland area is 52.92 km^2 in pre-monsoon and 518.68 km^2 in post-monsoon season, respectively. The composite wetland map from 1987 to 2019 of post-monsoon clearly indicates that 10.48km^2 wetlands are identified as hydro-ecologically consistent wetlands. Simulated models reveal that the wetland area from 2009 to 2019 has declined by 66.16km^2 and is expected to decrease by 164.62km^2 in the next 20 years. Normalized Difference Water Index (NDWI) depth indicates that water availability also may decline significantly in the next 20 years as per regression model-based simulation. All the simulated models were validated with observed wetland area by kappa coefficient, receiver operating curve. The present study will definitely be useful for decision-makers by aiding them in initiatives that take a significant step toward maintaining the wetland landscape, as well as the environment.

For details refer to https://doi.org/10.1016/j.ecoinf.2021.101272

*Corresponding Author

Regional scenario of air pollution in lockdown due to COVID-19 pandemic: Evidence from major urban agglomerations of India

Manob Das, Arijit Das, **Raju Sarkar***, Sunil Saha and Papiya Mandal

Abstract: Air pollution in India during COVID-19 lockdown, which imposed on 25th March to 31st May 2020, has brought a significant improvement in air quality. The present paper mainly focuses on the scenario of air pollution level ($PM_{2.5}$, PM_{10}, SO_2, NO_2 and O_3) across 57 urban agglomerations (UAs) of India during lockdown. For analysis, India has been divided into six regions - Northern, Western, Central, Southern, Eastern and North-Eastern. Various spatial statistical modelling with composite air quality index (CAQI) have been utilised to examine the spatial pattern of air pollution level. The result shows that concentration of all air pollutants decreased significantly (except O_3) during lockdown. The maximum decrease is the concentration of NO_2 (40%) followed by $PM_{2.5}$ (32%), PM_{10} (24%) and SO_2 (18%). Among 57 UA's, only five - Panipat (1.00), Ghaziabad (0.76), Delhi (0.74), Gurugram (0.72) and Varanasi (0.71) had least improvement in air pollution level considering entire lockdown period. The outcome of this study has an immense scope to understand the regional scenario of air pollution level and to implement effective strategies for environmental sustainability.

For details refer to https://doi.org/10.1016/j.uclim.2021.100821

Exploring short term spatio-temporal pattern of $PM_{2.5}$ and PM_{10} and their relationship with meteorological parameters during COVID-19 in Delhi+

Manob Das, Arijit Das, **Raju Sarkar***, Papiya Mandal, Sunil Saha and Sasanka Ghosh

Abstract: Present study aims to examine the impact of lockdown on spatio-temporal concentration of $PM_{2.5}$ and PM_{10} - categorized and recorded based on its levels during pre-lockdown, lockdown and unlock phases while noting the relationship of these levels with meteorological parameters (temperature, wind speed, relative humidity, rainfall, pressure, sun hour and cloud cover) in Delhi. To aid the study, a comparison was made with the last two years (2018 to 2019), covering the same periods of pre-lockdown, lockdown and unlock phases of 2020. Correlation analysis, linear regression (LR) was used to examine the impact of meteorological parameters on particulate matter (PM) concentrations in Delhi, India. The findings showed that (i) substantial decline of PM concentration in Delhi during lockdown period, (ii) there were substantial seasonal variation of particulate matter concentration in city and (iii) meteorological parameters have close associations with PM concentrations. The findings will help planners and policy makers to understand the impact of air pollutants and meteorological parameters on infectious disease and to adopt effective strategies for future.

For details refer to https://doi.org/10.1016/j.uclim.2021.100944

*Corresponding Author
+Eligible for Certificate only

Habitat vulnerability in slum areas of India – What we learnt from COVID-19?+

Manob Das, Arijit Das, Biplab Giri, **Raju Sarkar*** and Sunil Saha

Abstract: UN-Habitat identified the present COVID-19 pandemic as 'city-centric'. In India, more than 50% of the total cases were documented in megacities and million-plus cities. The slums of cities are the most vulnerable due to its unhygienic environment and high population density that requires an urgent implementation of public healthcare measures. This study aims to examine habitat vulnerability in slum areas to COVID-19 in India using principal component analysis and Fuzzy AHP based technique to develop slum vulnerability index to COVID-19 ($SVI_{covid-19}$). Four slum vulnerability groups (i.e. principal components) were retained with eigen-values greater than 1 based on Kaiser criterion - poor slum household status; lack of social distance maintenance; high concentrations of slum population and towns and mobility of the households. This study also mapped composite $SVI_{covid-19}$ on the basis of PCA and Fuzzy AHP method at the state level for a better understanding of spatial variations. The result shows that slums located in the eastern and central parts of India (particularly Uttar Pradesh, Bihar, Jharkhand, Odisha, West Bengal) were more vulnerable to COVID-19 transmission due to lack of availability as well as accessibility to the basic services and amenities to slum dwellers. Thus, the findings of the study may not only help to understand the habitat vulnerability in slum areas to COVID-19 but it will also teach a lesson to implement effective policies for enhancing the quality of slum households (HHs) and to reduce the health risk from any infectious disease in future.

For details refer to https://doi.org/10.1016/j.ijdrr.2021.102553

Spatio-temporal concentration of atmospheric particulate matter ($PM_{2.5}$) during pandemic: A study on most polluted cities of indo-gangetic plain+

Manob Das, Arijit Das, Sasanka Ghosh, **Raju Sarkar*** and Sunil Saha

Abstract: COVID-19 pandemic exhibited the entire world two aspects: human threats and environmental restoration. Due to pandemic, the nationwide lockdown in India imposed on 25 March and continued till 31 May 2020 in different phases. Again partial withdrawl of restrictions started from UnlockI (1–30 June 2020) to revive the Indian economy partially. The present research focused to assess impact of lockdown on the concentration of particulate matter ($PM_{2.5}$) across the ten most polluted cities of Indo-Gangetic Plain of India alongwith incorporation of spatial distribution of $PM_{2.5}$hotspots. It observed that during lockdown, the average concentration of $PM_{2.5}$($\mu g/m^3$) across the cities decreased from 197 to 79 which is decrease of 60% since pre lockdown. In January 2020, the cities under considerations were in the category of 'severe' air quality index (AQI) but from March no cities fall under this category. The hotspot maps showed that in last three years (2017–2019), relatively higher concentration of $PM_{2.5}$ was observed mostly around Delhi NCR but during same period of 2020 (lockdown and Unlock I), this concentartion decreased substantially. The findings of the study suggest that only by effective policies like short term lockdown, implementation of odd and even number motor vehicles, relocation of polluted industries need to be implemented by central and state governmental authorities to achive environmental sustainability.

For details refer to https://doi.org/10.1016/j.uclim.2020.100758

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

DR. RITU RAJ

Department of Civil Engineering

Dr. Ritu Raj is working as an Assistant Professor in the Department of Civil Engineering Department, DTU. He has published more than 50 technical papers in reputed journal and international conferences. He has supervised no. of students at the level of graduates, postgraduates, and doctorates. His research interest includes behavior of wind load on the response of tall building, Aerodynamics Study, aero-elastic model study inside BLWT, Behavior of high strength concrete with and without fiber, earthquake engineering. He has more than 7.5 years of graduate and post-graduate teaching experience. He is areas of specializations are Structure Engineering, Strength of Materials, Steel Structures and Design of Tall Buildings.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. S. Pal and **R. Raj**, "Evaluation of Wind Induced Interference Effects on Shape Remodeled Tall Buildings", *Arabian Journal for Science and Engineering*, vol. 46, pp. 11425–11445, 2021. Impact Factor: 2.334.
2. S. Pal, **R. Raj** and S. Anbukumar, "Comparative study of wind induced mutual interference effects on square and fish-plan shape tall buildings", *Sādhanā*, vol. 46, no. 86, 2021. Impact Factor: 1.188.

Evaluation of Wind Induced Interference Effects on Shape Remodeled Tall Buildings

Supriya Pal and **Ritu Raj***

Abstract: The present work focuses on the outcome of experimental investigation of wind-induced pressure on Square, Fish-plan shape-1, and Fish-plan shape-2 building models under various interference conditions. The tests are carried out in a boundary layer wind tunnel with a scale of 1:300 for 100 percent blockage between twin interfering models. The gap between the twin building models is set at 10% of the principal model's height. By proposing equations, an attempt is made to understand the distribution of the average pressure coefficient at each level along with the building height for all surfaces. The study concludes that $-1 >$ Pressure Interference Factor > 1 as experienced by Fish-shape models exhibits increased pressure and suction due to the presence of interfering building model which is unlike Square-plan shape model at present working condition. For complex plan-shaped structures at interference conditions, the study of only the Interference factor (IF) is misleading, and hence, the study of both IF and ID (Interference Difference) is suggested. In interference tests, the Fish-plan shape-1 model shows enhanced overturning moment (along-wind) performance for all interference conditions. For the Fish-plan shape-2 model, diminished overturning moment (along-wind) performance is determined for Back-to-Front and Front-to-Front interference conditions.

For details refer to https://doi.org/10.1007/s13369-021-05923-x

Comparative study of wind induced mutual interference effects on square and fish-plan shape tall buildings

Supriya Pal, **Ritu Raj*** and S Anbukumar

Abstract: This paper deals with comparative study of wind-induced mutual interference effects on twin Square and Fish- plan shape building models having equal volume. Wind induced pressure and force is measured through experiments under boundary layer wind tunnel for interference and isolated wind incidence condition with building model of scale 1:300. For isolated condition's study two wind incidences i.e. 0^0 and 180^0 is considered whereas; for interference conditions five different orientation of twin interfering building models are considered. The distance between the twin building models is fixed at 10% of the height of principal model. The variation of coefficient of wind pressure on different surfaces of the model is shown by contour plots. To examine the mean variation along the faces Face-Average C_p has been calculated, plotted and discussed to a great extent. The interference study is done in order to understand the effects of different conditions that can arise in real life situations and the differences associated with them. The concluding remarks states the dominance of Drag and Lift forces at isolated 0^0 and 180^0 wind incidences for Fish- plan shape model and at isolated 0^0 wind direction at Square shape model. Also, the overall efficiency in terms of Base shear of principal building is enhanced due to interference effect; with maximum efficiency exhibited by Back-to-Back wind interference condition when only Fish- plan shape model is considered. Overall, maximum efficiency in terms of induced wind pressure and base shear is exhibited by Square- plan shape model at Full Blockage condition.

For details refer to https://doi.org/10.1007/s12046-021-01592-6

*Corresponding Author

BIOGRAPHY

MR. SAGAR MEHRA

Department of Civil Engineering

Mr. Sagar Mehra is a PhD candidate in the Department of Civil Engineering, DTU, Delhi, India. He has obtained his Bachelor of Engineering from the University of Pune (Gold Medalist) and his Masters of Engineering from Delhi College of Engineering, Department of Civil Engineering, University of Delhi, Delhi. He has expertise in working on ETABS, SAFE, SAP, STAAD-PRO, ABAQUS. His current interest includes tall buildings, deep foundations, and application of torque on pile groups. He has served in varied multinational organizations as a structural engineer in India as well abroad. He has visited UAE and China to support the civil engineering activities.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01

1. **S. Mehra** and A. Trivedi, "Pile Groups Subjected to Axial and Torsional Loads in Flow-Controlled Geomaterial", *International Journal of Geomechanics*, vol. 21, no. 3, pp. 04021002, 2021. Impact Factor: 3.819.

Pile Groups Subjected to Axial and Torsional Loads in Flow-Controlled Geomaterial

Sagar Mehra and Ashutosh Trivedi

Abstract: The pile groups were used as a foundation for complex structures experiencing large axial, lateral, and torsional loads. As a result, they undergo vertical, lateral, and eccentric movements. Moreover, there were several studies on piles and pile groups under axial and lateral loads, but the solutions for pile groups subjected to combined axial and torsional loads were largely elusive. Therefore, a novel numerical scheme was presented to capture the nonlinear pile–soil interaction in a flow-controlled geomaterial to make allowance for the yield effects. Based on the numerical scheme, a three-dimensional finite-element analysis was performed on pile groups subjected to combined axial and torsional loads in the flow-controlled geomaterial using a computational program. The flow potential for the yield surface of the flow-controlled geomaterial is a hyperbolic function of stresses in the meridional stress plane and the smooth elliptic function in the deviatoric stress plane. The load–displacement relationship of a large diameter pile (LDP) and pile groups (1,2 and 2,2) was compared with the experimental pile load test and the numerical results reported in the literature. It was observed that the resultant displacement increases significantly with the torsional load for the LDP and pile groups. Similarly, the twist increases significantly with an increase in the axial load. The displacement and twist parameters were classified based on the plastic strain and dilation angle of the geomaterial.

For details refer to https://doi.org/10.1061/(ASCE)GM.1943-5622.0001928

BIOGRAPHY

MS. SUPRIYA PAL

Department of Civil Engineering

Ms. Supriya Pal is a fourth year doctoral student in Structural Engineering in the Department of Civil Engineering at Delhi Technological Student, working under Dr. Ritu Raj and Prof. S. Anbukumar. The thesis title is EFFECTS OF WIND INDUCED PRESSURE ON TALL BUILDINGS WITH VARIOUS GEOMETRIES. Her major research interest is in Structural Engineering- Wind Engineering, Wind loads on Structures and Computational Fluid Dynamics. She has published a number of research papers in reputed journals.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **S. Pal**, R. Raj and S. Anbukumar, "Comparative study of wind induced mutual interference effects on square and fish-plan shape tall buildings", *Sādhanā*, vol. 46, no. 86, 2021. Impact Factor: 1.188.

2. **S. Pal** and R. Raj, "Evaluation of Wind Induced Interference Effects on Shape Remodeled Tall Buildings", *Arabian Journal for Science and Engineering*, vol. 46, pp. 11425–11445, 2021. Impact Factor: 2.334.

Comparative study of wind induced mutual interference effects on square and fish-plan shape tall buildings

Supriya Pal, Ritu Raj and S Anbukumar

Abstract: This paper deals with comparative study of wind-induced mutual interference effects on twin Square and Fish- plan shape building models having equal volume. Wind induced pressure and force is measured through experiments under boundary layer wind tunnel for interference and isolated wind incidence condition with building model of scale 1:300. For isolated condition's study two wind incidences i.e. 0^0 and 180^0 is considered whereas; for interference conditions five different orientation of twin interfering building models are considered. The distance between the twin building models is fixed at 10% of the height of principal model. The variation of coefficient of wind pressure on different surfaces of the model is shown by contour plots. To examine the mean variation along the faces Face-Average C_p has been calculated, plotted and discussed to a great extent. The interference study is done in order to understand the effects of different conditions that can arise in real life situations and the differences associated with them. The concluding remarks states the dominance of Drag and Lift forces at isolated 0^0 and 180^0 wind incidences for Fish- plan shape model and at isolated 0^0 wind direction at Square shape model. Also, the overall efficiency in terms of Base shear of principal building is enhanced due to interference effect; with maximum efficiency exhibited by Back-to-Back wind interference condition when only Fish- plan shape model is considered. Overall, maximum efficiency in terms of induced wind pressure and base shear is exhibited by Square- plan shape model at Full Blockage condition.

For details refer to https://doi.org/10.1007/s12046-021-01592-6

Evaluation of Wind Induced Interference Effects on Shape Remodeled Tall Buildings

Supriya Pal and Ritu Raj

Abstract: The present work focuses on the outcome of experimental investigation of wind-induced pressure on Square, Fish-plan shape-1, and Fish-plan shape-2 building models under various interference conditions. The tests are carried out in a boundary layer wind tunnel with a scale of 1:300 for 100 percent blockage between twin interfering models. The gap between the twin building models is set at 10% of the principal model's height. By proposing equations, an attempt is made to understand the distribution of the average pressure coefficient at each level along with the building height for all surfaces. The study concludes that $-1 >$ Pressure Interference Factor > 1 as experienced by Fish-shape models exhibits increased pressure and suction due to the presence of interfering building model which is unlike Square-plan shape model at present working condition. For complex plan-shaped structures at interference conditions, the study of only the Interference factor (IF) is misleading, and hence, the study of both IF and ID (Interference Difference) is suggested. In interference tests, the Fish-plan shape-1 model shows enhanced overturning moment (along-wind) performance for all interference conditions. For the Fish-plan shape-2 model, diminished overturning moment (along-wind) performance is determined for Back-to-Front and Front-to-Front interference conditions.

For details refer to https://doi.org/10.1007/s13369-021-05923-x

BIOGRAPHY

DR. AKSHI KUMAR

Department of Computer Science and Engineering

Dr. Akshi Kumar is an Associate Professor in the Dept. of IT, Netaji Subhas University of Technology, Delhi, India. She is a Post-doc from Federal Institute of Education, Science and Technology, CearÃ¡, Fortaleza, Brazil and PhD from Faculty of Technology, University of Delhi, India. She was an Assistant Professor at the Delhi Technological University, Delhi, India from Aug 2008-Aug 2021. Dr. Kumar name has been included in the Top 2% scientist of the world list by Stanford University, USA in 2021. She is a recipient of Commendable Research Award for Excellence in Research at DTU, 2019, 2020, 2021 and "VIWA Outstanding Women in Engineering (CSE)" Award, 2020. Dr. Kumar has authored a monograph ˜Web Technology: Theory and Practice published by CRC Press, Taylor and Francis Group and edited a book with Springer. She has published 76 peer-reviewed journal papers, 65 conference papers with 4 best paper awards and 2 patents published with Indian Patent Office. She has successfully guided 5 doctorate and 32 M.Tech. thesis. She has also accomplished productive collaborative research with grants of approximately $7000 from various international funding agencies. Her research interests are in the area of affective computing, social media analytics, NLP and pervasive healthcare.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	02
Commendable Research Award	04

1. **A. Kumar** and A. Jaiswal, "A deep swarm-optimized model for leveraging industrial data analytics in cognitive manufacturing", *IEEE Transactions on Industrial Informatics*, vol. 17, no. 4, pp.2938-2946, 2021. Impact Factor: 10.215.
2. **A. Kumar**, K. Sharma and A. Sharma, "Genetically optimized Fuzzy C-means data clustering of IoMT-based biomarkers for fast affective state recognition in intelligent edge analytics", *Applied Soft Computing*, vol. 109, pp. 107525, 2021. Impact Factor: 6.725.
3. **A. Kumar**, K. Sharma and A. Sharma, "Hierarchical deep neural network for mental stress state detection using IoT based biomarkers", *Pattern Recognition Letters*, vol. 145, pp. 81-87, 2021. Impact Factor: 3.756.
4. D. Gupta, M. P. S. Bhatia and **A. Kumar**, "Resolving Data Overload and Latency Issues in Multivariate Time-Series IoMT Data for Mental Health Monitoring", *IEEE Sensors Journal*, vol. 21, no. 22, pp. 25421 – 25428, 2021. Impact Factor: 3.301.
5. **A. Kumar** and V. H. C. Albuquerque, "Sentiment Analysis Using XLM-R Transformer and Zero-shot Transfer Learning on Resource-poor Indian Language", *ACM Transactions on Asian and Low-Resource Language Information Processing*, vol. 20, no. 5, pp. 1-13, 2021. Impact Factor: 1.413.
6. **A. Kumar** and Sahil Raheja, "Edge Detection in Digital Images Using Guided L_0 Smoothen Filter and Fuzzy Logic", *Wireless Personal Communications*, vol. 121, pp. 2989–3007, 2021. Impact Factor: 1.671.

A deep swarm-optimized model for leveraging industrial data analytics in cognitive manufacturing

Akshi Kumar and Arunima Jaiswal

Abstract: To compete in the current data-driven economy, it is essential that industrial manufacturers leverage real-time tangible information assets and embrace big data technologies. Data classification is one of the most proverbial analytical techniques within the cognitively capable manufacturing industries for finding the patterns in the structured and unstructured data at the plant, enterprise, and industry levels. This article presents a cognition-driven analytics model, CNN-WSADT, for the real-time data classification using three soft computing techniques, namely, deep learning [convolution neural network (CNN)], machine learning [decision tree (DT)], and swarm intelligence [wolf search algorithm (WSA)]. The proposed deep swarm-optimized classifier is a feature-boosted DT, which learns features using a deep convolution net and an optimal feature set built using a metaheuristic WSA. The performance of CNN-WSADT is studied on two benchmark datasets and the experimental results depict that the proposed cognition model outperforms the other considered algorithms in terms of the classification accuracy.

For details refer to https://doi.org/10.1109/TII.2020.3005532

Genetically optimized Fuzzy C-means data clustering of IoMT-based biomarkers for fast affective state recognition in intelligent edge analytics

Akshi Kumar, Kapil Sharma and Aditi Sharma

Abstract: IoMT sensors such as wearables, moodables, ingestible sensors and trackers have the potential to provide a proactive approach to healthcare. But grouping, traversing and selectively tapping the IoMT data traffic and its immediacy makes data management & decision analysis a pressing issue. Evidently, the selection process for real-world, time-constrained health problems involves looking at multivariate time-series data generated simultaneously from various wearables resulting in data overload and accuracy issues. Computational intelligence of edge analytics can extend predictive capability by quickly turning digital biomarker data into actions for remote monitoring and trigger alarm during emergency incidents without relying on backend servers. But the pervasive generation of data streams from IoMT levies significant issues in data visualization and exploratory data analysis. This paper presents a genetically optimized Fuzzy C-means data clustering technique for affective state recognition on the edge. Clustering segregates the biomarker data in chunks and generates a summarized data for each subject which is then genetically optimized to avoid stagnation in local optima. A multi-level convolution neural network is finally used to classify the affective states into the baseline, stress and amusement categories. The model is evaluated on the publicly available WESAD dataset and compares favorably to state-of-the-art with less time complexity. It demonstrates the use of data clustering technique for numerosity reduction of real-time data streams in intelligent edge analytics which facilitates fast analysis of affective state of the user.

For details refer to https://doi.org/10.1016/j.asoc.2021.107525

Hierarchical deep neural network for mental stress state detection using IoT based biomarkers

Akshi Kumar, Kapil Sharma and Aditi Sharma

Abstract: Affective state recognition at an early stage can help in mood stabilization, stress and depression management for mental well-being. Pro-active and remote mental healthcare warrants the use of various biomarkers to detect the affective mental state of the individual by evaluating the daily activities. With the easy accessibility of IoT-based sensors for healthcare, observable and quantifiable characteristics of our body, physiological changes in the body can be measured and tracked using various wearable devices. This work puts forward a model for mental stress state detection using sensor-based bio-signals. A multi-level deep neural network with hierarchical learning capabilities of convolution neural network is proposed. Multivariate time-series data consisting of both wrist-based and chest-based sensor bio-signals is trained using a hierarchy of networks to generate high-level features for each bio-signal feature. A model-level fusion strategy is proposed to combine the high-level features into one unified representation and classify the stress states into three categories as baseline, stress and amusement. The model is evaluated on the WESAD benchmark dataset for mental health and compares favourably to state-of-the-art approaches giving a superlative performance accuracy of 87.7%.

For details refer to https://doi.org/10.1016/j.patrec.2021.01.030

Resolving Data Overload and Latency Issues in Multivariate Time-Series IoMT Data for Mental Health Monitoring

Divya Gupta, M. P. S. Bhatia and **Akshi Kumar***

Abstract: Pervasive healthcare services have evolved substantially in the recent years with IoMT rapidly changing the pace and scale of healthcare delivery. A promising application of IoMT is to fetch patterns of mental behaviour symptomatology based on bio-signals and transfer it to the corresponding hospital or psychologist for remote monitoring. But the data volume & performance, device diversity & interoperability, hacking & unauthorized use and acceptance & adoption barriers still restrain the practical and competent use of these devices. This research presents a plausible solution to surmount the data overload and processing latency in real-time sensory data collected through wearable devices for mental health monitoring. We propose a modified k-medoid data clustering technique based on time-frame restricted intra-cluster similarity calculations to obtain a summarized version of the original benchmark WESAD dataset for which the degree of information lost is minimum. A CNN is then trained on this summarized dataset for classification of mental state into the baseline, stress and amusement categories. The results show a significant reduction in the average execution time by 34% with a comparable accuracy to the original dataset, thus offering prompt real-time healthcare analytics.

For details refer to 10.1109/JSEN.2021.3095853

*Corresponding Author

Sentiment Analysis Using XLM-R Transformer and Zero-shot Transfer Learning on Resource-poor Indian Language

Akshi Kumar and Victor Hugo C. Albuquerque

Abstract: Sentiment analysis on social media relies on comprehending the natural language and using a robust machine learning technique that learns multiple layers of representations or features of the data and produces state-of-the-art prediction results. The cultural miscellanies, geographically limited trending topic hash-tags, access to aboriginal language keyboards, and conversational comfort in native language compound the linguistic challenges of sentiment analysis. This research evaluates the performance of cross-lingual contextual word embeddings and zero-shot transfer learning in projecting predictions from resource-rich English to resource-poor Hindi language. The cross-lingual XLM-RoBERTa classification model is trained and fine-tuned using the English language Benchmark SemEval 2017 dataset Task 4 A and subsequently zero-shot transfer learning is used to evaluate the classification model on two Hindi sentence-level sentiment analysis datasets, namely, IITP-Movie and IITP-Product review datasets. The proposed model compares favorably to state-of-the-art approaches and gives an effective solution to sentence-level (tweet-level) analysis of sentiments in a resource-poor scenario. The proposed model compares favorably to state-of-the-art approaches and achieves an average performance accuracy of 60.93 on both the Hindi datasets.

For details refer to https://doi.org/10.1145/3461764

Edge Detection in Digital Images Using Guided L_0 Smoothen Filter and Fuzzy Logic+

Akshi Kumar and Sahil Raheja

Abstract: Image segmentation is an important process in computer vision. Recently fuzzy logic based edge detection is heavily investigated as by changing the number of rules edge detection can be improved. However, due to large colour variations in the images false edges are detected and even using fuzzy rules they cannot be reduced significantly. These falsely detected edges can be controlled by using smoothen filter while controlling the degree of smoothness. This paper, presents fuzzy logic based edge detection mechanism while using Guided L_0 smoothen filter for the smoothening of image under various degree of smoothens. Simulation results for edge detection is presented for Canny, Sobel, Fuzzy logic based edge detection and finally fuzzy logic edge detection with inclusion of L_0 smoothen filter. The results are compared with classical and modern methods. Simulation is performed on Berkley Segmentation Database (BSD) and USC-SIPI Image Database while considering more than 100 images. The obtained F-measure is as high as 0.848.

For details refer to https://doi.org/10.1007/s11277-021-08860-y

+Eligible for Certificate only

BIOGRAPHY

MS. AMRITA SISODIA

Department of Computer Science and Engineering

Ms. Amrita Sisodia received her master's degree in Information Technology in 2016 from Guru Gobind Singh Indraprastha University, Delhi. Presently, she is pursuing PhD in Computer Science from Delhi Technology University as Teaching Cum Research Fellow (TRF) since 2017. She is working in the area of big data, healthcare, machine learning and data analytics. She has published research articles in peer reviewed international journals. In addition to this, she has published one book chapter and many articles in international conferences.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Sisodia** and R. Jindal, "A meta-analysis of industry 4.0 design principles applied in the health sector", *Engineering Applications of Artificial Intelligence*, vol. 104, pp. 104377, 2021. Impact Factor: 6.212.

A meta-analysis of industry 4.0 design principles applied in the health sector

Amrita Sisodia and Rajni Jindal

Abstract: The approach of health 4.0 is driven out from the well-known industry 4.0. The goal of industry 4.0 is to bring a revolution in the manufacturing sector by digitization. The future of health management will become timelier and more personalized as new technologies will empower individuals to conduct their health monitoring by using cyber–physical systems. The design principles of industry 4.0 connect the physical and virtual world in real-time. Virtualization in health happens after the emergence of Information and Communication Technologies (ICT). For this 5G, the next-generation mobile network provides ambient intelligence for orchestration of medical services so that government and private companies can reconsider health prospects. These technological developments in healthcare, big data and industry 4.0 are individually attracting the huge attention of academics and industries. However, a detailed study of big data and industry 4.0 together concerning healthcare is still not present in the existing literature. The main contribution of this article is to present a meta-analytic approach to interpret, integrate and critically investigate the findings of original articles. This study expounds a novel approach for achieving effectual and comparable results related to the explained research problems. The results summarize about the standards used in main research directions, and existing deficiencies present in this area. The findings of this systematic literature review (SLR) can be helpful as future guidelines to researchers and practitioners working in the area of health 4.0 and related topics.

For details refer to https://doi.org/10.1016/j.engappai.2021.104377

BIOGRAPHY

PROF. ANIL SINGH PARIHAR

Department of Computer Science and Engineering

Dr. Anil Singh Parihar is a Professor in the Discipline of Computer Engineering, Department of Computer Science & Engineering, Delhi Technological University (formerly Delhi College of Engineering), Delhi, India. Earlier he worked as an Assistant Professor in the Department of Information Technology, Delhi Technological University), Delhi, India. He received his Bachelor of Technology degree in Electronics & Communication Engineering from the U. P. Technical University, Lucknow, Master of Engineering degree in Electronics & Communication Engineering from Delhi College of Engineering, Delhi, India, and PhD degree from Delhi Technological University, Delhi, India. He has authored several research papers in international journal and conferences of high repute including IEEE transactions on Fuzzy Systems and IEEE transactions on Image Processing. His research area includes Machine Learning, Deep Learning, Pattern Recognition, Computer Vision, Digital Image Processing, Biometric Security, Evolutionary Computing, and Artificial Intelligence.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. **A. S. Parihar**, J. Pal and I. Sharma, "Multiview video summarization using video partitioning and clustering", *Journal of Visual Communication and Image Representation*, vol. 74, pp. 102991, 2021. Impact Factor: 2.678.
2. **A. S. Parihar**, G. Jain, S. Chopra and S. Chopra, "SketchFormer: transformer-based approach for sketch recognition using vector images", *Multimedia Tools and Applications*, vol. 80, pp. 9075–9091, 2021. Impact Factor: 2.757.
3. **K. Singh** and A. S. Parihar, "Variational optimization based single image dehazing", *Journal of Visual Communication and Image Representation*, vol. 79, pp. 103241, 2021. Impact Factor: 2.678.

Multiview video summarization using video partitioning and clustering

Anil Singh Parihar, Joyeeta Pal and Ishita Sharma

Abstract: Multiview video summarization plays a crucial role in abstracting essential information form multiple videos of the same location and time. In this paper, we propose a new approach for the multiview summarization. The proposed approach uses the BIRCH clustering algorithm for the first time on the initial set of frames to get rid of the static and redundant. The work presents a new approach for shot boundary detection using frame similarity measures Jaccard and Dice. The algorithm performs effectively synchronized merging of keyframes from all camera-views to obtain the final summary. Extensive experimentation conducted on various datasets suggests that the proposed approach significantly outperforms most of the existing video summarization approaches. To state a few, a 1.5% improvement on video length reduction, 24.28% improvement in compression ratio, and 6.4% improvement in quality assessment ratio is observed on the lobby dataset.

For details refer to https://doi.org/10.1016/j.jvcir.2020.102991

SketchFormer: transformer-based approach for sketch recognition using vector images

Anil Singh Parihar, Gaurav Jain, Shivang Chopra and Suransh Chopra

Abstract: Sketches have been employed since the ancient era of cave paintings for simple illustrations to represent real-world entities and communication. The abstract nature and varied artistic styling make automatic recognition of these drawings more challenging than other areas of image classification. Moreover, the representation of sketches as a sequence of strokes instead of raster images introduces them at the correct abstract level. However, dealing with images as a sequence of small information makes it challenging. In this paper, we propose a Transformer-based network, dubbed as AttentiveNet, for sketch recognition. This architecture incorporates ordinal information to perform the classification task in real-time through vector images. We employ the proposed model to isolate the discriminating strokes of each doodle using the attention mechanism of Transformers and perform an in-depth qualitative analysis of the isolated strokes for classification of the sketch. Experimental evaluation validates that the proposed network performs favorably against state-of-the-art techniques.

For details refer to https://doi.org/10.1007/s11042-020-09837-y

Variational optimization based single image dehazing

Kavinder Singh and **Anil Singh Parihar***

Abstract: In this paper, we present a new approach for single image dehazing based on the proposed variational optimization. A hazy image captures the information about haze in terms of the transmission map and object details present in it. We propose to estimate the initial transmission map by performing the structure-aware smoothing of the hazy image. Further, we formulated a variational optimization for the estimation of final transmission, which refines the initial transmission of a hazy image. Atmospheric light can be considered to be constant throughout the scene for practical purposes. The uniform atmospheric light is computed from the dark channel of a hazy image. The exhaustive experimentation shows that the performance of the proposed method is comparable or better.

For details refer to https://doi.org/10.1016/j.jvcir.2021.103241

*Corresponding Author

BIOGRAPHY

MR. ARKA BHOWMIK

Department of Computer Science and Engineering

Mr. Arka Bhowmik completed M.Tech. (2017-2019) in the field of Computer Science and Engineering, from Delhi Technological University. In his academic years he contributed towards multiple projects and publications related to Deep Learning and social networks. Currently he is working as a software engineer with expertise in backend distributed systems, cloud and low level systems.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Bhowmik**, S. Kumar and N. Bhat, "Evolution of automatic visual description techniques-a methodological survey", *Multimedia Tools and Applications*, vol. 80, pp. 28015–28059, 2021. Impact Factor: 2.757.

Evolution of automatic visual description techniques-a methodological survey

Arka Bhowmik, Sanjay Kumar and Neeraj Bhat

Abstract: Describing the contents and activities in an image or video in semantically and syntactically correct sentences are known as captioning. Automated captioning is one of the most researched topics these days, with new sophisticated models being discovered every day. Captioning models require intense training and perform intense, complex calculations before successfully generating a caption and hence, takes a considerable amount of time even in machines with high specifications. In this survey, we go through the recent state-of-the-art advancements in automatic image and video description methodologies using deep neural networks and summarize the concepts inferred from them. The summarization has been done with a systematic, detailed, and critical analysis of the latest methodologies published in high impact proceedings and journals. Our investigation focuses on techniques that can optimize existing concepts and incorporate new methods of visual attention for generating captions. This survey emphasizes on the importance of applicability and effectiveness of existing works in real-life applications and highlights those computationally feasible and optimized techniques which can be supported in multiple devices, including lightweight devices like smartphones. Furthermore, we propose possible improvements and model architecture to support online video captioning.

For details refer to https://doi.org/10.1007/s11042-021-10964-3

BIOGRAPHY

DR. ASHISH GIRDHAR

Department of Computer Science and Engineering

Dr. Ashish Girdhar is currently working as Assistant Professor in Department of Computer Science Engineering at Delhi & Technological University since December 2020. He has total of more than 9 years of Teaching Experience. He has done his PhD in area of Image Processing from Thapar Institute of Engineering and Technology, Patiala. He has 7 SCI/SCIE Publications.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Girdhar**, H. Kapur and V. Kumar, "A novel grayscale image encryption approach based on chaotic maps and image blocks", *Applied Physics B*, vol. 127, no. 39, 2021. Impact Factor: 2.070.

A novel grayscale image encryption approach based on chaotic maps and image blocks

Ashish Girdhar, Himani Kapur and Vijay Kumar

Abstract: Image encryption converts a meaningful image into some random arrangement of pixel intensities. That means, the intelligible property of an image is destroyed. Taking into consideration excessively large time and space complexity required by the image encryption algorithm using multiple chaotic systems, this paper proposes an image encryption method in which employs three chaotic sequence to achieve fairly high level of encryption. Novelty of the proposed approach lies in the designed algorithm to achieve both permutation and substitution processes of image encryption. In the end, a comparison in the coefficient correlation values is drawn to evaluate the performance of the proposed algorithm with respect to many lately proposed image encryption schemes.

For details refer to https://doi.org/10.1007/s00340-021-07585-x

BIOGRAPHY

MS. INDU SINGH

Department of Computer Science and Engineering

Ms. Indu Singh is currently working as Assistant Professor in Computer Science Engineering Department at Delhi Technological University, Delhi, India. Singh has received her B.Tech in 2010 in Computer Science Engineering and M.Tech degree in Information Security from Ambedkar Institute of Advanced Communication Technologies & Research, Govt. of NCT Delhi in 2012. She is currently pursuing her Ph.D in Computer Science Engineering from Delhi Technological University, Delhi with specialisation in Data Mining and Information Security. Her research interests include Database Systems, Data Mining, Information Security, Machine Learning, Fuzzy systems and Swarm Intelligence. She has several papers published in International conferences and Journals of IEEE, Elsevier, Springer and ACM. She has received IEEE Best Paper Award in ICACCI-2016. Singh is also serving as a reviewer for Computers in Biology and Medicine (Elsevier), Soft Computing Journal (Springer), Journal of Ambient Intelligence and Humanized Computing(Springer) and various International Conferences of Elsevier, Springer and IEEE. She is also a member of IEEE.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **I. Singh**, N. Kumar, K. G. Srinivasa, S. Maini, U. Ahuja and S. Jain, "A multi-level classification and modified PSO clustering based ensemble approach for credit scoring", *Applied Soft Computing*, vol. 111, pp. 107687, 2021. Impact Factor: 6.725.
2. **I. Singh** and R. Jindal, "Expectation maximization clustering and sequential pattern mining based approach for detecting intrusive transactions in databases", Multimedia Tools and Applications, vol. 80, pp. 27649–27681, 2021. Impact Factor: 2.757.

A multi-level classification and modified PSO clustering based ensemble approach for credit scoring

Indu Singh, Narendra Kumar, Srinivasa K. G., Shivam Maini, Umang Ahuja and Siddhant Jain

Abstract: Credit scoring is a statistical technique that guides financial institutions to make informed decisions regarding the extension of loans to customers based on cautious examination of their historical records with the intent of reducing the organization's operational costs and eliminate potential risks. Irrelevant attributes often degrade the classification accuracy, thus feature selection can help in dealing efficaciously with large datasets. It has been well established based on numerous studies that heterogeneous ensemble-based models have unparalleled performance among several mathematical and Artificial Intelligence-based techniques devised for the issue. This paper proposes a novel approach namely Multi-Level Classification and Cluster based Ensemble (MLCCE) that incorporates the strengths of both feature selection and ensemble-based classification. MLCCE uses the attribute dependency-based feature selection scheme followed by multi-level classification. Finally the model utilizes Particle Swarm Optimization based clustering followed by a weighted combination that corresponds to the performance of the individual classifier in different spatial regions of data. During performance evaluation, MLCCE has shown remarkable results on both the benchmark credit scoring datasets—Australian and German dataset as compared to other ensemble-based methods.

For details refer to https://doi.org/10.1016/j.asoc.2021.107687

Expectation maximization clustering and sequential pattern mining based approach for detecting intrusive transactions in databases

Indu Singh and Rajni Jindal

Abstract: Database security is pertinent to every organisation with the onset of increased traffic over large networks especially the internet and increase in usage of cloud based transactions and interactions. Greater exposure of organisations to the cloud implies greater risks for the organisational as well as user data. In this paper, we propose a novel approach towards database intrusion detection systems (DIDS) based on Expectation maximization Clustering and Sequential Pattern Mining (*EMSPM*). This approach unlike any other does not have records and assumes a predetermined policy to be maintained in an organisational database and can operate seamlessly on databases that follow Role Based Access Control as well as on those which do not conform to any such access control and restrictions. This is achieved by focusing on pre-existing logs for the database and using the Expectation maximization clustering algorithm to allot role profiles according to the database user's activities. These clusters and patterns are then processed into an algorithm that prevents generation of unwanted rules followed by prevention of malicious transactions. Assessment into the accuracy of *EMSPM* over sets of synthetically generated transactions yielded propitious results with accuracies over 93%.

For details refer to https://doi.org/10.1007/s11042-021-10786-3

BIOGRAPHY

MR. KAVINDER SINGH

Department of Computer Science and Engineering

Mr. Kavinder Singh is working as an Assistant Professor in the Department of Computer Science and Engineering. He is currently working in the area of image processing and computer vision. He is currently pursuing his PhD from Delhi Technological University, Delhi.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **K. Singh** and A. S. Parihar, "Variational optimization based single image dehazing", *Journal of Visual Communication and Image Representation*, vol. 79, pp. 103241, 2021. Impact Factor: 2.678.

Variational optimization based single image dehazing

Kavinder Singh and Anil Singh Parihar

Abstract: In this paper, we present a new approach for single image dehazing based on the proposed variational optimization. A hazy image captures the information about haze in terms of the transmission map and object details present in it. We propose to estimate the initial transmission map by performing the structure-aware smoothing of the hazy image. Further, we formulated a variational optimization for the estimation of final transmission, which refines the initial transmission of a hazy image. Atmospheric light can be considered to be constant throughout the scene for practical purposes. The uniform atmospheric light is computed from the dark channel of a hazy image. The exhaustive experimentation shows that the performance of the proposed method is comparable or better.

For details refer to https://doi.org/10.1016/j.jvcir.2021.103241

BIOGRAPHY

MS. MANISHA SAINI

Department of Computer Science and Engineering

Ms. Manisha Saini is currently pursuing Ph.D. in Computer Science and Engineering Department from Delhi Technological University, Delhi, India and also working as Assistant Professor in the Computer Science Engineering Department at Manav Rachna International Institute of Research and Studies, Faridabad, Haryana, India. Her research interests include Computer Vision, Neural Networks, Machine Learning, and Deep Learning.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **M. Saini** and S. Susan, "Bag-of-Visual-Words codebook generation using deep features for effective classification of imbalanced multi-class image datasets", *Multimedia Tools and Applications*, vol. 80, pp. 20821–20847, 2021. Impact Factor: 2.757.

Bag-of-Visual-Words codebook generation using deep features for effective classification of imbalanced multi-class image datasets

Manisha Saini and Seba Susan

Abstract: Classification of imbalanced multi-class image datasets is a challenging problem in computer vision. Most of the real-world datasets are imbalanced in nature because of the uneven distribution of the samples in each class. The problem with an imbalanced dataset is that the minority class having a smaller number of instance samples is left undetected. Most of the traditional machine learning algorithms can detect the majority class efficiently but lag behind in the efficient detection of the minority class, which ultimately degrades the overall performance of the classification model. In this paper, we have proposed a novel combination of visual codebook generation using deep features with the non-linear Chi^2 SVM classifier to tackle the imbalance problem that arises while dealing with multi-class image datasets. The low-level deep features are first extracted by transfer learning using the ResNet-50 pre-trained network, and clustered using k-means. The center of each cluster is a visual word in the codebook. Each image is then translated into a set of features called the Bag-of-Visual-Words (BOVW) derived from the histogram of visual words in the vocabulary. The non-linear Chi^2 SVM classifier is found most optimal for classifying the ensuing features, as proved by a detailed empirical analysis. Hence with the right combination of learning tools, we are able to tackle classification of multi-class imbalanced image datasets in an effective manner. This is proved from the higher scores of accuracy, F1-score and AUC metrics in our experiments on two challenging multi-class datasets: Graz-02 and TF-Flowers, as compared to the state-of-the-art methods.

For details refer to https://doi.org/10.1007/s11042-021-10612-w

BIOGRAPHY

MS. MANPREET KAUR

Department of Computer Science and Engineering

Ms. Manpreet Kaur was born in Punjab, India in 1983. She received her B. Tech. in Electronics and Communication Engineering from Punjab Technical University, Punjab, India in 2005 and Master of Engineering in Electronics and Communication from Thapar University, Patiala, India in 2007. She is currently pursuing Ph.D. from Delhi Technological University, Delhi, India. Presently she is working as Member (Senior Research Staff) at Central Research Laboratory, Ghaziabad, Bharat Electronics Limited. Her research interest includes the wireless communication, cognitive radios networks and 5G and beyond networks.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **M. Kaur** and R. K. Yadav, "Effective Capacity Analysis Over Fisher-Snedecor F Fading Channels with MRC Reception", *Wireless Personal Communications*, vol. 121, pp. 1693–1705, 2021. Impact Factor: 1.671.

Effective Capacity Analysis Over Fisher-Snedecor F Fading Channels with MRC Reception

Manpreet Kaur and Rajesh Kumar Yadav

Abstract: In contrary to Shannon's ergodic capacity, the delay-constrained effective rate is used to define the maximum data rate of the real-time applications in 5G and beyond networks. The effective capacity (EC) performance of the delay sensitive communication system over Fisher-Snedecor *F* fading channel with maximum ratio combining is studied. The closed-form mathematical expressions for the EC are derived in terms of Meijer G-function and the effect of different fading parameters on the effective throughput of the system is demonstrated. The simplified asymptotic expression for high signal-to-noise ratio (SNR) and low SNR regimes are provided to gain more insight into the system. The effect of different system parameters on the EC performance is also demonstrated. Simulation results are corroborated along with the numerical results to verify the correctness of the proposed formulations.

For details refer to https://doi.org/10.1007/s11277-021-08692-w

BIOGRAPHY

DR. PAWAN SINGH MEHRA

Department of Computer Science and Engineering

Dr. Pawan Singh Mehra is working as an Assistant Professor at Delhi Technological University, New Delhi, India. He earned a PhD in computer engineering at Jamia Millia Islamia and M.Tech. (Hons.) in computer science and engineering at the Center for Development of Advanced Computing (CDAC). He earned a BE at RJIT, Gwalior. He has approximately ten years of teaching and research experience. He has authored more than 25 publications in international conferences and journals indexed in SCI, Scopus, ESCI, and Web of Science. His research interests include wireless sensor networks, internet of things, image processing, cryptography, and network security and blockchain.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. A. K. Dwivedi, **P. S. Mehra**, O. Pal, M. N. Doja and B. Alam, "EETSP: Energy-efficient two-stage routing protocol for wireless sensor network-assisted Internet of Things", *International Journal of Communication Systems*, vol. 34, no. 17, pp. e4965, 2021. Impact Factor: 2.047.

EETSP: Energy-efficient two-stage routing protocol for wireless sensor network-assisted Internet of Things

Anshu Kumar Dwivedi, **Pawan Singh Mehra***, Om Pal, Mohammad Najmud Doja and Bashir Alam

Abstract: Wireless sensor network (WSN) is a key technology that can support Industrial Revolution 4.0. The sensor nodes (SNs) are the important component of WSN. Recharge or repair of batteries of SNs is impossible, and thus, energy is the most valuable resource of WSN. Over the years, many methods have been proposed to conserve the precious energy resource of WSN. The most important concern in WSN is how much of the energy of the SNs can be saved, which can contribute to the better network life of WSN. WSN-assisted IoT output is reduced when a wide region of the network is deployed. Energy-efficient routing is one of the ways to reduce power consumption in WSNs. Therefore, a novel energy-efficient two-stage routing protocol (EETSP) has been proposed to reduce the energy used in WSN and extend the stability period as well as the network lifetime of WSN. Through this protocol, the number of packets communicated to the base station (BS) is significantly improved, and the cluster heads (CHs) and secondary cluster heads (SCHs) reduce the energy utilization in the network. SCH works as a backup CH. EETSP consists of two stages. The selection of CH and SCH is made in the primary stage, based on the input parameters. Intercluster routing and intracluster routing are performed in the second stage. The improvements of EETSP are examined against LEACH and Z-SEP, and obtained results indicate that the EETSP is better in terms of stability period, throughput and network lifetime.

For details refer to https://doi.org/10.1002/dac.4965

**Corresponding Author*

BIOGRAPHY

MS. PRATIMA SHARMA

Department of Computer Science and Engineering

Ms. Pratima Sharma is a Research Scholar, Department of Computer Science & Engineering at Delhi Technological University, India. Prior to this she worked as an Assistant Professor, at Inderprastha Engineering College, Ghaziabad, for nearly three years. She received the M.Tech. and B.Tech. degrees in Computer Science and Engineering from Guru Gobind Singh Indraprastha University, Delhi, India, in 2013 and 2015, respectively. Her research and publication interests include Blockchain Technology, Honeypot, Network Security, Information Security and Data Mining. She has presented papers at International/ National conferences, published articles and papers in various journals. .

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **P. Sharma**, R. Jindal and M. D. Borah, "Blockchain-based decentralized architecture for cloud storage system", *Journal of Information Security and Applications*, vol. 62, pp. 102970, 2021. Impact Factor: 3.872.

Blockchain-based decentralized architecture for cloud storage system

Pratima Sharma, Rajni Jindal and Malaya Dutta Borah

Abstract: Cloud storage system provides on-demand and pay-per-use storage model with low computing cost. However, this storage system suffers from various security risks. Blockchain technology is an advanced technique that stores data in a distributed manner, and the data, once stored, cannot be altered. Therefore, we propose a blockchain-based decentralized architecture for the cloud storage system. The proposed architecture includes access control and integrity checking mechanism to provide a more secure environment. Moreover, it provides four primary services to ensure security features in a cloud storage system: (i) A registration process is designed to register data owners and users using a key generation technique to provide an authentication feature; (ii) The data owners save the user data Meta details in the blockchain structure and set access rules to maintain the authorization feature; (iii) The cloud storage system stores the original data and uses the optimization algorithm to reduce the transaction processing time; (iv) Data owners maintain the data integrity using the Merkle root concept. The experimental results, analysis, and performance evaluation show that our proposed architecture provides a feasible and reliable cloud environment.

For details refer to https://doi.org/10.1016/j.jisa.2021.102970

BIOGRAPHY

PROF. RAHUL KATARYA

Department of Computer Science and Engineering

Prof. Rahul Katarya is working in the Department of Computer Science & Engineering, Delhi Technological University (DTU) (formerly Delhi College of Engineering), New Delhi, India. He is the Coordinator (Promotion and Branding) in Office of International Affairs, DTU. He was selected Worlds top 2% Scientist in 2021 by Stanford University, USA as rank 3578 in top ranked Science-Metrix category (Artificial Intelligence & Image Processing) published on October 19, 2021. He was also selected in Worlds top 2% scientist in 2020 by Stanford University, USA, as he achieved Stanford University World Ranking 3696 for research in the top ranked Science-Metrix category (Artificial Intelligence & Image Processing). He is the Officer-in-charge of a Big Data Analytics and Web Intelligence (BDAWI) Laboratory, and CALIBRE research group is associated with this laboratory. His research interests are Big Data Analytics, Data Science, Web Mining, Social Networks, Recommender Systems, Artificial Intelligence, Machine Learning, Web Personalization, Deep Learning, Knowledge Discovery & Management, Computational Intelligence, Climate change, healthcare and Online Human Behaviour Analysis etc. He is a reviewer of various IEEE Transactions, Elsevier and Springer journals. He has published various research articles in Science Citation Index (SCI) indexed international journals and in IEEE international conferences. In February 2021, Delhi Technological University awarded him for Commendable Research Award for excellence in research in the year 2020. In March 2018, Delhi Technological University awarded him for Commendable Research Awards for excellence in research for the year 2017. He has delivered various expert talks in the Russia, Japan, USA and New Zealand in Big Data analytics, Artificial Intelligence, Healthcare, Climate change and Data Mining.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	05

1. G. Gupta and **R. Katarya**, "EnPSO: An AutoML Technique for Generating Ensemble Recommender System", *Arabian Journal for Science and Engineering*, vol. 46, pp. 8677–8695, 2021. Impact Factor: 2.334.
2. A. Gupta and **R. Katarya**, "PAN-LDA: A latent Dirichlet allocation based novel feature extraction model for COVID-19 data using machine learning", *Computers in Biology and Medicine*, vol. 138, pp. 104920, 2021. Impact Factor: 4.589.
3. G. Gupta and **R. Katarya**, "Research on Understanding the Effect of Deep Learning on User Preferences", *Arabian Journal for Science and Engineering*, vol. 46, pp. 3247–3286, 2021. Impact Factor: 2.334.
4. A. Gupta, Anjum, S. Gupta and **R. Katarya**, "InstaCovNet-19: A deep learning classification model for the detection of COVID-19 patients using Chest X-ray ", *Applied Soft Computing*, vol. 99, pp. 106859, 2021. Impact Factor: 6.725.
5. P. Kedia, Anjum and **R. Katarya**, "CoVNet-19: A Deep Learning model for the detection and analysis of COVID-19 patients", *Applied Soft Computing*, vol. 104, pp.107184, 2021. Impact Factor: 6.725.

EnPSO: An AutoML Technique for Generating Ensemble Recommender System

Garima Gupta and **Rahul Katarya***

Abstract: With the explosive increase in data on the web, recommending items to users is becoming more complex. In recent times, the best recommender systems have come from ensemble learning, which combines many models and techniques to generate recommendations that can draw the best characteristics of the constituent models. These ensemble models can improve accuracy, and they are also able to reduce the biases that come with each model. However, the massive number of permutations in which recommendation models are combined to create an ensemble model adds another layer of complexity to an already complex problem. Thus, in line with the recent trend in Automated Machine Learning (AutoML) aimed at reducing the complexity associated with model selection, there is a need for a machine learning framework that can learn the best ensemble model for a given problem given the base models. We proposed a system Ensemble with Particle Swarm Optimization, which intelligently optimizes the recommendations by identifying the best ensemble architecture for the data at hand. Our proposed AutoML system can improve recommendations for the MovieLens dataset by combining the results from base techniques without any user effort. The major challenge in creating such a system is to develop a framework for generating ensemble models and finding an efficient way to reach the best performing model since the search space can be vast. To overcome this challenge, we have used hierarchical models to generate ensembles and Particle Swarm Optimization to find the optimal ensemble models.

For details refer to https://doi.org/10.1007/s13369-021-05670-z

PAN-LDA: A latent Dirichlet allocation based novel feature extraction model for COVID-19 data using machine learning

Aakansha Gupta and **Rahul Katarya***

Abstract: The recent outbreak of novel Coronavirus disease or COVID-19 is declared a pandemic by the World Health Organization (WHO). The availability of social media platforms has played a vital role in providing and obtaining information about any ongoing event. However, consuming a vast amount of online textual data to predict an event's trends can be troublesome. To our knowledge, no study analyzes the online news articles and the disease data about coronavirus disease. Therefore, we propose an LDA-based topic model, called PAN-LDA (Pandemic-Latent Dirichlet allocation), that incorporates the COVID-19 cases data and news articles into common LDA to obtain a new set of features. The generated features are introduced as additional features to Machine learning(ML) algorithms to improve the forecasting of time series data. Furthermore, we are employing collapsed Gibbs sampling (CGS) as the underlying technique for parameter inference. The results from experiments suggest that the obtained features from PAN-LDA generate more identifiable topics and empirically add value to the outcome.

For details refer to https://doi.org/10.1016/j.compbiomed.2021.104920

Research on Understanding the Effect of Deep Learning on User Preferences

Garima Gupta and **Rahul Katarya***

Abstract: Recommender systems are becoming more essential than ever as the data available online is increasing manifold. The increasing data presents us with an opportunity to build complex systems that can model the user interactions more accurately and extract sophisticated features to provide recommendations with better accuracy. To construct these complex models, deep learning is emerging as one of the most powerful tools. It can process large amounts of data to learn the structure and patterns that can be exploited. It has been used in recommender systems to solve cold-start problem, better estimate the interaction functions, and extract deep feature representations, among other facets that plague the traditional recommender systems. As big data is becoming more prevalent, there is a need to use tools that can take advantage of such explosive data. An extensive study on recommender systems using deep learning has been performed in the paper. The literature

**Corresponding Author*

review spans in-depth analysis and comparative study of the research domain. The paper exhibits a vast range of scope for efficient recommender systems in future.

For details refer to https://doi.org/10.1007/s13369-020-05112-2

InstaCovNet-19: A deep learning classification model for the detection of COVID-19 patients using Chest X-ray+

Anunay Gupta, Anjum, Shreyansh Gupta and **Rahul Katarya***

Abstract: Recently, the whole world became infected by the newly discovered coronavirus (COVID-19). SARS-CoV-2, or widely known as COVID-19, has proved to be a hazardous virus severely affecting the health of people. It causes respiratory illness, especially in people who already suffer from other diseases. Limited availability of test kits as well as symptoms similar to other diseases such as pneumonia has made this disease deadly, claiming the lives of millions of people. Artificial intelligence models are found to be very successful in the diagnosis of various diseases in the biomedical field In this paper, an integrated stacked deep convolution network InstaCovNet-19 is proposed. The proposed model makes use of various pre-trained models such as ResNet101, Xception, InceptionV3, MobileNet, and NASNet to compensate for a relatively small amount of training data. The proposed model detects COVID-19 and pneumonia by identifying the abnormalities caused by such diseases in Chest X-ray images of the person infected. The proposed model achieves an accuracy of 99.08% on 3 class (COVID-19, Pneumonia, Normal) classification while achieving an accuracy of 99.53% on 2 class (COVID, NON-COVID) classification. The proposed model achieves an average recall, F1 score, and precision of 99%, 99%, and 99%, respectively on ternary classification, while achieving a 100% precision and a recall of 99% on the binary class., while achieving a 100% precision and a recall of 99% on the COVID class. InstaCovNet-19's ability to detect COVID-19 without any human intervention at an economical cost with high accuracy can benefit humankind greatly in this age of Quarantine.

For details refer to https://doi.org/10.1016/j.asoc.2020.106859

CoVNet-19: A Deep Learning model for the detection and analysis of COVID-19 patients+

Priyansh Kedia, Anjum and **Rahul Katarya***

Abstract:

Background - The ongoing fight with Novel Corona Virus, getting quick treatment, and rapid diagnosis reports have become an act of high priority. With millions getting infected daily and a fatality rate of 2%, we made it our motive to contribute a little to solve this real-world problem by accomplishing a significant and substantial method for diagnosing COVID-19 patients.

Aim - The Exponential growth of COVID-19 cases worldwide has severely affected the health care system of highly populated countries due to proportionally a smaller number of medical practitioners, testing kits, and other resources, thus becoming essential to identify the infected people. Catering to the above problems, the purpose of this paper is to formulate an accurate, efficient, and time-saving method for detecting positive corona patients.

Method - In this paper, an Ensemble Deep Convolution Neural Network model "CoVNet-19" is being proposed that can unveil important diagnostic characteristics to find COVID-19 infected patients using X-ray images chest and help radiologists and medical experts to fight this pandemic.

Results - The experimental results clearly show that the overall classification accuracy obtained with the proposed approach for three-class classification among COVID-19, Pneumonia, and Normal is 98.28%, along with an average precision and Recall of 98.33% and 98.33%, respectively. Besides this, for binary classification between Non-COVID and COVID Chest X-ray images, an overall accuracy of 99.71% was obtained.

Conclusion - Having a high diagnostic accuracy, our proposed ensemble Deep Learning classification model can be a productive and substantial contribution to detecting COVID-19 infected patients.

For details refer to https://doi.org/10.1016/j.asoc.2021.107184

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

DR. RAJEEV KUMAR

Department of Computer Science and Engineering

Dr. Rajeev Kumar received his B.Tech. in Information Technology from Uttar Pradesh Technical University, Lucknow, India in 2007 and his M.Tech. and Ph.D. in Computer Engineering from University of Delhi, Delhi, India, in 2012 and 2017, respectively. He did his Post-Doctorate from Kyungil University, South Korea. Currently, he is working as an Assistant Professor in the Department of Computer Science and Engineering, Delhi Technological University (Formerly Delhi College of Engineering), Delhi, India. His research interests include steganography, reversible data hiding, multimedia forensics, DeepFakes and wireless sensor networks. He has published more than 40 research papers (which includes 25 SCI (E)) in international journals and conferences of repute.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. A. Singh. Nandan, S. Singh, A. Malik and **R. Kumar**, "A Green Data Collection & Transmission Method for IoT-Based WSN in Disaster Management", *IEEE Sensors Journal*, vol. 21, no. 22, pp. 25912-25921, 2021. Impact Factor: 3.301.
2. N. Kumar, **R. Kumar** and R. Caldelli, "Local Moment Driven PVO Based Reversible Data Hiding", *IEEE Signal Processing Letters*, vol. 28, pp. 1335 – 1339, 2021. Impact Factor: 3.109.

A Green Data Collection & Transmission Method for IoT-Based WSN in Disaster Management

Aridaman Singh Nandan, Samayveer Singh, Aruna Malik and **Rajeev Kumar***

Abstract: Being as an integral part of data exchange in disaster management, Internet of Thing (IoT) is an essential component to update the disaster management information to all the connected nodes. In such scenarios, the nodes are deployed with a limited battery, batteries of these nodes are non-rechargeable and such networks consume huge energy in data exchange. Therefore, the practical implementation of such type of networks is a difficult task as routing avoids the paths and consume a tremendous amount of energy during collection/transmission of data. This paper proposes an optimized Genetic Algorithm (GA) based green data collection/transmission method for IoT based WSN in disaster management by satisfying multiple constraints i.e., optimizing intra-cluster distance, systematic utilization of node's energy in the cluster and reducing hop count. The proposed direct data collection/transmission and movable sink strategies shorten the communication distance between the sink and cluster head (CH) which diminishes the hotspot problem. The direct data collection helps in transmitting data directly to the sink when the sinks are nearer to the sensor nodes with respect to CH. Further, the incorporated dynamic sensing range minimizes overlapping of sensing range of CH along with a significant decrement in the transmission energy. The simulation results show that the proposed protocol outperforms the existing protocols on the performance metrics namely network's remaining energy, lifetime, stability period, and throughput per rounds.

For details refer to https://doi.org/10.1109/JSEN.2021.3117995

Local Moment Driven PVO Based Reversible Data Hiding

Neeraj Kumar, **Rajeev Kumar*** and Roberto Caldelli

Abstract: Pixel-value-ordering (PVO) is one of the most widely used reversible data hiding (RDH) framework which efficiently utilizes smooth pixels of the cover image to provide high-fidelity stego-image but with limited embedding capacity. This letter proposes an RDH scheme based on local moment driven pixel value ordering (LM-PVO) which further enhances the effectiveness of smooth pixel's utilization by dividing the fixed-size blocks into two groups. Pixels of each group are sub-divided into two sub-groups based on the local moment of the block so that correlation among the pixels of each sub-group is enhanced. Thus doing, the pixels of each sub-group are grouped based on their intensity values instead of their position as in the conventional PVO-based schemes; this enables information hider to embed a higher amount of secret data while also enhancing the stego-image quality. Experimental results also validate the superiority of the proposed scheme over the existing PVO-based RDH schemes.

For details refer to https://doi.org/10.1109/LSP.2021.3090673

*Corresponding Author

BIOGRAPHY

DR. SANJAY KUMAR

Department of Computer Science and Engineering

Dr. Sanjay Kumar is currently working as an Assistant Professor in the Department of Computer Science and Engineering, Delhi Technological University, New Delhi, India. He received B.Tech. in Computer Science and Engineering from KIIT University, Bhubaneswar, India. He has completed M.Tech. and Ph.D. both in Computer Applications from Indian Institute of Technology (IIT) Delhi, New Delhi, India. Previously, he has worked with National Informatics Centre (NIC), Ministry of Electronics and Information Technology (Miety), Govt. of India, as a Scientist-B. His research interests include Complex Network Analysis, Graph Mining, Machine Learning, Deep Learning and Algorithm Design.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	04

1. **S. Kumar**, B. S. Panda and D. Aggarwal, "Community detection in complex networks using network embedding and gravitational search algorithm", *Journal of Intelligent Information Systems*, vol. 57, pp. 51–72, 2021. Impact Factor: 1.888.
2. **S. Kumar**, L. Singhla, K. Jindal, K. Grover and B. S. Panda, "IM-ELPR: Influence maximization in social networks using label propagation based community structure", *Applied Intelligence*, vol. 51, pp. 7647–7665, 2021. Impact Factor: 5.086.
3. **S. Kumar**, M. Saini, M. Goel and B. S. Panda, "Modeling information diffusion in online social networks using a modified forest-fire model", *Journal of Intelligent Information Systems*, vol. 56, pp. 355–377, 2021. Impact Factor: 1.888.
4. A. Bhowmik, **S. Kumar** and N. Bhat, "Evolution of automatic visual description techniques-a methodological survey", *Multimedia Tools and Applications*, vol. 80, pp. 28015–28059, 2021. Impact Factor: 2.757.

Community detection in complex networks using network embedding and gravitational search algorithm

Sanjay Kumar, B. S. Panda and Deepanshu Aggarwal

Abstract: The structural and functional characteristic features of nodes can be analyzed by visualizing community structure in complex networks. Community detection helps us to detect nodes having similar behavior in a system and organize the network into a network of closely connected groups or modules. Network embedding technique represents the nodes of the input graph into vector space and preserves their inherent and topological features and can contribute significantly to various applications in network analysis. In this paper, we propose a novel community detection method using network embedding technique. Firstly, nodes of the graph are embedded in feature space of *d* dimensions, and then low-rank approximation is applied to avoid the results from being affected by noise or outliers. Further, *k*-means clustering is employed to find the centroids of the clusters in the network and followed by a gravitational search algorithm to improve the results of centroids of clusters. Finally, we compute the effectiveness of detected communities using different performance measures. Our method serves as a universal framework towards applying and bench-marking various embedding techniques in graphs for performing community detection. We perform the test using various evaluation criteria on several real-life and synthetic networks and the obtained result reveals the utility of the proposed algorithm.

For details refer to https://doi.org/10.1007/s11042-021-10964-3

IM-ELPR: Influence maximization in social networks using label propagation based community structure

Sanjay Kumar, Lakshay Singhla, Kshitij Jindal, Khyati Grover and B. S. Panda

Abstract: The structural and functional characteristic features of nodes can be analyzed by visualizing community structure in complex networks. Community detection helps us to detect nodes having similar behavior in a system and organize the network into a network of closely connected groups or modules. Network embedding technique represents the nodes of the input graph into vector space and preserves their inherent and topological features and can contribute significantly to various applications in network analysis. In this paper, we propose a novel community detection method using network embedding technique. Firstly, nodes of the graph are embedded in feature space of *d* dimensions, and then low-rank approximation is applied to avoid the results from being affected by noise or outliers. Further, *k*-means clustering is employed to find the centroids of the clusters in the network and followed by a gravitational search algorithm to improve the results of centroids of clusters. Finally, we compute the effectiveness of detected communities using different performance measures. Our method serves as a universal framework towards applying and bench-marking various embedding techniques in graphs for performing community detection. We perform the test using various evaluation criteria on several real-life and synthetic networks and the obtained result reveals the utility of the proposed algorithm.

For details refer to https://doi.org/10.1007/s10844-020-00625-6

Modeling information diffusion in online social networks using a modified forest-fire model

Sanjay Kumar, Muskan Saini, Muskan Goel and B. S. Panda

Abstract: Information dissemination has changed rapidly in recent years with the emergence of social media which provides online platforms for people worldwide to share their thoughts, activities, emotions, and build social relationships. Hence, modeling information diffusion has become an important area of research in the field of network analysis. It involves the mathematical modeling of the movement of information and study the information spread pattern. In this paper, we attempt to model information propagation in online social networks using a nature-inspired approach based on a modified forest-fire model. A slight spark can start a wildfire in a forest, and the spread of this fire depends on vegetation, weather, and topography, which may act as fuel. On similar lines, we labeled users who haven't joined the network yet as *Empty*, existing users as *Tree*, and information as *Fire*. The spread of information across online social networks depends upon users-followers relationships, the significance of the topic, and other such features. We introduce a novel *Burnt* state to the traditional forest-fire model to represent non-spreaders in the network. We validate our method on six real-world data-sets extracted from Twitter and conclude that the proposed model performs reasonably well in predicting information diffusion.

For details refer to https://doi.org/10.1007/s10844-020-00623-8

Evolution of automatic visual description techniques-a methodological survey+

Arka Bhowmik, **Sanjay Kumar*** and Neeraj Bhat

Abstract: Describing the contents and activities in an image or video in semantically and syntactically correct sentences are known as captioning. Automated captioning is one of the most researched topics these days, with new sophisticated models being discovered every day. Captioning models require intense training and perform intense, complex calculations before successfully generating a caption and hence, takes a considerable amount of time even in machines with high specifications. In this survey, we go through the recent state-of-the-art advancements in automatic image and video description methodologies using deep neural networks and summarize the concepts inferred from them. The summarization has been done with a systematic, detailed, and critical analysis of the latest methodologies published in high impact proceedings and journals. Our investigation focuses on techniques that can optimize existing concepts and incorporate new methods of visual attention for generating captions. This survey emphasizes on the importance of applicability and effectiveness of existing works in real-life applications and highlights those computationally feasible and optimized techniques which can be supported in multiple devices, including lightweight devices like smartphones. Furthermore, we propose possible improvements and model architecture to support online video captioning.

For details refer to https://doi.org/10.1007/s11042-021-10964-3

*Corresponding Author
+Eligible for Certificate only

BIOGRAPHY

PROF. SHAILENDER KUMAR

Department of Computer Science and Engineering

Prof. (Dr.) Shailender Kumar completed his Bachelor of Engineering (Computer Science and Engineering) in 2001, Master of Technology (Computer Science) in 2005 and Doctorate of Philosophy in the Computer Science and Engineering from Maharshi Dayanand University, Haryana, India in 2017. He has more than 20 years of teaching experience at various esteemed Engineering Colleges like Delhi College of Engineering, Netaji Subhas Institute of Technology, Ambedkar Institute of Advanced Communication Technologies and Research etc. Currently, he is working as Professor at Delhi Technological University, Delhi, India. He has published more than 50 research papers in various reputed International Journals and Conferences.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. G. Chugh, **S. Kumar** and N. Singh, "Survey on Machine Learning and Deep Learning Applications in Breast Cancer Diagnosis", *Cognitive Computation*, vol. 13, pp. 1451–1470, 2021. Impact Factor: 5.418.

Survey on Machine Learning and Deep Learning Applications in Breast Cancer Diagnosis

Gunjan Chugh, **Shailender Kumar*** and Nanhay Singh

Abstract: Cancer is a fatal disease caused due to the undesirable spread of cells. Breast carcinoma is the most invasive tumors and is the main reason for cancer deaths in females. Therefore, early diagnosis and prognosis have become necessary to increase survivability and reduce death rates in the long run. New artificial intelligence technologies are assisting radiologists in medical image scrutiny, thereby improving cancer patients' status. This survey enrolls peer-reviewed, newly developed computer-aided diagnosis (CAD) systems implementing machine learning (ML) and deep learning (DL) techniques for diagnosing breast carcinoma, compares them with previously established methods, and provides technical details with the pros and cons for each model. We also discuss some open issues, research gaps, and future research directions for the advanced CAD models in medical image analysis. Over the past decade, machine learning and deep learning have emerged as a subfield of artificial intelligence (AI), whose healthcare industry applications have provided excellent results with reduced cost and improved efficiency. This survey analyzes different classifiers of machine learning and deep learning approaches for breast cancer diagnosis. Results from previous studies proved that deep learning outperforms conventional machine learning for diagnosing breast carcinoma when the dataset is broad. Research gaps from the recent studies depict that practical and scientific research is an urgent necessity for improving healthcare in the long run.

For details refer to https://doi.org/10.1007/s12559-020-09813-6

**Corresponding Author*

BIOGRAPHY

DR. DEEP SHREE

Delhi School of Management

Dr. Deep Shree is Assistant Professor of Marketing at Delhi School of Management, Delhi Technological University. She earned her Ph.D. from Indian Institute of Technology Delhi (IIT Delhi). Her works have been published in Journal of Business Research, International Journal of Nonprofit and Voluntary Sector Marketing, International Review on Public and Nonprofit Marketing, International Journal of Business Innovation and Research, International Journal of Business Excellence, among others. Her areas of interest include branding, nonprofit marketing, social marketing, and marketing strategy.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **D. Shree**, R. K. Singh, J. Paul, A. Haod and S. Xu, "Digital platforms for business-to-business markets: A systematic review and future research agenda", *Journal of Business Research*, vol. 137, pp. 354-365, 2021. Impact Factor: 7.550.

Digital platforms for business-to-business markets: A systematic review and future research agenda

Deep Shree, Rajesh Kumar Singh, Justin Paul, Andy Haod and Shichun Xu

Abstract: The evolution of digital platforms has transformed the way businesses operate. Digital platforms have become popular and common in Business-to-Business (B2B) markets, thereby leading to increased interest of researchers. Even with the increasing interest, the field suffers from the lack of a comprehensive approach towards plugging the gaps left behind. This review presents a synthesis of the last ten years of research on digital platforms in B2B markets. Based on Diffusion of Innovation (DOI) and Technology-Organization-Environment (TOE) frameworks for adoption of innovation, the current study identifies the technological, organizational, and environmental context-based factors that play a major role in adoption of digital platforms in B2B markets. We also present a detailed overview of the research in terms of publication timeline, geographical distribution, industrial context, theory used, and methodology employed. In addition, we identify some significant gaps and set a future research agenda.

For details refer to https://doi.org/10.1016/j.jbusres.2021.08.031

BIOGRAPHY

DR. AAKASH KUMAR SETH

Department of Electrical Engineering

Dr. Aakash Kumar Seth received B.Tech degree in Electrical and Electronics Engineering from Bhagwan Parshuram Institute of Technology, Delhi, India in 2013 and M.Tech degree in Electric Drives and Control from Institute of Engineering and Technology, Lucknow, India in 2017. He completed his Ph.D. in Electrical Engineering from Delhi Technological University, Delhi in 2021. Dr. Seth is recipient of research excellence award in Commendable research award category in 2020. His research interest includes Electric Vehicle Charging, Power Quality, Microgrid and Power System Protection.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01
Commendable Research Award	01

1. **A. K. Seth** and M. Singh, "Second Order Ripple Minimization in Single Phase Single Stage On-Board PEV Charger", *IEEE Transactions on Transportation Electrification*, vol. 7, no. 3, pp. 1186-1195, 2021. Impact Factor: 5.123.
2. **A. K. Seth** and M. Singh, "Unified adaptive neuro-fuzzy inference system control for OFF board electric vehicle charger", *International Journal of Electrical Power & Energy Systems*, vol. 130, pp. 106896, 2021. Impact Factor: 4.630.

Second Order Ripple Minimization in Single Phase Single Stage On-Board PEV Charger

Aakash Kumar Seth and Mukhtiar Singh

Abstract: This article presents a single-phase, single-stage onboard plug-in electric vehicle (PEV) charger. The single-phase PEV chargers have an inherent problem of introducing a second-order ripple component on dc side. This problem is further exaggerated during the vehicle-to-grid (V2G) mode of operation where it may be normally controlled to supply both active as well as reactive power. During the V2G reactive power compensation, the second-order harmonics ripple component at dc side will increase, which further reduces the life cycle and performance of battery pack. Therefore, a second-order ripple component compensation technique is proposed by precompensating the reference current itself. The resultant reference current is periodic in nature, and accordingly, a repetitive controller (RC) is used, which is well known for its capability of tracking the periodic signals. The PEV charger is controlled in both grid-to-vehicle (G2V) and V2G modes. In this article, the performance of the controller has been tested in eight different modes on active-reactive (P-Q) power plane and found that ripple minimization technique successfully reduced second-order ripple component on dc side. The PEV charger controller has been simulated in MATLAB/Simulink environment and implemented on the scaled down experimental setup.

For details refer to https://doi.org/10.1109/TTE.2021.3049559

Unified adaptive neuro-fuzzy inference system control for OFF board electric vehicle charger

Aakash Kumar Seth and Mukhtiar Singh

Abstract: This paper illustrates the control algorithm design for a two stage off board bidirectional smart electric vehicle (EV) charger architecture. The proposed EV charger is controlled to perform four quadrant operation (i.e. vehicle-to-grid (V2G) and grid-to-vehicle (G2V)) while compensating the load harmonics, simultaneously. Here, the 3-phase AC-DC converter and DC-DC converter are two main components, where the first one is controlled to regulate DC-link voltage as well as reactive power and current harmonics of nearby non-linear load while the second one regulates the exchange of active power. Generally, the AC-DC converter is controlled via two control loops, i.e. outer loop and inner loop. However, setting the gains of almost four proportional integral (PI) controllers and determining decoupling terms for inner control loops is very difficult, especially under the dynamic operating conditions. Therefore, an adaptive neuro-fuzzy inference system (ANFIS) has been designed to estimate the direct and quadrature axis reference currents directly while regulating two different quantities in single step only and hence, named as unified ANFIS controller. The proposed EV charger is simulated in MATLAB/Simulink and controller performance is validated with scaled down hardware model in real time.

For details refer to https://doi.org/10.1016/j.ijepes.2021.106896

BIOGRAPHY

DR. AJAY KUMAR

Department of Electrical Engineering

Dr. Ajay Kumar received the B.Tech. degree in Electronics and Communication from UPTU, Lucknow, India in 2009 and M.Tech. degree in Nanoscience and Technology from Delhi Technological University, Delhi, India in 2014. He is currently Assistant Professor in Electronics and Communication Engineering Department in Jaypee Institute of Information Technology (JIIT), Noida and completed his Ph.D. degree in Electrical Engineering Department, Delhi Technological University (Formerly Delhi College of Engineering), New Delhi, India in 2019. He has worked in Microelectronics Research Lab, Applied Physics Department, Delhi Technological University. He has authored or co-authored over 75 papers in various international and national journals and conferences. His research area is modelling and simulation of sub-30 nm recessed channel MOSFET for performance applications. He received commendable research excellent award in 2018, 2019, and 2020 by DTU. Ajay Kumar is a senior member of IEEE, OSA and other professional societies.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Kumar**, N. Gupta and R. Chaujar, "Reliability of Sub-20 nm Black Phosphorus Trench (BP-T) MOSFET in High-Temperature Harsh Environment", *Silicon*, vol. 13, pp. 1277–1283, 2021. Impact Factor: 2.670.

Reliability of Sub-20 nm Black Phosphorus Trench (BP-T) MOSFET in High-Temperature Harsh Environment

Ajay Kumar, Neha Gupta and Rishu Chaujar

Abstract: In this work, the high-temperature reliability of the Black Phosphorus Trench (BP-T) MOSFET device has been analyzed. When the temperature is very high (500 K), the proposed device (BP-T-MOSFET) shows very high reliability with less effects in the device performance. The device is also calibrated with the experimental data. All the simulation has been performed using ATLAS-3D device simulator. BP-T-MOSFET shows high-temperature reliability in terms of reduced sub-threshold current, hot-electron injection gate current, and impact ionization substrate current. Further, higher switching ratio (I_{on}/I_{off}), electron mobility, and electron velocity have also been observed owing to the electrical properties of black phosphorus used in the trench gate which shows the potential in a high-temperature environment. Owing to trench structure and electrical properties of black phosphorus, BP-T-MOSFET has significant device efficiency and low leakage currents at high temperatures which prove as highly shrieked MOS device applications in harsh temperature environment.

For details refer to https://doi.org/10.1007/s12633-020-00531-0

BIOGRAPHY

MR. AJENDRA SINGH

Department of Electrical Engineering

Mr. Ajendra Singh was born in Uttar Pradesh, India, he received his B.Tech. degree in Electrical Engineering and M.Tech. degree (Control and Instrumentation) from Delhi College of Engineering, University of Delhi, now pursuing Ph.D. degree course in Electrical Engineering from Delhi Technological Department from August 2016.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **A. Singh** and J. N. Rai, "Stability analysis of fractional order fuzzy cellular neural networks with leakage delay and time varying delays", *Chinese Journal of Physics*, vol. 73, pp. 589-599, 2021. Impact Factor: 3.237.
2. **A. Singh** and J. N. Rai , "Stability of Fractional Order Fuzzy Cellular Neural Networks with Distributed Delays via Hybrid Feedback Controllers", *Neural Processing Letters*, vol. 53, pp. 1469–1499, 2021. Impact Factor: 2.908.

Stability analysis of fractional order fuzzy cellular neural networks with leakage delay and time varying delays

Ajendra Singh and Jitendra Nath Rai

Abstract: In this paper we investigated the stability of fractional order fuzzy cellular neural networks with leakage delay and time varying delays. Based on Lyapunov theory and applying bounded techniques of fractional calculation, sufficient criterion are established to guarantee the stability. Hybrid feedback control is applied to derive the proposed results. Finally, numerical examples with simulation results are given to illustrate the effectiveness of the proposed method.

For details refer to https://doi.org/10.1016/j.cjph.2021.07.029

Stability of Fractional Order Fuzzy Cellular Neural Networks with Distributed Delays via Hybrid Feedback Controllers

Ajendra Singh and Jitendra Nath Rai

Abstract: This article studies the Global Mittag-Leffler stability of fractional order fuzzy cellular neural networks via hybrid feedback controllers. Based on hybrid feedback control technique Lyapunov approach, and some novel analysis techniques of fractional calculation, some sufficient conditions are obtained to guarantee the Global Mittag-lefflers stability. Finally, two simulation example are given to illustrate the effectiveness of the proposed method.

For details refer to https://doi.org/10.21203/rs.3.rs-170780/v

BIOGRAPHY

MR. AJISHEK RAJ

Department of Electrical Engineering

Mr. Ajishek Raj received B. Tech degree in Electrical and Electronics Engineering from Dr. M G R Educational and Research Institute, Chennai in 2012, M. Tech degree from Delhi Technological University, Delhi in 2016. He has pursued Doctoral studies in the Department of Electrical Engineering at Delhi Technological University, Delhi. His research interests are in the area of analog signal processing, signal generation, active non-linear applications, and inverse analog filters. He has published 12 research papers in various international journals/ conferences.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **A. Raj**, D. R. Bhaskar and P. Kumar, "Novel architecture of four quadrant analog multiplier/divider circuit employing single CFOA", Analog Integrated Circuits and Signal Processing , vol. 108, pages 689–701, 2021. Impact Factor: 1.337
2. **A. Raj**, P. Kumar and D. R. Bhaskar, "Systematic realization of low-frequency third-order sinusoidal oscillators", International Journal of Circuit Theory and Applications, vol. 49,no. 10, pp. 3302-3316 , 2021. Impact Factor: 2.038.

Novel architecture of four quadrant analog multiplier/divider circuit employing single CFOA

Ajishek Raj, Data Ram Bhaskar and Pragati Kumar

Abstract: In this communication, a current feedback operational amplifier (CFOA) based novel architecture of voltage-mode analog multiplier/divider circuit has been proposed. The proposed circuit employs a single CFOA and four MOSFETs. The multiplier circuit can operate in four quadrant modes, whereas, the divider circuit can operate in two quadrant modes. The applications of the proposed multiplier circuit in amplitude modulator, squarer, and frequency doubler circuit have also been presented. To check the robustness of the proposed circuit, mismatch analysis, process corner-voltage-temperature analysis, and Monte-Carlo simulations have been performed. Noise analysis has also been carried out and the output noise for multiplier and divider circuits are found to be below 0.28 μV /sqrt(Hz). The presented circuit has been simulated with CMOS CFOA implemented using 0.18 μm TSMC technology parameters.

For details refer to https://doi.org/10.1007/s10470-021-01915-x

Systematic realization of low-frequency third-order sinusoidal oscillators

Ajishek Raj, Pragati Kumar and Data Ram Bhaskar

Abstract: In this paper, a systematic realization technique for low-frequency third-order sinusoidal oscillators (TOSOs) with independent control of condition of oscillation (CO) and frequency of oscillation (FO), employing minimum number of resistors and grounded capacitors, has been presented. Twelve new matrices have been systematically derived. These 12 matrices lead to four distinct low-frequency sinusoidal oscillators with independent control of CO and FO. Workability of these proposed oscillators has been validated through experimental results of low-frequency oscillations operating at 3.03 Hz, realized with off-the-shelf available IC AD844 type CFOAs. The total harmonic distortion of the presented oscillators is below 0.74%, and the frequency deviations are less than 1.06%.

For details refer to https://doi.org/10.1002/cta.3099

BIOGRAPHY

DR. AJIT NANDAWADEKAR

Department of Electrical Engineering

Mr. Ajit Nandawadekar is an Experienced Research Scholar in the field of Electrical and Electronic Engineering. Currently, he is pursuing a Ph.D. in Electrical Engineering from Delhi Technological University. His research interests include Superconducting magnets, Quench protection system, Superconducting joints, Multiphase drives, Power electronics, and Magnetic resonance imaging (MRI).

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Nandawadekar**, V. Soni, N. Suman, S. Ram T, R. Kumar, S.K. Saini, R G Sharma, M. Singh and S. Kar, "Thermal and Electrical Behaviour of the Persistent Current Switch for a Whole-Body Superconducting MRI Magnet", *IEEE Transactions on Applied Superconductivity*, vol. 31, no. 5, pp. 1-5, 2021. Impact Factor: 1.704.

Thermal and Electrical Behaviour of the Persistent Current Switch for a Whole-Body Superconducting MRI Magnet

Ajit Nandawadekar, V. Soni, N. Suman, Sankar Ram T, R. Kumar, S.K. Saini, R G Sharma, Mukhtiar Singh and Soumen Kar

Abstract: A prototype persistent current switch is developed for an actively shielded whole-body 1.5 T MRI magnet having an operating current of ~500 A. The switch is developed using a six-strand CuNi-NbTi conductor. The total length of the conductor used in the PCS is ~40 m using a bifilar winding technique having a room temperature resistance of 15 Ω and an inductance of 6.6 μH. Two numbers of thermo-foil heaters having a resistance of 90 Ω each are placed between the layers of the winding pack of the switch. The wet-winding technique is followed for the switch using a cryogenic grade epoxy. The characteristics of the switch are performed using a 4 K test rig for its applicability in the 1.5 T MRI magnet. The normal resistance of the switch is measured to be 12.5 Ω at 15 K which is 15% less than the estimated value. The total energy loss onto the switch is estimated to be 0.24% of the ramping energy of the magnet at 6 V charging voltage. The thermal switching profile of the switch is studied and correlated with the total energy loss.

For details refer to https://doi.org/10.1109/TASC.2021.3076748

BIOGRAPHY

DR. AMBRISH DEVANSHU

Department of Electrical Engineering

Dr. Ambrish Devanshu received his B.Tech. degree in Electrical and Electronics Engineering from the School of Engineering, Cochin University of Science and Technology, Cochin, Kerala, India in 2011. He had completed his major project in the lead centre of Indian Space Research Organisation (ISRO) under the Department of Space (DOS), Government of India, Vikram Sarabhai Space Centre (VSSC). From September 2011 to June 2014, he served as a Project Engineer in Wipro Technologies, Greater Noida, and India. Thereafter, he joined as a full-time PhD in the Department of Electrical Engineering, Delhi Technological University (DTU), Delhi, India and got awarded his PhD degree in 2019. Currently, he is working as a Faculty of Electrical Engineering Department National Institute of Technology Patna. He has 5 SCI paper as a first and corresponding author on his name along with several conference papers in IEEE. He has also reviewed more than 50 research papers of many reputed peer reviewed SCI journals including IEEE Transactions, Taylor & Francis, Wiley, etc. He has also delivered in expert talk in many institutes of national importance like NIT Calicut, NIT Manipur etc. Recently, in 2021, he received premier research award in 4th Research Excellence Award Functions as a Certificate of Appreciation and INR 1 Lakhs cash prize, organised by Delhi Technological University, Delhi, India. He was the member of the organizing committee of the First International IEEE conference ICPEICES-2016 organised by DTU.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Devanshu**, M. Singh and N. Kumar, "Artificial neural network-based current control of field oriented controlled induction motor drive", *Electrical Engineering*, vol. 103, pp. 1093–1104, 2021. Impact Factor: 1.836.

Artificial neural network-based current control of field oriented controlled induction motor drive

Ambrish Devanshu, Madhusudan Singh and Narendra Kumar

Abstract: A hysteresis current controller (HCC) is commonly used in high-performance AC motor drives to control the current directly. Recently, the predictive current controller (PCC) is also used as an alternative to the classical current controller for speed and torque regulation of induction motor (IM) drives. However, PCC has drawbacks of large flux and torque ripples, large total harmonic distortions (THDs) in current and voltage and dependency on parameters. This paper proposes current control with artificial neural network (ANN) for a field-oriented controlled induction motor (FOCIM) drive. The ANN has input current error between the reference and the measured stator currents. The output function of neuron is a hyperbolic tan (or tan-sigmoid) function to apply error Levenberg–Marquardt (L–M) back propagation as learning rule because of its fast convergence. The proposed method is based on a new approach in which hysteresis band is replaced by ANN comparator to improve the performance of the FOCIM drive. It minimizes torque ripples, flux ripples, voltage and current THDs over the existing HCC and PCC methods. The superiority of the proposed method compared to existing methods is established by simulation and experimental results.

For details refer to https://doi.org/10.1007/s00202-020-01138-9

BIOGRAPHY

MS. ANKITA ARORA

Department of Electrical Engineering

Ms. Ankita Arora is working as the Assistant Professor in Department of Electrical Engineering, Delhi Technological University, Delhi. She received the B.Tech degree in Electrical Engineering from Jamia Millia Islamia, New Delhi, India, in 2012, M.Tech Degree in Process Control from Netaji Subhash Institute of Technology, Delhi University, New Delhi, India, in 2015. She is currently working towards her Doctoral Degree in the Department. Her research interests include Power electronics, Power quality, Machine Learning, Renewable Energy sources and Microgrid. She is a member of IEEE, International Association of Engineers (IAENG) and many other reputed societies.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Arora** and A. Singh, "Development and performance analysis of cubic Bezier functional expansion-based adaptive filter for grid-interfaced PV system", *International Transactions on Electrical Energy Systems*, vol. 31, no. 10, pp. e12840, 2021. Impact Factor: 2.860.

Development and performance analysis of cubic Bezier functional expansion-based adaptive filter for grid-interfaced PV system

Ankita Arora and Alka Singh

Abstract: A non-linear cubic Bezier-functional expansion-based adaptive filter (CB-FEBAF) has been designed for achieving shunt compensation in this article. The algorithm is developed for mitigating current-based power quality problems such as harmonics in supply current, reactive VAR compensation, active power compensation, power factor improvement, load balancing, and so on. The CB-FEBAF is developed using Bezier curve expansion of the input signal. The functional expansion-based real time and online training converges fast and shows fast response over offline techniques such as neural network and neuro-fuzzy-based algorithms. The designed CB-FEBAF controller is trained online using gradient descent least mean square algorithm to extract the fundamental component of the load current. Moreover, the feedforward active power term corresponding to PV power contribution has been added to the developed controller. This helps to overcome the challenges in the integration of renewable energy-based distribution systems. The proposed controller is compared with non-adaptive synchronous reference frame theory, backpropagation neural network, and legendre-based functional neural network. Hardware results prove the multifunctional capabilities of the developed approach.

For details refer to https://doi.org/10.1002/2050-7038.12840

BIOGRAPHY

MR. ANUNAY GUPTA

Department of Electrical Engineering

Mr. Anunay Gupta is a final year undergraduate student at Delhi Technological University. His research interest is deep learning in vision applications. He is actively involved in research under the mentorship of Dr. Rahul Katarya in the position of Research Intern at Big Data Analytics and Web Intelligence Lab since early 2020.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Gupta**, Anjum, S. Gupta and R. Katarya, "InstaCovNet-19: A deep learning classification model for the detection of COVID-19 patients using Chest X-ray ", *Applied Soft Computing*, vol. 99, pp. 106859, 2021. Impact Factor: 6.725.

InstaCovNet-19: A deep learning classification model for the detection of COVID-19 patients using Chest X-ray

Anunay Gupta, Anjum, Shreyansh Gupta and Rahul Katarya

Abstract: Recently, the whole world became infected by the newly discovered coronavirus (COVID-19). SARS-CoV-2, or widely known as COVID-19, has proved to be a hazardous virus severely affecting the health of people. It causes respiratory illness, especially in people who already suffer from other diseases. Limited availability of test kits as well as symptoms similar to other diseases such as pneumonia has made this disease deadly, claiming the lives of millions of people. Artificial intelligence models are found to be very successful in the diagnosis of various diseases in the biomedical field In this paper, an integrated stacked deep convolution network InstaCovNet-19 is proposed. The proposed model makes use of various pre-trained models such as ResNet101, Xception, InceptionV3, MobileNet, and NASNet to compensate for a relatively small amount of training data. The proposed model detects COVID-19 and pneumonia by identifying the abnormalities caused by such diseases in Chest X-ray images of the person infected. The proposed model achieves an accuracy of 99.08% on 3 class (COVID-19, Pneumonia, Normal) classification while achieving an accuracy of 99.53% on 2 class (COVID, NON-COVID) classification. The proposed model achieves an average recall, F1 score, and precision of 99%, 99%, and 99%, respectively on ternary classification, while achieving a 100% precision and a recall of 99% on the binary class., while achieving a 100% precision and a recall of 99% on the COVID class. InstaCovNet-19's ability to detect COVID-19 without any human intervention at an economical cost with high accuracy can benefit humankind greatly in this age of Quarantine.

For details refer to https://doi.org/10.1016/j.asoc.2020.106859

BIOGRAPHY

MR. AVDHESH KUMAR

Department of Electrical Engineering

Mr. Avdhesh Kumar, received the bachelor and master degree in electrical engineering from UPTU Lucknow and IIT BHU Varanasi respectively. He is currently pursuing Ph.D. degree with the department of electrical engineering at the Delhi technological university (Delhi), India.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **A. Kumar**, R. Garg and P. Mahajan, "Control of Grid Integrated Photovoltaic system using new Variable Step Size Least Mean Square adaptive filter", *Electrical Engineering*, vol. 103, pp. 2945–2959, 2021. Impact Factor: 1.836.
2. **A. Kumar**, R. Garg and P. Mahajan, "Modified Synchronous Reference Frame Control of Solar Photovoltaic-Based Microgrid for Power Quality Improvement", *Arabian Journal for Science and Engineering*, vol. 46, pp. 1001–1018, 2021. Impact Factor: 2.334.

Control of Grid Integrated Photovoltaic system using new Variable Step Size Least Mean Square adaptive filter

Avdesh Kumar, Rachana Garg and Priya Mahajan

Abstract: In this paper, a new variable step size least mean square adaptive filter-based control algorithm is proposed to generate reference current for voltage source converter of a grid-integrated PV system. The proposed control generates reference current by extracting the fundamental active and reactive component from load current with fast convergence. The proposed control offers better initial transients and dynamic performance than conventional LMS and synchronous reference frame-based control. Grid-integrated PV system is modelled in MATLAB/Simulink and is tested on different loading condition viz. nonlinear load, unbalanced load and variable load. Further, to validate the efficacy of the proposed control, it is also tested in real time on prototype hardware in the laboratory. It has been observed that proposed control provides compensation of harmonic and reactive power of the local load. Distortion at grid side of the system is within the limits as per IEEE-519 standard.

For details refer to https://doi.org/10.1007/s00202-021-01273-x

Modified Synchronous Reference Frame Control of Solar Photovoltaic-Based Microgrid for Power Quality Improvement

Avdhesh Kumar, Rachana Garg and Priya Mahajan

Abstract: In this paper, solar photovoltaic (SPV)-based microgrid has been connected to grid. Modified synchronous reference frame control of PV inverter has been proposed to estimate reference current for power quality improvement. Conventionally, DC link voltage of the PV inverter is regulated using proportional integral (PI) controller, which suffers from undershoot/overshoot and long settling time during load variation. Intelligent control technique can be the better solution with more accuracy and fast dynamic response. In the present work, interval type-2 (IT-2)-based fuzzy logic controller (FLC) has been proposed to control inverter's DC link voltage. Performance of the grid-connected SPV system is analyzed using proposed IT-2 FLC and compared with conventional PI as well as type-1 FLC. It compensates the harmonics of the nonlinear load and maintains the grid at unity power factor by supplying the reactive demand of the load. Total harmonic distortion at grid side of the system is within the limits as per IEEE-519 standard. To test the efficacy of the proposed IT-2 FLC for grid-connected SPV system MATLAB software2016(a) has been used.

For details refer to https://doi.org/10.1007/s13369-020-04789-9

BIOGRAPHY

DR. HEMANT SAXENA

Department of Electrical Engineering

Dr. Hemant Saxena was born in Nalanda, Bihar, India, in 1990. He received B.Tech degree in Electrical Engineering from the Maharshi Dayanand University, Rohtak, India and ME degree in Power Systems from NITTTR, Bhopal, India. He has just completed his PhD from Delhi Technological University, Delhi, India, in Electrical Engineering Department in 2021. He has published nine SCI journal papers and presented three papers in reputed international conferences. His research area is focused on the application of power electronics for power quality improvement in the grid-tied PV systems.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **H. Saxena**, A. Singh and J. N. Rai, "Analysis of SOGI-ROGI for synchronization and shunt active filtering under distorted grid condition", *ISA Transactions*, vol. 109, pp. 380-388, 2021. Impact Factor: 5.468.
2. **H. Saxena**, A. Singh and J. N. Rai, "Enhanced Third-Order Generalized Integrator-Based Grid Synchronization Technique for DC-Offset Rejection and Precise Frequency Estimation", *Arabian Journal for Science and Engineering*, vol. 46, pp. 9753–9762, 2021. Impact Factor: 2.334.

Analysis of SOGI-ROGI for synchronization and shunt active filtering under distorted grid condition

Hemant Saxena, Alka Singh and Jitendra Nath Rai

Abstract: This paper presents an interesting application of two different generalized integrators connected in a cascade configuration. A Second-Order Generalized Integrator (SOGI) and a Reduced-Order Generalized Integrator (ROGI) controller have been considered to cascade. The designed controller is applied to filter distortions in the grid voltage to generate a synchronizing signal as well as estimate the fundamental component of load current. Thus, their combination can achieve synchronization as well as find application in the improvement of the power quality of the distribution grid. In addition, the performance of SOGI-ROGI with the frequency locked loop (FLL) under frequency variations has been improved. Extensive simulation and hardware results are presented to illustrate the actions of designed controller under normal and distorted grid conditions. Results under highly distorted grid and non-linear loading conditions are presented vis-à-vis simple generalized integrators considered independently.

For details refer to https://doi.org/10.1016/j.isatra.2020.10.025

Enhanced Third-Order Generalized Integrator-Based Grid Synchronization Technique for DC-Offset Rejection and Precise Frequency Estimation

Hemant Saxena, Alka Singh and Jitendra Nath Rai

Abstract: An enhanced third-order generalized integrator (TOGI) method has been proposed for the estimation of grid frequency and the synchronizing signals. The proposed method precisely estimates grid frequency and synchronizing signals in the presence of high harmonic content, phase change, frequency change, noise, and DC-offset in the grid voltage. A robust frequency estimator based on three consecutive sampling method has been integrated with TOGI algorithm for accurate frequency estimation. The proposed technique gives zero steady-state error in case of frequency estimation under different grid voltage conditions. This paper demonstrates the developed enhanced TOGI technique for synchronization in a single-phase system. The efficacy of the proposed algorithm has been tested and analyzed in MATLAB/Simulink and verified with experimental results.

For details refer to https://doi.org/10.1007/s13369-021-05559-x

BIOGRAPHY

MR. KUSHAGRA BHATIA

Department of Electrical Engineering

Mr. Kushagra Bhatia pursuing my Master's in Electrical and Computer Engineering at the University of Washington. He had worked as a Data Engineer prior to joining masters at UW. He had completed bachelor degree in Electrical and Electronics Engineering in 2020. In addition to this research paper published in Utilities Policy journal he have published four more research papers in reputed conferences and a journal. His research focus has been on: Natural Language Processing, Machine Learning and Forecasting. Skills acquired: Pytorch, Sklearn, Tensorflow, NLTK, spaCy.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **K. Bhatia**, R. Mittal, J. Varanasi and M. M. Tripathi, "An ensemble approach for electricity price forecasting in markets with renewable energy resources", *Utilities Policy*, vol. 70, pp. 101185, 2021. Impact Factor: 2.812.

An ensemble approach for electricity price forecasting in markets with renewable energy resources

Kushagra Bhatia, Rajat Mittal, Jyothi Varanasi and M. M. Tripathi

Abstract: With the restructuring of formerly vertically integrated utilities, the energy market behaves like a competitive market, which has resulted in an increased focus on the formulation of forecasting techniques. The contribution of this work is twofold. Firstly, we analyze and evaluate the impact of renewable sources on price forecasts and use them in model training. Next, we propose a bootstrap aggregated-stack generalized architecture for very short-term electricity price forecasting to facilitate market participants in formulating strategies in real time. The stacking phase integrates extreme gradient boosting and random forest, which is then bagged to obtain a computationally efficient model. The final combination of feature engineering and ensemble architecture is observed to outperform the existing techniques.

For details refer to https://doi.org/10.1016/j.jup.2021.101185

BIOGRAPHY

DR. MAYANK KUMAR

Department of Electrical Engineering

Dr. Mayank Kumar received the B.Tech. (Hons.) degree in electronics and communication engineering from Dr. A.P.J. Abdul Kalam Technical University, Lucknow, India, in 2010, and the M.Tech. and Ph.D. degrees in electrical engineering from the Motilal Nehru National Institute of Technology Allahabad, Prayagraj, India, in 2013 and 2017, respectively. He is currently an Assistant Professor with the Department of Electrical Engineering, Delhi Technological University, Delhi, India. Prior to this, he was an Assistant Professor at Adani Institute of Infrastructure Engineering, Ahmedabad, India from July 2017 to January 2020. He has more than seven years of experiences in the field of teaching and research. His research interests include, digitized PWM control of power electronic converters, switching techniques of dc to dc, dc to ac, and ac to ac converters, modeling and control of switched power electronics circuits, solar power conversion, and so on. He is a regular reviewer of IEEE Transactions on Industrial Electronics, IEEE Transactions on Power Electronics, IEEE Transactions on Circuits and Systems, IET Power Electronics, and so on.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01

1. **M. Kumar**, "Open Circuit Fault Detection and Switch Identification for LS-PWM H-Bridge Inverter", *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 68, no. 4, pp. 1363-1367, 2021. Impact Factor: 3.292.

Open Circuit Fault Detection and Switch Identification for LS-PWM H-Bridge Inverter

Mayank Kumar

Abstract: The increases in number of power semiconductor devices in multilevel inverters increase the probability of fault occurrence and resulting the reduction in the system reliability. The semiconductor switch faults reduce the production quality and with increased duration of fault occurrence may also be the reason for complete system damage. In H-bridge inverters, the fault signatures of diagonally opposite switch fault conditions are approximately similar. Therefore, a fast fault detection with accurate switch identification technique is required. This brief presents a novel fast fault detection with accurate switch identification technique for an H-bridge inverter. The open switch fault with healthy diode is considered for the analysis. The non-ideal characteristics of semiconductor switches are used to identify open switch fault. This brief also proposed a switching time-domain open circuit fault detection technique. The pulse-width modulated inverter (PWMI) output voltage and load current have been used for detection and identification of the switch faults. The level-shifted pulse width modulation (LS-PWM) technique is used for three-level inverter voltage output.

For details refer to https://doi.org/10.1109/TCSII.2020.3035241

BIOGRAPHY

MS. NEHA KHANDUJA

Department of Electrical Engineering

Ms. Neha Khanduja was born in Jaipur in 1984. She received B.E. (Electrical Engineering) degree from the Kautilya Institute of Technology, University of Rajasthan, Jaipur in 2006 and M. Tech (Control & Instrumentation) from the Delhi Technological University, Delhi, in 2013. In July 2006, she joined the Department of Electrical Engineering, Poornima College of Engineering, Jaipur as Lecturer. In July 2008, she joined the Department of Electrical & Electronics Engineering, Gurgaon Institute of Technology & Management, Gurugram, Haryana as Lecturer. In August 2009, she joined the Department of Electrical & Electronics Engineering, Bhagwan Parshuram Institute of Technology, Rohini, Delhi as Lecturer. Presently she is Assistant Professor in Department of Electrical & Electronics Engineering, Bhagwan Parshuram Institute of Technology, Rohini, Delhi, India. Her research interests are in the area of Control Systems, Metaheuristic algorithms, Computational Intelligence and Nonlinear Systems.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **N. Khanduja** and B. Bhushan, "Optimal design of FOPID Controller for the control of CSTR by using a novel hybrid metaheuristic algorithm", *Sādhanā*, vol. 46, no. 104, 2021. Impact Factor: 1.188.

Optimal design of FOPID Controller for the control of CSTR by using a novel hybrid metaheuristic algorithm

Neha Khanduja and Bharat Bhushan

Abstract: The escalating complexity in the process control industry emanates the demand for novel and advanced control techniques, which results in enhanced performance indices. A hybrid optimal control method i.e., FOPID control using chaotic state of matter search with elite opposition-based learning for controlling CSTR is proposed in this paper. Fractional order PID is a generalized form of PID Controller. It uses fractional calculus, resulting in a more flexible and better response accompanying rigorous adoption for substantially closed-loop system stability. Hybridization of SMS with chaotic maps and elite oppositional-based learning results in enhanced exploration capability along with randomization. In this paper, the results show that the CSMSEOBL tuned FOPID controller provides superior and optimum performance when compared to other metaheuristic algorithms.

For details refer to https://doi.org/10.1007/s12046-021-01632-1

BIOGRAPHY

MR. PRAVEEN BANSAL

Department of Electrical Engineering

Mr. Praveen Bansal currently working as a research scholar in Department of Electrical Engineering at DTU. His research interest includes Multilevel Inverters, Shunt Active Power Filter, DSTATCOM and Power Quality

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **P. Bansal** and A. Singh, "Nonlinear adaptive normalized least mean absolute third algorithm for the control of five-level distribution static compensator", *International Journal of Circuit Theory and Applications*, vol. 49, no. 9, pp. 2840-2864, 2021. Impact Factor: 2.038.

Nonlinear adaptive normalized least mean absolute third algorithm for the control of five-level distribution static compensator

Praveen Bansal and Alka Singh

Abstract: This paper presents the design and control of single-phase five-level cascaded H-bridge multilevel inverter (CHB-MLI) as a shunt active power filter (SAPF) unit to mitigate the various power quality (PQ) problems such as reactive power burden, injection of harmonics in the supply, poor power factor, and so on. The control of CHB-MLI has been done using the normalized least mean absolute third (NLMAT) algorithm, which overcomes the shortcoming of conventional least mean square (LMS), normalized LMS (NLMS), and least mean absolute third (LMAT) algorithm. The control algorithm is designed in MATLAB Simulink, and its scaled down prototype model is developed in the laboratory to find the fundamental active component of load current and to mitigate the aforementioned PQ problems. The proposed system is tested for single-phase grid-connection, and it works satisfactorily under steady state and dynamic load conditions. A dSpace1104 microcontroller is used to test the proposed algorithm and to generate firing pulses. Besides, the detailed comparison in the context of mean square error (MSE), weights convergence and intermediate error with conventional LMS, NLMS, and LMAT algorithm have also been discussed. Moreover, the harmonic distortion observed in the source current is within stipulated IEEE-519 limits.

For details refer to https://doi.org/10.1002/cta.3045

BIOGRAPHY

DR. PRIYANKA CHAUDHARY

Department of Electrical Engineering

Dr. Priyanka Chaudhary has completed her Ph.D. degree at Department of Electrical Engineering, Delhi Technological University, Delhi, India. She is presently working as Assistant Professor at Department of Electrical Engineering, School of Engineering and Technology, Noida International University, Greater Noida, Uttar Pradesh, India. She has published and presented more than 14 research papers in reputed international and national journals and conference proceedings. She is the recipient of Department of Science and Technology (Ministry of India), International Travel Grant to present her research at International Conference in Italy. She is Student Member of IEEE. Her area of interest includes renewable energy systems especially solar photovoltaic systems, power system engineering, smart grid and soft computing applications in power systems etc. She is also associated with many journals including IEEE Transactions, IET Renewable Power Generation, IET Generation, Transmission and Distribution, Renewable and Sustainable Energy Reviews, Energy, Renewable Energy, Solar Energy (Elsevier), as reviewer.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **P. Chaudhary** and M. Rizwan, "QNBP NN-based *I cos* ϕ algorithm for PV systems integrated with LV/MV grid", *Soft Computing*, vol. 25, pp. 2599–2614, 2021. Impact Factor: 3.643.

QNBP NN-based *I cos* ϕ algorithm for PV systems integrated with LV/MV grid

Priyanka Chaudhary and M. Rizwan

Abstract: In this paper, a robust control technique is designed presented for a grid-integrated solar photovoltaic system. The proposed system consists of a solar photovoltaic array, converter along with linear/nonlinear loads. The main aim of this controller is to obtain maximum power from solar photovoltaic array and control the DC link voltage and injected grid current under different scenarios. The performance analysis of the proposed controller is demonstrated under different scenarios and meteorological conditions. The proposed system performs very well under transient conditions and gives very fast response. Moreover, various power quality indices were monitored and analyzed at unity power factor using hybrid control technique based on *I cos* ϕ approach with quasi-newton backpropagation learning. The grid current distortion is kept within the prescribed limits given by IEEE-519 and the IEEE-1547 standard. Experimental results illustrate the capabilities of proposed system under abnormal and unbalanced conditions.

For details refer to https://doi.org/10.1007/s00500-020-05295-8

BIOGRAPHY

MR. PRIYANSH KEDIA

Department of Electrical Engineering

Mr. Priyansh Kedia is a final year Electrical Engineering Student at Delhi Technological University, Delhi, India. He is specialized in Data Science, Machine Learning, and Deep Learning. He has skilful expertise in Python Programming Language. Research areas of my interest are Natural Language Processing and Computer Vision. He have a solid and thorough understanding of state-of-the-art ML and Deep Learning (DL) algorithms. He has completed several intermediate and advanced level certification courses in these domains, and has gained knowledge and experience about the latest industry requirements. He has worked on many projects building machine learning and deep learning models for supervised and unsupervised learning tasks. He is a researcher at the Big Data Analytics and Web Intelligence Lab, at DTU where he have worked on several ML-AI research projects and proposals. He has published four research papers in reputed Journals and Conferences and have also written a few articles on Medium.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **P. Kedia**, Anjum and R. Katarya, "CoVNet-19: A Deep Learning model for the detection and analysis of COVID-19 patients", *Applied Soft Computing*, vol. 104, pp.107184, 2021. Impact Factor: 6.725.

CoVNet-19: A Deep Learning model for the detection and analysis of COVID-19 patients

Priyansh Kedia, Anjum and Rahul Katarya

Abstract:

Background - The ongoing fight with Novel Corona Virus, getting quick treatment, and rapid diagnosis reports have become an act of high priority. With millions getting infected daily and a fatality rate of 2%, we made it our motive to contribute a little to solve this real-world problem by accomplishing a significant and substantial method for diagnosing COVID-19 patients.

Aim - The Exponential growth of COVID-19 cases worldwide has severely affected the health care system of highly populated countries due to proportionally a smaller number of medical practitioners, testing kits, and other resources, thus becoming essential to identify the infected people. Catering to the above problems, the purpose of this paper is to formulate an accurate, efficient, and time-saving method for detecting positive corona patients.

Method - In this paper, an Ensemble Deep Convolution Neural Network model "CoVNet-19" is being proposed that can unveil important diagnostic characteristics to find COVID-19 infected patients using X-ray images chest and help radiologists and medical experts to fight this pandemic.

Results - The experimental results clearly show that the overall classification accuracy obtained with the proposed approach for three-class classification among COVID-19, Pneumonia, and Normal is 98.28%, along with an average precision and Recall of 98.33% and 98.33%, respectively. Besides this, for binary classification between Non-COVID and COVID Chest X-ray images, an overall accuracy of 99.71% was obtained.

Conclusion - Having a high diagnostic accuracy, our proposed ensemble Deep Learning classification model can be a productive and substantial contribution to detecting COVID-19 infected patients.

For details refer to https://doi.org/10.1016/j.asoc.2021.107184

BIOGRAPHY

DR. RAJESH KUMAR

Department of Electrical Engineering

Dr. Rajesh Kumar received the B.Tech. degree in Applied Electronics and Instrumentation Engineering from MRCE Faridabad (M.D.U Rohtak), M.Tech. degree in Electrical Engineering (Control Systems) from the National Institute of Technology, Kurukshetra, India. He has completed his Ph.D. degree in the area of control and identification of nonlinear systems using intelligent tools from Netaji Subhas Institute of Technology, New Delhi (University of Delhi), India. Dr. Kumar is also serving as the reviewer for more than 20 reputed international journals. He has published number of research papers in various high-quality international SCI/SCIE journals. His current research interests include Artificial Neural networks, Intelligent modeling and control, system identification, stability analysis, and optimization.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Kumar** and S. Srivastava, "A novel dynamic recurrent functional link neural network-based identification of nonlinear systems using Lyapunov stability analysis", *Neural Computing and Applications*, vol. 33, pp. 7875–7892, 2021. Impact Factor: 5.606.

A novel dynamic recurrent functional link neural network-based identification of nonlinear systems using Lyapunov stability analysis

Rajesh Kumar and Smriti Srivastava

Abstract: In this paper, a novel dynamic recurrent functional link neural network (DRFLNN) is proposed for the identification of unknown dynamics of the nonlinear systems. The proposed structure contains a self-feedback loop(s) as well as the adjustable weighted feed-through of the input signals to the output neuron(s). A learning algorithm is developed using the combination of Lyapunov stability and dynamic back-propagation method and is applied to derive the stable parameter adjustment equations. The performance evaluation of the proposed DRFLNN model is done by comparing it with the multi-layer perceptron (consisting of a single hidden layer), radial basis function network, Elman recurrent neural network (ERNN), nonlinear auto-regressive moving average, and the conventional functional link neural network. Three benchmark systems have been used on which all these models are applied. From the results, it is found that ERNN provided better prediction accuracy as compared to the remaining models and the second-best accuracy is obtained from the proposed model. Further, the ERNN model is more complex and offers more parameters to be tuned as compared to the DRFLNN model. Thus, the training of the ERNN model is quite difficult as compared to the DRFLNN.

For details refer https://doi.org/10.1007/s00521-020-05526-x

BIOGRAPHY

DR. RAM BHAGAT

Department of Electrical Engineering

Dr. Ram Bhagat is working as a Associate Professor in Department of Electrical Engineering, Delhi Technological University, Delhi, India. His research interests are in the area of Network Analysis and Synthesis, Microelectronics, CMOS Analog Integrated Circuits and Control System. He has published 11 papers in the journals/conferences.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Bhagat**, D. R. Bhaskar and P. Kumar, "Quadrature Sinusoidal Oscillators Using CDBAs: New Realizations", *Circuits, Systems, and Signal Processing*, vol. 40, pp. 2634–2658, 2021. Impact Factor: 2.225.

Quadrature Sinusoidal Oscillators Using CDBAs: New Realizations

Ram Bhagat, D. R. Bhaskar and Pragati Kumar

Abstract: Four new circuits of fully uncoupled quadrature sinusoidal oscillators, using two current differencing buffered amplifiers (CDBAs), four/five resistors and two capacitors have been presented. In contrast to all previously published CDBA-based, fully decoupled, quadrature sinusoidal oscillators in which one of the input terminals is left unutilized, the presented circuits are realized by utilizing the intrinsic current differencing property of CDBAs, thus utilizing all the four terminals of the CDBA. All these quadrature oscillator (QO) circuits have an inherent feature of amplitude control of output voltages without using external control circuitry. Out of the four proposed QO circuits, two circuits have the additional feature of generating low-frequency oscillations, thus making them capable of generating wide range of frequency waveforms. The proposed oscillator circuits also possess additional functionalities not available in other CDBA-based quadrature sinusoidal oscillator circuits presented previously. The workability of the proposed circuits has been confirmed through experimental results where CDBAs are implemented using commercially available current feedback operational amplifiers (AD844).

For details refer https://doi.org/10.1007/s00034-020-01603-7

BIOGRAPHY

MS. RUPAM SINGH

Department of Electrical Engineering

Ms. Rupam Singh (Member, IEEE) received the B.Tech. degree in electrical and electronics engineering from Hindustan College of Science and Technology, Mathura, India, in 2013, the M.Tech. degree in control system from Amity University, Noida, India, in 2016, and the Ph.D. degree in intelligent control and robotics from the Department of Electrical Engineering, Delhi Technological University, New Delhi, India, in 2021. She is currently working as a Post-Doctoral Fellow with the Institute for Intelligent System Technologies, Alpen-Adria UniversitÃ¤t, Klagenfurt, Austria. She has many publications in peer-reviewed journals and presented her research articles in several international conferences. Her area of research is artificial intelligence, machine learning, control systems, condition monitoring, and their application in robotics and unmanned vehicles.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01
Commendable Research Award	02

1. **R. Singh** and B. Bhushan , "Condition Monitoring Based Control Using Wavelets and Machine Learning for Unmanned Surface Vehicles", *IEEE Transactions on Industrial Electronics*, vol. 68, no. 8, pp. 7464-7473, 2021. Impact Factor: 10.215.
2. **R. Singh** and B. Bhushan, "Improved ant colony optimization for achieving self-balancing and position control for balancer systems", *Journal of Ambient Intelligence and Humanized Computing*, vol. 12, pp. 8339-8356, 2021. Impact Factor: 7.104.
3. **R. Singh** and B. Bhushan, "Randomized algorithms for probabilistic analysis of parametric uncertainties with unmanned helicopters", *Mechanical Systems and Signal Processing*, vol. 152, pp. 107459, 2021. Impact Factor: 6.823.

Condition Monitoring Based Control Using Wavelets and Machine Learning for Unmanned Surface Vehicles

Rupam Singh and Bharat Bhushan

Abstract: This article proposes the idea of fault classification-based control for the steady-state operation of unmanned surface vehicles (USVs). The idea of fault classification is achieved with the help of wavelet transforms and support vector machines, and the control is performed using a wavelet fuzzy controller. Initially, a brief idea of faults that affect the stable operation of USVs is identified. Furthermore, the surge and sway translational motion of USVs are realized with the help of a ball balancer setup. The fault data are measured in terms of plate angle, ball position, and motor operating voltage for developing the fault classifier. The proposed algorithm

depicted improved classification accuracy when compared with conventional methods. To accommodate the operation of the system as per the operating state, a wavelet-based fuzzy controller is proposed. The proposed controller solves the problem of position tracking and balancing for ball and plate system with high precision, hence achieving the stable operation.

For details refer https://doi.org/10.1109/TIE.2020.3001855

Improved ant colony optimization for achieving self-balancing and position control for balancer systems

Rupam Singh and Bharat Bhushan

Abstract: The balancer systems represent feedback in loop-based underactuated system which is electromechanical, multivariate, and nonlinear. This paper develops a self-balancing controller using an improved ant colony optimization (ACO) to optimize the proportional integral derivative controller (PID) controller. The proposed controller achieves self-balancing control for a ball on the plate by controlling the plate inclination angle. Initially, the modelling of the ball balancer system is achieved with the help of a two degree of freedom (2DoF) ball balancer system controlled by a PID controller. Further, ACO is employed to autonomously evaluate the condition of a process and find the optimal tuning parameters for the PID controller. The transition probability of the ACO is revised to improve the response and convergence speed of the algorithm resulting in an improved ACO. The developed control schemes were applied with the 2DoF ball balancer model both in simulation as well as for the real-time operation. The results depicted the performance of the proposed control scheme by analysing the characteristics such as transient response and steady-state error. Further, stability analysis has been done for the developed control schemes using describing function method for multiple frequencies. The results depicted the superiority of the improved ACO based PID controller over the conventional PID controller.

For details refer https://doi.org/10.1007/s12652-020-02566-y

Randomized algorithms for probabilistic analysis of parametric uncertainties with unmanned helicopters

Rupam Singh and Bharat Bhushan

Abstract: This paper aims at the development of a randomized algorithm based probabilistic analysis approach for parametric uncertainties in unmanned helicopter systems. The proposed approach is developed considering the stochastic characterization of bounded uncertainty in the system assuming that the plant dynamics are exactly known. This provides a new paradigm for synthesizing the controller gain to solve the problem of trajectory tracking for unmanned. Further, to assess the operation of the proposed randomization algorithm-based probabilistic controller and achieve the controller synthesis, a two degrees of freedom (2DoF) helicopter system is modelled and operated with uncertainties for different trajectories. Besides, the robustness of the controller operating under uncertainties is verified with reachability analysis developed on reach tubes and reach sets of the ellipsoidal method. The results identified the efficiency of the proposed approach with time domain characteristics for both simulation and real-time experiments. Moreover, a comparative assessment of the projected approach with conventional techniques is carried out to validate the controller response on the helicopter model.

For details refer https://doi.org/10.1016/j.ymssp.2020.107459

BIOGRAPHY

PROF. VINOD KUMAR YADAV

Department of Electrical Engineering

Prof. Vinod Kumar Yadav received B.Tech. degree in electrical engineering from Institute of Engineering and Technology (IET), Bareilly, India in 2003, M.Tech. degree in power system engineering from National Institute of Technology (NIT), Jamshedpur, India in 2005 and Ph. D. degree in power system engineering from Indian Institute of Technology (IIT), Roorkee, India in 2011. Since 2011, he is associated with various technical universities and involved in teaching electrical engineering. Currently, he is Professor in Electrical Engineering Department, Delhi Technological University (Previously Delhi College of Engineering), Delhi, India. His research interests include renewable energy systems, power system planning & optimization, distributed generation and smart grid. Dr. Yadav has received Two times Commendable Research Award from Delhi Technological University, Delhi, 2020 and 2021, also received best teacher award from Rashtriya Shaikshik Mahasangh, Uttar Pradesh in 2016. He is Senior member of IEEE, USA and Member of International Association of Engineers.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. S. Ghosha, **V. K. Yadav**, V. Mukherjee and S. Gupta, "Three decades of Indian power-sector reform: A critical assessment", *Utilities Policy*, vol. 68, pp. 101158, 2021. Impact Factor: 2.812.

Three decades of Indian power-sector reform: A critical assessment

Santosh Ghosha, **Vinod Kumar Yadav***, Vivekananda Mukherjee and Shubham Gupta

Abstract: The accumulated financial loss of the Indian state-owned electricity utilities (SOEUs) has crossed over USD 6.25 billion and 80% of the SOEUs are consistently incurring losses and hence financially unsustainable in long term. In this article, the impact of three decades of Indian policy reform towards reviving the techno-commercial performance of the SOEUs is critically assessed. To quantify the relative performance of SOEUs and bring out the reason behind the inefficiencies of individual SOEUs, data envelopment analysis improved by Shannon's entropy model is applied. The benchmark SOEUs are identified for each inefficient ones, and corrective policy measures are recommended.

For details refer to https://doi.org/10.1016/j.jup.2020.101158

**Corresponding Author*

BIOGRAPHY

MR. ADITYA S KUMAR

Department of Electronics and Communication Engineering

Mr. Aditya S Kumar is a B.Tech. graduate in Electronics and Communication Engineering from Delhi Technological University. He was a member of the Digital System Architecture and Design (DSAD) Research Group led by Prof. Neeta Pandey. His research interests include Digital System Design and Low-power VLSI Design. He is currently working as a Senior Engineer in Samsung Semiconductor India Research (SSIR), Bengaluru

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. S. Kumar**, S. Jain and N. Pandey, "Clock Aligned Input Adiabatic Logic", *Microelectronics Journal*, vol. 114, pp. 105122, 2021. Impact Factor: 1.605.

Clock Aligned Input Adiabatic Logic

Aditya S Kumar, Sagar Jain and Neeta Pandey

Abstract: Adiabatic logic families employing four phase trapezoidal power clock, require T/4 phase shift between the input and clock and therefore require insertion of additional buffer for synchronization. This manuscript proposes Clock Aligned Input Adiabatic Logic (CAIAL) which eliminates the T/4 phase shift requirement between the clock and inputs, having similar power requirements as existing adiabatic logic families. The proposed design (CAIAL) dissipates lesser power as compared to its CMOS and FinFET counterparts. Ripple Carry Adder (RCA) and Kogge Stone Adder (KSA) of varying bit widths using existing and proposed methodologies have been designed. The functionality of all the circuits is verified using 32 nm PTM HP technology parameters in Tanner T-Spice™. A significant reduction in buffer count and power saving of 35% in RCA and 22% in KSA is achieved across all bit widths at 500 MHz. The robustness of the proposed 2N2N2P-CAIAL combination to process, voltage and clock skew variations have also been proven.

For details refer to https://doi.org/10.1016/j.mejo.2021.105122

BIOGRAPHY

MS. AKANKSHA SRIVASTAVA

Department of Electronics and Communication Engineering

Ms. Akanksha Srivastava is a Doctoral research scholar at the Electronics and Communication Engineering Department at Delhi Technological University, Delhi, India. She is also working as a Principal Investigator (Women Scientist) in a project entitled Green EARTH: Green Energy Aware Radio Technology for Cognitive Network with Heterogeneity under Women Scientists Scheme-A (WOS-A) funded by the Department of Science and Technology (DST), Government of India at DTU, Delhi. She is an active member of various professional bodies like IEEE, IEEE ComSoc, and IEEE-WIE. In 2020, she contributed as an ambassador for the IEEEXtreme 14.0 competition. In 2018, she was awarded the India Innovation Challenge Design Contest award by DST and Texas Instruments. Her current research includes Green Communication, Energy Efficient Wireless Networks, Cognitive Radio Networks.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Srivastava** and G. Kaur, "Resource management for traffic imbalance problem in green cognitive radio networks", *Physical Communication*, vol. 48, pp. 101437, 2021. Impact Factor: 1.810.

Resource management for traffic imbalance problem in green cognitive radio networks

Akanksha Srivastava and Gurjit Kaur

Abstract: The main goal of the cognitive radio network (CRN) is to provide high throughput and ubiquitous data access, but now it is focusing on energy-efficient green CRN. The energy consumption of CRN depends upon the total network time of cognitive users (CUs) and the unbalanced traffic load of CUs (when multiple CUs try to approach the same channel and their time and energy are wasted due to congestion). Hence, we design the channel decision models based on queuing priority for two different channel selection strategies, first probability-based channel selection strategy (PCSS) and second sensing-based channel selection strategy (SCSS). This model helps to calculate the optimum channel selection probability in PCSS and the optimum number of channels in the SCSS. With the help of the above-mentioned parameters, the total network time of CUs can be minimized, and their traffic load can be distributed among multiple applicant channels. We have considered the effects of PU's interruption and sensing errors (missed detection and false alarm) in our analysis. The result shows that, for heavy traffic load of CUs, the sensing-based strategy provides lesser network time, while for low traffic load, the probability-based strategy performs better. Next, we analyze the energy consumption at various operational modes in CRN and propose a channel sensing strategy that represents the energy-saving percentage for different conditions. The proposed strategies can minimize the total network time over 60% and energy consumption over 75% compared to the non-load balancing strategy.

For details refer to https://doi.org/10.1016/j.phycom.2021.101437

BIOGRAPHY

DR. AKHILESH VERMA

Department of Electronics and Communication Engineering

Dr. Akhilesh Verma received his undergraduate degree in Electronics and Communication Engineering in the year 2010 from Uttar Pradesh Technical University, Lucknow, India. He received his masters degree in Electronics and Communication Engineering from the National Institute of Technical Teachers Training and Research, Chandigarh, India in 2014. He has worked as a lecturer in Hermes College of Engineering and Management, Roorkee, Uttarakhand from 2010 to 2012. He worked as an Assistant Professor in Tula Institute (The college of Engineering and management) from 2014 to 2015. He has completed his Ph.D. degree in Electronics and Communication Engineering Department at Delhi Technological University, Delhi, since 2016. He has authored or co-authored more than 12 articles in peer reviewed journals and conference proceedings. He has also published one Indian patent. His research interests include mm-wave antennas, Beamforming networks, Passive phase shifters, SIW, mobile terminals and base stations antenna.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Verma** and S. N. Raghava, "Circularly polarized hybrid mode substrate integrated waveguide antenna for two quadrant scanning beamforming applications for 5G International", *Journal of RF and Microwave Computer-Aided Engineering*, vol. 31, no. 10, pp. e22798, 2021. Impact Factor: 1.694.

Circularly polarized hybrid mode substrate integrated waveguide antenna for two quadrant scanning beamforming applications for 5G

Akhilesh Verma and Srinivasa Nallanthighal Raghava

Abstract: Electromagnetic band gap (EBG) based two ports multiple-input and multiple-output (MIMO) substrate integrated waveguide (SIW) antenna for two quadrant beamforming applications using metasurfaces (MS) is addressed. A novel SIW structure is employed to achieve beamforming. This work comprises two types of vias having different diameters and lengths in order to achieve multibeam in the first and second quadrant with 120° coverage. Two cross slots tilted at **±45∘** are etched on top of the structure. The width variation of one of the cross slots achieved beam scanning in first quadrant with coverage of 90°. Additionally, four circular slots are etched on the top metallic layer to improve the axial ratio and the gain of the antenna. Apart from that, two diagonally etched slots help to enhance the gain and radiation properties of the antenna. Furthermore, to get the good mutual coupling and isolation between the two ports, EBG unit cells are deployed on the ground. The proposed antenna shows good right hand circularly polarized radiation within the band with the help of MS deployed on an extended part of the substrate. MS also improves the return loss bandwidth. In the end, the diversity properties of the MIMO have been studied as well. The proposed antenna shows good performance in all respects for 5G applications.

For details refer to https://doi.org/10.1002/mmce.22798

BIOGRAPHY

MR. ANURAG CHAUHAN

Department of Electronics and Communication Engineering

Mr. Anurag Chauhan, Assistant Professor in the Department of Electronics and Communication Engineering since Dec 2016. The research areas include VLSI, molecular electronics, spintronics and nano-materials.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Chauhan**, A. Maahich and J. Pal, "First-principles calculations of the electronic and optical properties of $WSe_2/Cd_{0.9}Zn_{0.1}Te$ van der Waals heterostructure", *Journal of Computational Electronics*, vol. 20, pp. 13–20, 2021. Impact Factor: 1.807.

First-principles calculations of the electronic and optical properties of $WSe_2/Cd_{0.9}Zn_{0.1}Te$ van der Waals heterostructure

Anurag Chauhan, Ankit Maahich and Jatin Pal

Abstract: Electronic and optical properties of monolayer tungsten selenide (WSe_2) and cadmium zinc telluride ($Cd_{0.9}Zn_{0.1}Te$) heterostructure with VdW, i.e., Van der Waals attractions between two layers, are explored using first-principles calculations. From the results, it is discovered that the proposed heterostructure of $WSe_2/Cd_{0.9}Zn_{0.1}Te$ results into nearly direct band gap semiconducting material and has staggered (Type-II) band gap alignment which is required for opto electronic applications. Moreover, the results suggest that for monolayer WSe_2 and $Cd_{0.9}Zn_{0.1}Te$, optical absorption is significant in a limited range of visible spectrum (≈ 420–470 nm) and (≈ 390–430 nm), respectively, but more absorption takes place in the infrared (IR) region for individual layers. However, the absorption in the $WSe_2/Cd_{0.9}Zn_{0.1}Te$ heterostructure results in the red shift phenomenon and high absorption is achieved in the entire visible spectrum (≈ 410–710 nm). Along with the absorption spectrum, dielectric function, refractive index and optical conductivity of the heterostructure are also calculated agreeing with the trends of each other. Desirable band alignment and high absorption coefficient in the visible spectrum can find applications in photovoltaic cells and other opto electronic devices.

For details refer to https://doi.org/10.1007/s10825-021-01659-x

BIOGRAPHY

MS. BHAWNA RAWAT

Department of Electronics and Communication Engineering

Ms. Bhawna Rawat is a Ph.D. research scholar in the Department of Electronics and Communication Engineering at Delhi Technological University under the supervision of Prof. Poornima Mittal. Her research interests include low power circuit design and memory circuits in emerging technologies. She received her B. Tech Degree in Electronics and Communication Engineering from Shiv Nadar University, Greater Noida, and M.Tech degree in VLSI Design from Indira Gandhi Delhi Technical University for Women, Delhi. She is GATE qualified and receives DTU fellowship.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **B. Rawat** and P. Mittal, "A 32 nm single-ended single-port 7T static random access memory for low power utilization", *Semiconductor Science and Technology*, vol. 36, no. 9, pp. 095006, 2021. Impact Factor: 2.352.

2. **B. Rawat** and P. Mittal, "Single bit line accessed high-performance ultra-low voltage operating 7T static random access memory cell with improved read stability", *International Journal of Circuit Theory and Applications*, vol. 49, no. 5 pp. 1435-1449, 2021. Impact Factor: 2.038.

A 32 nm single-ended single-port 7T static random access memory for low power utilization

Bhawna Rawat and Poornima Mittal

Abstract: In this paper, a seven-transistor static random access memory (SRAM) bit cell with a single bitline architecture is proposed. This cell is designed at 32 nm and is operational at 300 mV. The static noise margin for the read and hold modes is 90 mV, while the write margin is 180 mV. Monte Carlo analysis for 6σ global variations and temperature variation analysis for temperatures in the range −10 °C to 80 °C validate its performance. The cell is compared with other single-ended 5T, 6T, 7T, 8T, 9T and 10T SRAM cells and is found to be superior in performance. As the leakage current is low, the I_{ON}/I_{OFF} ratio is high compared with the other cells. The power consumption of the bit cell is also found to be minimal for all modes of operation. The dynamic write analysis demonstrates that the proposed cell completes the write operation in a 10 ns pulse width. Moreover, the improvement in performance is obtained for an area as low as 0.539 μm^2. The area of 5T, 6T, 7T-1, 7T-2, 7T-4, 7T-5, 8T, 9T and 10T cells is greater than the 7TP bit cell area by 22.17%, 51.8%, 35.8%, 13.9%, 30.4%, 6.78%, 56.6%, 63.3% and 75.5%, respectively.

For details refer to https://doi.org/10.1088/1361-6641/ac07c8

Single bit line accessed high-performance ultra-low voltage operating 7T static random access memory cell with improved read stability

Bhawna Rawat and Poornima Mittal

Abstract: Static random access memory (SRAM) bit cell is a prominent element for portable devices. The popularity of sleek designs and demand for longer battery life has driven memory cell into nanometer domain. This has also bolstered the need for low-voltage devices. But reduction in operational voltage for cell is limited by process variation. In this work, a single bit line seven-transistor (7T) SRAM bit cell is reported. The cell is designed for 32-nm technology node and is functional at 300 mV. The reported cell maintains a 90-mV hold and read static noise margins (SNMs), while the write margin is 190 mV. The pulse width needed to successfully write into the cell is 30 ns. The performance of proposed 7T cell is compared against different 6T, 7T, 8T, and 10T SRAM bit cells. The hold and read SNMs for proposed 7T are found to be 58.8%, better than single-ended 6T cell, while the write ability is improved by 71.4%. The leakage current is observed to have decreased by a factor of 14 for $Q = 0$ (Q being the data storage node) and by factor of 28 for $Q = 1$, compared to 6T cell. Also, the area footprint of the proposed 7T SRAM cell is 0.442 μm^2.

For details refer to https://doi.org/10.1002/cta.2960

BIOGRAPHY

DR. CHHAVI DHIMAN

Department of Electronics and Communication Engineering

Dr. Chhavi Dhiman (M'16) received the B.Tech. from Indira Gandhi Delhi Technological University for Women (IGDTUW) (Formerly known as IGIT, GGSIPU), Delhi, India, in 2011, M.Tech. and Ph.D. from Delhi Technological University (DTU) Delhi, India, in 2014 and 2019 respectively. She is currently working as an Assistant Professor in the Department of Electronics and Communication Engineering, Delhi Technological University. Her research interests include computer vision, deep learning, Pattern Recognition, Image Processing, Human action and activity recognition. She has received the research excellence awards in the year 2020, and 2021 from the Delhi Technological University. She is a reviewer of various journals of the IET, and Elsevier.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01

1. **C. Dhiman**, D. K. Vishwakarma and P. Agarwal, "Part-wise Spatio-temporal Attention Driven CNN-based 3D Human Action Recognition", *ACM Transactions on Multimedia Computing, Communications, and Applications*, vol. 17, no. 3, pp. 1-24, 2021. Impact Factor: 3.144.

Part-wise Spatio-temporal Attention Driven CNN-based 3D Human Action Recognition

Chhavi Dhiman, Dinesh Kumar Vishwakarma and Paras Agarwal

Abstract: Recently, human activity recognition using skeleton data is increasing due to its ease of acquisition and finer shape details. Still, it suffers from a wide range of intra-class variation, inter-class similarity among the actions and view variation due to which extraction of discriminative spatial and temporal features is still a challenging problem. In this regard, we present a novel Residual Inception Attention Driven CNN (RIAC-Net) Network, which visualizes the dynamics of the action in a part-wise manner. The complete skeletonis partitioned into five key parts: Head to Spine, Left Leg, Right Leg, Left Hand, Right Hand. For each part, a Compact Action Skeleton Sequence (CASS) is defined. Part-wise skeleton-based motion dynamics highlights discriminative local features of the skeleton that helps to overcome the challenges of inter-class similarity and intra-class variation with improved recognition performance. The RIAC-Net architecture is inspired by the concept of inception-residual representation that unifies the Attention Driven Residues (ADR) with inception-based Spatio-Temporal Convolution Features (STCF) to learn efficient salient action features. An ablation study is also carried out to analyze the effect of ADR over simple residue-based action representation. The robustness of the proposed framework is evaluated by performing an extensive experiment on four challenging datasets: UT Kinect Action 3D, Florence 3D action, MSR Daily Action3D, and NTU RGB-D datasets, which consistently demonstrate the superiority of the proposed method over other state-of-the-art methods.

For details refer to https://doi.org/10.1145/3441628

BIOGRAPHY

DR. DWIJENDRA PANDEY

Department of Electronics and Communication Engineering

Dr. Dwijendra Pandey received his PhD in the Department of Electronics and Communication Engineering, Delhi Technological University (DTU), Delhi, India in year 2020. He has also worked as a Junior/Senior Research Fellow (JRF/SRF) in a Clustered based Networked Project on Imaging Spectrometer and its Applications (NISA) funded by Department of Science and Technology (DST), Government of India, and as a Research Associate (RA) in Announcement of opportunity (hyper AO) airborne hyperspectral mission- science & applications project funded by Space Application Centre (SAC), Indian Space Research Organisation (ISRO), Government of India, in Multidisciplinary Centre for Geoinformatics, DTU, Delhi. His research interests include Remote Sensing of Impervious Surfaces, Hyperspectral Remote Sensing, Image Processing, Spectral Index based target detection and classification, and Machine Learning.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **D. Pandey** and K. C. Tiwari, "Spectral library creation and analysis of urban built-up surfaces and materials using field spectrometry", *Arabian Journal of Geosciences*, vol. 14, no. 595, 2021. Impact Factor: 1.827.

Spectral library creation and analysis of urban built-up surfaces and materials using field spectrometry

Dwijendra Pandey and Kailash Chandra Tiwari

Abstract: Hyperspectral remote sensing is useful for the study of urban environment due to its ability to examine the comprehensive spectral characteristics of urban built-up surfaces and materials. This study deals with the creation of a spectral library and statistical analysis of spectral signatures of urban built-up surfaces and materials. Field measurement has been carried out using a spectroradiometer over the wavelength range of 350 to 2500 nm. Further, this study investigates the unique spectral characteristics and complexity of heterogeneous urban environments using mean spectral signatures of major built-up surfaces and materials. The study area belongs to the Udaipur, Rajasthan, India, which is an amalgamation of urban built-up and non-built-up surfaces. The results of the analysis suggest that various built-up surfaces and materials can be identified by investigating different absorption features in different spectral regions of a particular urban built-up class.

For details refer to https://doi.org/10.1007/s12517-021-06723-1

BIOGRAPHY

MS. GARIMA VARSHNEY

Department of Electronics and Communication Engineering

Ms. Garima Varshney is currently working as Senior Research Fellow (SRF) in the department of Electronics & Communication Engineering, Delhi Technological University. Her area of interest comprises analog integrated circuits, fractional order circuits etc.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. **G. Varshney**, N. Pandey and R. Pandey, "Electronically tunable fractional-order multivibrator using OTA and its application as versatile modulator", *AEU - International Journal of Electronics and Communications*, vol. 141, pp. 153956, 2021. Impact Factor: 3.183.
2. **G. Varshney**, N. Pandey and R. Pandey, "Electronically Tunable Multifunction Transadmittance-Mode Fractional-Order Filter", *Arabian Journal for Science and Engineering*, vol. 46, pp. 1067–1078, 2021. Impact Factor: 2.334.
3. **G. Varshney**, N. Pandey and R. Pandey, "Generalization of shadow filters in fractional domain", *International Journal of Circuit Theory and Applications*, vol. 49, no. 10, pp. 3248-3265, 2021. Impact Factor: 2.038.

Electronically tunable fractional-order multivibrator using OTA and its application as versatile modulator

Garima Varshney, Neeta Pandey and Rajeshwari Pandey

Abstract: In this paper, a multivibrator built around three operational transconductance amplifiers (OTA) is generalized in fractional domain. Mathematical formulation for time period of the multivibrator is drafted using Reimann-Liouville fractional integral. The oscillation period and amplitude of the square wave are electronically tunable and can be controlled independently. The use of the fractional-order capacitor facilitates the multivibrator to have very high frequency oscillations using simple components, this feature of fractional-order multivibrator is explored as a versatile modulator (i.e., amplitude modulator, frequency modulator, delta modulator and sigma-delta modulator), the adjustment of modulation index of analog modulators has also been examined.

For details refer to https://doi.org/10.1016/j.aeue.2021.153956

Electronically Tunable Multifunction Transadmittance-Mode Fractional-Order Filter

Garima Varshney, Neeta Pandey and Rajeshwari Pandey

Abstract: In this paper a multifunction transadmittance-mode fractional-order filter is proposed for the very first time. The proposed structure provides fractional-order low-pass filter, fractional-order high-pass filter and fractional-order all-pass filter. It uses two operational transconductance amplifier and one fractional capacitor (FC). The FC is realized using the twelfth-order continued fraction expansion-based RC ladder. Functional verification of proposed fractional-order filter is verified through PSPICE using 180-nm CMOS technology model parameters. The transfer functions sensitivities' with respect to various circuit parameters are examined through simulations. The effect of parameter variation on filter responses is studied using Monte Carlo analysis. Furthermore, the proposed filter possess electronic tunability through bias currents. Moreover, the circuit is tested experimentally using discrete components to realize the fractional-order capacitor showing great matching with the theoretical data.

For details refer to https://doi.org/10.1007/s13369-020-04841-8

Generalization of shadow filters in fractional domain

Garima Varshney, Neeta Pandey and Rajeshwari Pandey

Abstract: This work is intended to generalize the design of shadow filters to the fractional-order domain. Shadow filters, in integer-order domain, introduced by Lakys and Fabre, consist of an external amplifier in the feedback loop of the basic filter cell and by varying the gain of this amplifier the parameters of the resulting filter are modified without disturbing the active and passive components of the filter itself. In particular, we consider here the case where a basic 2α order filter is constructed using two fractional-order capacitors both of the same order α. Mathematical formulations are drafted for pole frequency and pole quality factor for different feedback signals with various cases of stability and demonstrated using MATLAB simulations. Functional verification of the proposed theory is verified using an active filter example, designed around operational transconductance amplifier (OTA), through SPICE using 180 nm CMOS technology model parameters.

For details refer to https://doi.org/10.1002/cta.3054

BIOGRAPHY

DR. GAURAV SAXENA

Department of Electronics and Communication Engineering

Dr. Gaurav Saxena received his Bachelor of Technology (B.Tech.) degree in Electronics and Communication Engineering, from Uttar Pradesh Technical University Lucknow, India, in 2007, M. Tech degree in Microwave Electronics, from University of Delhi, South Campus, Delhi, India and Ph.D. from Delhi Technological University, Delhi, India, in 2020 and awarded a Commendable Research Award for 3 SCI articles Published in 2020 session. He also received a meritorious scholarship from July 2010 to July 2012 given by the University of Delhi. From Dec.2011 to May 2012 he has worked as an internship trainee at CSIR, NPL Delhi where he established traceability of the VNA and received an appreciation certificate from Scientist-F. Now, he is working as an Associate Professor in Electronics & Communication Engineering Department from Galgotias College of Engineering and Technology, Greater Noida, Uttar Pradesh and published one patent and numerous research articles in peer reviewed International Journals and Conferences. His recent research interest includes modelling of passive microwave components like filters Power divider/combiner, Microwave antenna for 5G and Wireless applications, Meta-material absorber, MIMO Antenna receiver/transmitter, THz MIMO antenna, absorbers and LNA etc.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **G. Saxena**, P. Jain and Y. K. Awasthi, "Design and analysis of a planar UWB bandpass filter with stopband characteristics using MMR technique", *International Journal of Microwave and Wireless Technologies*, vol. 13, no. 10, pp. 999 – 1006, 2021. Impact Factor: 1.064.

2. **G. Saxena**, P. Jain and Y. K. Awasthi, "Design of metasurface absorber for low RCS and high isolation MIMO antenna for radio location & navigation", *AEU - International Journal of Electronics and Communications*, vol. 133, pp. 153680, 2021. Impact Factor: 3.183.

Design and analysis of a planar UWB bandpass filter with stopband characteristics using MMR technique

Gaurav Saxena, Priyanka Jain and Y. K. Awasthi

Abstract: In this paper, a ultra-wideband (UWB) bandpass filter with stopband characteristics is presented using a multi-mode resonator (MMR) technique. An MMR is formed by loading three dumbbell-shaped (Mickey and circular) shunt stubs placed in the center and two symmetrical locations from ports, respectively. Three circular and arrowhead defected ground structures on the ground plane are introduced to achieve UWB bandwidth with a better roll-off rate. The proposed filter exhibits stopband characteristics from 10.8 to 20 GHz with a 0.4 dB return loss. The group delay and roll-off rate of the designed filter are <0.30 ns in the passband and 16 dB/GHz at lower and higher cut-off frequencies, respectively. The dimension of the filter is 0.74λg × 0.67λg mm2 and was fabricated on a cost-effective substrate. All simulated results are verified through the experimental results.

For details refer to https://doi.org/10.1017/S1759078720001762

Design of metasurface absorber for low RCS and high isolation MIMO antenna for radio location & navigation

Gaurav Saxena, Priyanka Jain and Y. K. Awasthi

Abstract: In this article, a novel metasurface absorber is designed for RCS reduction as well as high isolation in a 4-elements MIMO antenna. A unit cell of metasurface absorber is amalgamated by concentric circular and elliptical-shaped rings with four 300 ohms lumped resistances. Absorbance at the intended frequency band (i.e. 8.75 GHz-9.00 GHz) of metasurface absorber is more than 90.0% and its reflectivity is tending to zero. Therefore, the isolation between antennas due to this absorbance is improved by 12 dB, and the total isolation of the antenna is achieved less than 23 dB. Similarly, the Radar cross-section (RCS) of the antenna is also significantly reduced by 10dBm^2. This MIMO antenna with an absorbing structure is fabricated on a richly existing FR4 substrate with dimensions of 55 × 40 × 1 mm^3. The performance of the designed MIMO antenna is also judged by diversity parameters similar to Envelope correlation coefficient (ECC), Directive gain (DG), Mean effective gain (MEG), Channel capacity loss (CCL), Total Active Reflection Coefficient (TARC), and channel capacity, etc. for the proposed frequency band. The simulated and measured ECC of the proposed MIMO is less than 0.073 which exhibits that this antenna is suitable for military application in radiolocation and navigation.

For details refer to https://doi.org/10.1016/j.aeue.2021.153680

BIOGRAPHY

DR. MANJEET KUMAR

Department of Electronics and Communication Engineering

Dr. Manjeet Kumar received the B.Tech degree in Electronics and Telecommunication Engineering from Kurukshetra University, Kurukshetra, India in 2008, and the M.Tech degree in Signal Processing from Guru Gobind Singh Indraprastha University, Delhi, India, in 2011, and the Ph.D. degree in from the Department of Electronics and Communication Engineering, Netaji Subhas Institute of Technology (NSIT), Delhi affiliated to University of Delhi, India, in 2017. He served as Assistant Professor the department of Electronics and Communication Engineering, Bennett University, Greater Noida from June 2016 to July 2020. From July 2020, he has been working as Assistant Professor in the department of Electronics and Communication Engineering at Delhi Technological University, Delhi. He has authored more than thirty-five research articles and twenty conference papers in reputed International journals and conferences. He also served as a reviewer in many International Journals. His research interests include Signal processing, Biomedical Signal Processing, ECG Signal Processing, PPG Signal Processing, Image Processing, Fractional Systems, Optimization Algorithms, Artificial Intelligence in Healthcare, Signal Analysis using Wavelet Transform, Healthcare Assistive Techniques, and Low-power Biomedical Circuit design, Analog Circuit Design.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	05

1. S. Yadav, R. Yadav, A. Kumar and **M. Kumar**, "A novel approach for optimal design of digital FIR filter using grasshopper optimization algorithm", *ISA Transactions*, vol. 108, pp. 196-206, 2021. Impact Factor: 5.468.
2. S. Yadav, R. Yadav, A. Kumar and **M. Kumar**, "A novel approach to design optimal 2-D digital differentiator using vortex search optimization algorithm", *Multimedia Tools and Applications*, vol. 80, pp. 5901–5916, 2021. Impact Factor: 2.757.
3. A. Kumar, R. Ranganatham, **M. Kumar** and R. Komaragiri, "Hardware Emulation of a Biorthogonal Wavelet Transform-Based Heart Rate Monitoring Device", *IEEE Sensors Journal*, vol. 21, no. 4, pp. 5271 – 5281, 2021. Impact Factor: 3.301.
4. A. Kumar, H. Tomar, V. K. Mehla, R. Komaragiri and **M. Kumar**, "Stationary wavelet transform based ECG signal denoising method", *ISA Transactions*, vol. 114, pp. 251-262, 2021. Impact Factor: 5.468.
5. N. Kumar, **M. Kumar** and N. Pandey, "Unified floating immittance emulator based on CCTA", *Microelectronics Journal*, vol. 118, pp. 105289, 2021. Impact Factor: 1.605.

A novel approach for optimal design of digital FIR filter using grasshopper optimization algorithm

Suman Yadav, Richa Yadav, Ashwni Kumar and **Manjeet Kumar***

Abstract: The idea behind designing digital filters is to compute the optimal filter coefficients such that the magnitude response of the designed matches the ideal frequency response using optimization algorithms. The proposed work employed a recently proposed swarm-based optimization technique, namely, a grasshopper optimization algorithm (GOA) to design a linear phase finite impulse response (FIR) low pass, high pass, band pass , and band stop filters. This proposed algorithm models the behaviour of grasshoppers while seeking food sources to solve optimization problems. For the designing of the FIR filter, an absolute error difference fitness function is used, which is minimized using GOA to obtain optimal filter coefficients. The performance comparison of the proposed work is done with already existing algorithms such as cuckoo search, particle swarm optimization, artificial bee colony to prove its superiority and consistency. It is found that GOA based filter meets the objective efficiently with reduced ripples in pass band and higher attenuation in stop band with least execution time.

For details refer to https://doi.org/10.1016/j.isatra.2020.08.032

A novel approach to design optimal 2-D digital differentiator using vortex search optimization algorithm

Suman Yadav, Richa Yadav, Ashwni Kumar and **Manjeet Kumar***

Abstract: The designing of 2-D digital differentiator is multimodal and high dimensional problem which requires large number of differentiator coefficients to be optimized, hence conventional design techniques will not lead to optimal 2-D differentiator design. Metaheuristic approaches is a good approach to handle multimodal and high dimensional problem under consideration. In this paper, a novel method for the design of FIR two-dimensional (2-D) digital differentiator with quadrantally odd symmetric properties is proposed. The coefficients of 2-D digital differentiator are computed and optimized using vortex search optimization (VSO) algorithm with the support of L_1 error objective function. The unique combination of VSO and L_1 error fitness function aids in achieving flatter magnitude response in designing of 2-D differentiator. Further, some comparative analysis with the well-known established techniques like cuckoo search algorithm (CSA), particle swarm optimization (PSO) and real coded genetic algorithm (RCGA) methodology is reported over full frequency bands, in order to demonstrate the advantage of the proposed novel 2-D digital differentiator design approach. To measure the performance of proposed system, some parameters are selected for illustration such as absolute magnitude error, mean absolute error, standard deviation and execution time. The excellence of the proposed approach is observed in approximating the ideal response of 2-D differentiator in contrast to other algorithms and to provide global optimal solution.

For details refer to https://doi.org/10.1007/s11042-020-10012-6

Hardware Emulation of a Biorthogonal Wavelet Transform-Based Heart Rate Monitoring Device

Ashish Kumar, Ramana Ranganatham, **Manjeet Kumar*** and Rama Komaragiri

Abstract: In this work, a low-power, area-efficient, and high-performance electrocardiogram (ECG) detector that can be used in modern implantable cardiac pacemaker systems is proposed. Qualitative and quantitative analysis indicates that the Biorthogonal-3.1 wavelet transform combined with adaptive slope prediction is best suited to detect various ECG peaks by effectively denoising various artifacts present in an ECG signal. A demand-based wavelet filter bank (WFB) architecture consisting of a series combination of three lowpass filters

**Corresponding Author*

is the primary reason for the low-power requirements of the circuit. Power consumption and area requirements of the circuit are further reduced by realizing the lowpass filters using lattice wave digital filter realization that reduces the requirement of delay elements, and multipliers count by 80% and 75%, respectively. The proposed ECG denoising scheme using the biorthogonal 3.1 wavelet transform generates a smoother denoised ECG wave by retaining the important morphology of an ECG signal. Adaptive slope prediction criterion-based ECG processing and detection schemes achieve a high detection accuracy of 99.90%, with the lowest error of 0.002%. The proposed scheme is capable of distinguishing between a normal ECG, paced ECG, arrhythmic ECG, and low and high-resolution ECG. The proposed algorithm is then emulated on the Xilinx®-Virtex®-7 FPGA hardware platform. Power consumption, area, delay, and switching energy of the proposed ECG processing scheme are reduced when compared to existing ECG detection schemes and are found to be of 0.493 µW, 1.1 mm2, 10 ns, and 4.93 µJ, respectively.

For details refer to https://doi.org/10.1109/JSEN.2020.3034742

Stationary wavelet transform based ECG signal denoising method+

Ashish Kumar, Harshit Tomar, Virender Kumar Mehla, Rama Komaragiri and **Manjeet Kumar***

Abstract: Electrocardiogram (ECG) signals are used to diagnose cardiovascular diseases. During ECG signal acquisition, various noises like power line interference, baseline wandering, motion artifacts, and electromyogram noise corrupt the ECG signal. As an ECG signal is non-stationary, removing these noises from the recorded ECG signal is quite tricky. In this paper, along with the proposed denoising technique using stationary wavelet transform, various denoising techniques like lowpass filtering, highpass filtering, empirical mode decomposition, Fourier decomposition method, discrete wavelet transform are studied to denoise an ECG signal corrupted with noise. Signal-to-noise ratio, percentage root-mean-square difference, and root mean square error are used to compare the ECG signal denoising performance. The experimental result showed that the proposed stationary wavelet transform based ECG denoising technique outperformed the other ECG denoising techniques as more ECG signal components are preserved than other denoising algorithms.

For details refer to https://doi.org/10.1016/j.isatra.2020.12.029

Unified floating immittance emulator based on CCTA+

Navnit Kumar, **Manjeet Kumar*** and Neeta Pandey

Abstract: In this paper, a unified floating immittace emulator based on Current Conveyor Transconductance Amplifier (CCTA) is put forward. It uses two CCTAs, two additional components (two MOS based resistors/one capacitor and one MOS based resistor) and four MOS switches. It can realize both positive and negative floating immittances through appropriate setting of switches. The proposed topology does not require any component matching, thus making it suitable for integration viewpoint. Further, the immittance may be tuned electronically via bias current of CCTA. Additionally, the operation in fractional domain also investigated. The impact of parasitics of CCTA on the performance of the proposed circuit is mathematically formulated. The functionality of the proposed circuit is verified through post layout simulations carried out using the netlist extraction from the layout and examined through SPICE simulations using 90 nm process parameter. The area of the layout of proposed unified immittance emulator is 67.80 µm 22.80 µm. The proposed immittance circuit is used to implement notch filter, fifth order low pass filter, and capacitance cancellation circuit.

For details refer to https://doi.org/10.1016/j.mejo.2021.105289

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

MR. MOHD SAZID

Department of Electronics and Communication Engineering

Mr. Mohd Sazid is working as a research scholar in Electronics and Communication Engineering Department in Delhi Technological University, India. His area of specialization is Radio frequency circuit design, Antenna and Propagation, Active and Passive microwave devices.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **M. Sazid** and N. S. Raghava, "Planar UWB-bandpass filter with multiple passband transmission zeros", *AEU - International Journal of Electronics and Communications*, vol. 134, pp. 153711, 2021. Impact Factor: 3.183.

Planar UWB-bandpass filter with multiple passband transmission zeros

Mohd Sazid and N. S. Raghava

Abstract: A planar ultra-wideband (UWB) bandpass filter (BPF) with multiple passband transmission zeros (TZs) and wide stopband is reported in this manuscript. The basic architecture of the BPF consists of two microstrip-to-coplanar waveguide (CPW) transition arranged on either sides of the substrate. A 3rd order BPF hence developed displays good frequency characteristics with two TZs on either passband edges. Later, defected ground structures (DGS) in the form of complementary split ring resonator (CSRR) and complementary folded split ring resonator (CFSRR) are utilized to place three TZs in the passband so as to cut off in-band interferences. Upon optimized simulation, a prototype is eventually developed and measured for compatible frequency characteristics.

For details refer to https://doi.org/10.1016/j.aeue.2021.153711

BIOGRAPHY

MS. MONICA GUPTA

Department of Electronics and Communication Engineering

Ms. Monica Gupta received M.E. degree in Electronics and Communication Engineering from Delhi College of Engineering, New Delhi in the year 2006. She is currently pursuing Ph. D degree in Electronics and Communication Engineering from Delhi Technological University, New Delhi (Formerly, DCE). She is working as an Assistant Professor with Bharati Vidyapeeth College of Engineering, New Delhi and has teaching experience of more than 14 years. Her research interests include Low power memory design.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. **M. Gupta**, K. Gupta and N. Pandey, "A data-independent 9T SRAM cell with enhanced ION/IOFF ratio and RBL voltage swing in near threshold and sub-threshold region", *International Journal of Circuit Theory and Applications*, vol. 49, no. 4, pp. 953-969, 2021. Impact Factor: 2.038.
2. **M. Gupta**, K. Gupta and N. Pandey, "A novel PVT-variation-tolerant Schmitt-trigger-based 12T SRAM cell with improved write ability and high ION/IOFF ratio in sub-threshold region", *International Journal of Circuit Theory and Applications*, vol. 49, no. 11, pp. 3789-3810, 2021. Impact Factor: 2.038.
3. **M. Gupta**, K. Gupta and N. Pandey, "Comparative Analysis of the Design Techniques for Low Leakage SRAMs at 32nm", *Microprocessors and Microsystems*, vol. 85, pp. 104281, 2021. Impact Factor: 1.525.

A data-independent 9T SRAM cell with enhanced I_{ON}/I_{OFF} ratio and RBL voltage swing in near threshold and sub-threshold region

Monica Gupta, Kirti Gupta and Neeta Pandey

Abstract: The conventional 8T SRAM cell with isolated read port is suggested as an alternative to overcome the read-write conflicts associated with 6T SRAM cell. However, in near threshold and sub-threshold regions, 8T cell performance is limited by reduced I_{ON}/I_{OFF} ratio, deteriorated RBL voltage swing, data dependency, and higher read failures, although the existing SRAM cells address some of these issues but still suffer from degraded performance due to the trade-off between leakage and read currents. In this paper, a 9T SRAM cell with novel read port is proposed that aims for low and data-independent leakages, high I_{ON}/I_{OFF} ratio, and large RBL voltage swing in near threshold and sub-threshold regions. The performance of the proposed cell is compared with 7T, 8T, 9T, and 10T cells at 32 nm technology node by simulating a column of 128 cells to demonstrate its versatility over others. The proposed cell shows enhanced I_{ON}/I_{OFF} ratio (71.2X), large RBL voltage swing and data-independent leakages at V_{DD} = 0.3 V in comparison to the conventional 8T SRAM cell. The results at different PVT corners are also captured to validate the impeccable performance of the proposed cell irrespective of operating conditions.

For details refer to https://doi.org/10.1002/cta.2951

A novel PVT-variation-tolerant Schmitt-trigger-based 12T SRAM cell with improved write ability and high I_{ON}/I_{OFF} ratio in sub-threshold region

Monica Gupta, Kirti Gupta and Neeta Pandey

Abstract: This paper presents a process voltage temperature (PVT)-variation-tolerant Schmitt-trigger-based 12T SRAM cell at 32 nm. The cell uses a modified Schmitt-trigger action in all operating modes for performance improvement, a characteristic that is not exhibited by existing SRAM cells. The action improves the stability of stored data in read and hold modes and assists the write process to enable a faster and low-voltage write operation. Additionally, the cell uses negative bitline technique and fully-gated grounded scheme for achieving further improvement in write ability and I_{ON}/I_{OFF} ratio. The proposed cell shows 34.9% reduced deviation in switching threshold voltage in comparison to conventional structure. Further, improvement of up to 211% in write ability and 169% in I_{ON}/I_{OFF} ratio is obtained over existing SRAM cells operating in sub-threshold region. The cell takes up to 86% and 99% lesser read and write access time, respectively. The Monte-Carlo simulations show the robust performance of proposed cell. The cell has reduced write, read, and hold failure probabilities resulting in overall Vmin of 425 mV, which is the least among the cells considered for comparison, thus making it an amenable design suitable for sub-threshold operation under PVT-variations.

For details refer to https://doi.org/10.1002/cta.3134

Comparative Analysis of the Design Techniques for Low Leakage SRAMs at 32nm

Monica Gupta, Kirti Gupta and Neeta Pandey

Abstract: This paper presents a comprehensive overview of leakage reduction techniques prevailing in Static Random Access Memories (SRAMs) by classifying them in three categories namely latch, bitline and read port. The performance of the techniques are evaluated in terms of leakage reduction capability along with the impact on read performance and hold stability through extensive simulative investigations at 32 nm technology node by taking conventional SRAM cell as reference. Further, as SRAMs are susceptible to inter-die as well as intra-die process variations, the performance at different PVT corners is also captured to demonstrate the efficacy of each technique under PVT variations. It is found that among the techniques used for reducing latch leakages, Multi-threshold CMOS technique possess the highest leakage reduction capabilities followed by Drowsy mode and Substrate-bias techniques. The results also indicate that Negative word line technique is more effective at low supply voltages whereas the Leakage biased bitline technique is more effective at high supply voltages for reducing bitline leakages. Amongst the read port leakage reduction techniques, Stack-effect and Dynamic control of power supply rail techniques are capable of suppressing the leakages at high voltages whereas Virtual cell ground technique is more efficacious at low voltages. The impact of technology scaling on SRAM cell performance with leakage reduction techniques is also studied. For the sake of completeness, suggestions are put forward for adopting a particular technique to address leakages at latch, bitline and read port levels.

For details refer to https://doi.org/10.1016/j.micpro.2021.104281

BIOGRAPHY

MR. MUNINDRA

Department of Electronics and Communication Engineering

Mr. Munindra was born in Roorkee, Uttrakhand-India in August 1990. He received the B. Tech. and M. Tech. degrees in Electronics and Communication engineering from the Uttrakhand Technical University, Dehradun, in 2011 and National Institute of Technology (NIT) Delhi in 2016 respectively. Currently, he is pursuing a Ph.D. degree in Electronics and Communication Engineering from Delhi Technological University, Delhi-India since 2017. MY research interests are graphene Felid effect transistor and its Biomedical application, RF electronics applications, designing of Sports item with CNT and graphene.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **Munindra** and D. Nand, "Nonlinearity and scaling trends of quasiballistic graphene field-effect transistors targeting RF applications", *Journal of Computational Electronics*, vol. 20, pp. 2379–2386, 2021. Impact Factor: 1.807.

Nonlinearity and scaling trends of quasiballistic graphene field-effect transistors targeting RF applications

Munindra and Deva Nand

Abstract: Ballistic transport based graphene field effect transistor (GFET) is the emerging nanoelectronics device technology, which is promising to add a new dimension to electronic devices and to replace conventional silicon technology, especially for radio frequency applications. In this paper, the radio (GHz) frequency static linearity and nonlinearity performance potential are analyzed for the ballistic approach GFET under the ballistic transport regime. This work explores the static linearity of graphene FET mathematically under the quasi-ballistic transport regime along with the scaling outlook of the GFETs at four different channel lengths. The proposed model explores close mathematical expressions for Harmonic distortion, intermodulation distortion, and interception points and also depicted them in graphical form. The second and third order harmonics and intermodulation distortions are analyzed with help of mathematical analysis of drain current equation formulated using Mckelvey's flux theory (MFT). The presented expressions are validated through a nonlinear output characteristic curve (Drain current versus drain voltage) at channel lengths of 140, 240, 300, and 1000 nm. The nonlinearity effect and its impact on the radio frequency electronic application of the quasi-ballistic and ballistic approach GFETs is one of the important prospects and is tabulated in Table 1 for more clarity with the particular models and respective frequencies.

For details refer to https://doi.org/10.21203/rs.3.rs-474403/v1

BIOGRAPHY

MR. NAVNIT KUMAR

Department of Electronics and Communication Engineering

Mr. Navnit Kumar is currently working as a fulltime Research Scholar in the Department of Electronics and Communication Engineering, Delhi Technological University (DTU), Delhi. He has received his B. TECH degree in Electronics and Communication Engineering from Uttar Pradesh Technical University, Lucknow. He has received his M. TECH degree in VLSI and Embedded System from National Institute of Technology Manipur. He has qualified GATE four times in Electronics and Communication Engineering. He has also qualified UGC-NET in Electronic Science. He has received domain certificate from NPTEL (IIT Madras) in the field of VLSI design. He has published three research papers in reputed SCI/SCIE international journals. His research area is focused on design and implementation of integer and fractional order immittance circuit.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **N. Kumar**, M. Kumar and N. Pandey, "Unified floating immittance emulator based on CCTA", *Microelectronics Journal*, vol. 118, pp. 105289, 2021. Impact Factor: 1.605.

Unified floating immittance emulator based on CCTA

Navnit Kumar, Manjeet Kumar and Neeta Pandey

Abstract: In this paper, a unified floating immittace emulator based on Current Conveyor Transconductance Amplifier (CCTA) is put forward. It uses two CCTAs, two additional components (two MOS based resistors/one capacitor and one MOS based resistor) and four MOS switches. It can realize both positive and negative floating immittances through appropriate setting of switches. The proposed topology does not require any component matching, thus making it suitable for integration viewpoint. Further, the immittance may be tuned electronically via bias current of CCTA. Additionally, the operation in fractional domain also investigated. The impact of parasitics of CCTA on the performance of the proposed circuit is mathematically formulated. The functionality of the proposed circuit is verified through post layout simulations carried out using the netlist extraction from the layout and examined through SPICE simulations using 90 nm process parameter. The area of the layout of proposed unified immittance emulator is 67.80 µm 22.80 µm. The proposed immittance circuit is used to implement notch filter, fifth order low pass filter, and capacitance cancellation circuit.

For details refer to https://doi.org/10.1016/j.mejo.2021.105289

BIOGRAPHY

PROF. NEETA PANDEY

Department of Electronics and Communication Engineering

Prof. Neeta Pandey is currently working as a Professor in the Department of Electronics and Communication Engineering, Delhi Technological University, Delhi, India. She did her M.E. (Microelectronics) from BITS, Pilani, Rajasthan, India and Ph. D. from Guru Gobind Singh Indraprastha University, New Delhi, India. She was with the Central Electronics Engineering Research Institute, Pilani; IIT Delhi, New Delhi; the Priyadarshini College of Computer Science, Noida; and the Bharati Vidyapeethâ€™s College of Engineering, New Delhi, in various capacities. She is currently a Professor with the Electronics and Communication Engineering Department, Delhi Technological University, New Delhi. She has authored over 200 technical papers in reputed national and international conferences and journals. Her current research interests include analog and digital very large-scale integration design. She is a Life Member of ISTE, a senior member of IEEE and the IEEE WIE Afï¬nity Group.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	10

1. P. Kumar, **N. Pandey** and S. K. Paul, "Electronically Tunable VDTA-Based Multi-function Inverse Filter", *Iranian Journal of Science and Technology, Transactions of Electrical Engineering*, vol. 45, pp. 247–257, 2021. Impact Factor: 1.194.
2. R. Sivaram, K. Gupta and **N. Pandey**, "Impact of multi threshold transistor in positive feedback source coupled logic (PFSCL) fundamental cell", *Analog Integrated Circuits and Signal Processin*, vol. 109, pp. 173–185, 2021. Impact Factor: 1.337.
3. N. Yadav, **N. Pandey** and D. Nand, "Leakage reduction in dual mode logic through gated leakage transistors", Microprocessors and Microsystems, vol. 84, pp. 104269, 2021. Impact Factor: 1.525.
4. M. Gupta, K. Gupta and **N. Pandey**, "A data-independent 9T SRAM cell with enhanced ION/IOFF ratio and RBL voltage swing in near threshold and sub-threshold region", *International Journal of Circuit Theory and Applications*, vol. 49, no. 4, pp. 953-969, 2021. Impact Factor: 2.038.
5. R. Arundeepakvel, Jatin, P. Khatter, **N. Pandey** and S. Minaei, "A novel design for voltage inverting metamutator and its applications", *Microelectronics Journal*, vol. 113, pp. 105096, 2021. Impact Factor: 1.605.
6. M. Gupta, K. Gupta and **N. Pandey**, "A novel PVT-variation-tolerant Schmitt-trigger-based 12T SRAM cell with improved write ability and high ION/IOFF ratio in sub-threshold region", *International Journal of Circuit Theory and Applications*, vol. 49, no. 11, pp. 3789-3810, 2021. Impact Factor: 2.038.
7. S. Singh, S. Jain, R. Pandey and **N. Pandey**, "Adaptive biased current differencing trans-conductance amplifier", *AEU - International Journal of Electronics and Communications*, vol. 128, pp. 153494, 2021. Impact Factor: 3.183.
8. A. S. Kumar, S. Jain and **N. Pandey**, "Clock Aligned Input Adiabatic Logic", *Microelectronics Journal*, vol. 114, pp. 105122, 2021. Impact Factor: 1.605.
9. M. Gupta, K. Gupta and **N. Pandey**, "Comparative Analysis of the Design Techniques for Low Leakage SRAMs at 32nm", *Microprocessors and Microsystems*, vol. 85, pp. 104281, 2021. Impact Factor: 1.525.
10. O. K. Gupta, **N. Pandey** and M. Gupta, "Improved reversed nested miller frequency compensation techniques using flipped and folded flipped voltage follower with resistor for three stage amplifier", *AEU - International Journal of Electronics and Communications*, vol. 142, pp. 154004, 2021. Impact Factor: 3.183.

Electronically Tunable VDTA-Based Multi-function Inverse Filter

Praveen Kumar, **Neeta Pandey*** and Sajal K. Paul

Abstract: An electronically tunable realization of voltage differencing transconductance amplifier (VDTA)-based multi-function inverse filter circuit is proposed in this letter. Various responses namely inverse low pass, inverse high pass, inverse band pass, and inverse band reject are achieved through switch settings. The proposed circuit uses only grounded capacitors and adds electronic tunability to filter parameters through bias currents of VDTA. SPICE simulations using TSMC 180 nm CMOS technology parameter are carried out to examine operation, total harmonic distortion and noise performance of proposal. Monte Carlo simulations are performed to study performance of the proposal under simultaneous variation in passive component values, oxide thickness and transistor threshold voltage.

For details refer to https://doi.org/10.1007/s40998-020-00355-z

Impact of multi threshold transistor in positive feedback source coupled logic (PFSCL) fundamental cell

Ranjana Sivaram, Kirti Gupta and **Neeta Pandey***

Abstract: In this paper, a new fundamental cell in positive feedback source coupled logic is presented, which is an improvement over the existing fundamental cell employed in digital circuit design in various high resolution mixed-signal integrated circuits. The operation of the existing fundamental cell relies on using large sized transistor in its centre branch, resulting in significantly larger implementation area. The proposed fundamental cell incorporates multi-threshold transistor in the center branch thereby allowing designer to use reduce its dimension and hence the area. The impact of the proposed modification is examined by configuring the cell as two input exclusive OR (XOR2) gate. The behaviour is analysed in terms of static and propagation delay parameters which are modelled and a design procedure is also elaborated. The theoretical prepositions are verified by designing and simulating for various operating conditions using model parameters of 180 nm CMOS technology node. A maximum error of 27% is observed between the simulated and predicted parameters. The process variation study through Monte Carlo analysis and PVT variations identifies the proposed fundamental cell based circuit as less prone to variations in comparison to existing fundamental cell based counterparts. A full adder, as an application of the proposed fundamental cell, shows a significant (66%) area reduction while delay, power and PDP are within 4% of their corresponding values for the existing one.

For details refer to https://doi.org/10.1007/s10470-021-01841-y

Leakage reduction in dual mode logic through gated leakage transistors

Neetika Yadav, **Neeta Pandey*** and Deva Nand

Abstract: This contribution proposes a technique for leakage power reduction in Dual Mode Logic (DML) circuits by incorporating Gated Leakage Transistor (GLT). The resulting circuits are named as GALEOR with Dual Mode Logic (GDML). Further, GDML design is extended by including a footed diode transistor, the design so obtained is referred to as GALEOR with Dual Mode Logic with footed diode (GDMLD). The analysis is done using footed type A and type B DML gates, resulting in GDML and GDMLD variants referred to as GDML-TA, GDML-TB, GDMLD-TA and GDMLD-TB. Two input NAND and NOR gates along with a full adder and a 2-bit multiplier circuit are used to investigate the proposed techniques at 90 nm and 45 nm technology nodes in both static and dynamic mode using SymicaDE tool. Analysis of leakage power reveals that its value increases with technology scaling. Average leakage power saving is 44.69%-74.11% for GDML and 67.18%-90.76% for GDMLD in static mode. Similarly, in pre-charge phase of dynamic mode, this value varies from 5.47%-28.22% for GDML and 14.55%-77.51% for GDMLD. For evaluation phase, average leakage power saving of

**Corresponding Author*

44.69%-74.11% for GDML and 67.18%-90.76% for GDMLD is achieved. Analysis of delay reveals that both the techniques increase delay of the design while providing significant leakage power saving.

For details refer to https://doi.org/10.1016/j.micpro.2021.104269

A data-independent 9T SRAM cell with enhanced I_{ON}/I_{OFF} ratio and RBL voltage swing in near threshold and sub-threshold region

Monica Gupta, Kirti Gupta and **Neeta Pandey***

Abstract: The conventional 8T SRAM cell with isolated read port is suggested as an alternative to overcome the read-write conflicts associated with 6T SRAM cell. However, in near threshold and sub-threshold regions, 8T cell performance is limited by reduced I_{ON}/I_{OFF} ratio, deteriorated RBL voltage swing, data dependency, and higher read failures, although the existing SRAM cells address some of these issues but still suffer from degraded performance due to the trade-off between leakage and read currents. In this paper, a 9T SRAM cell with novel read port is proposed that aims for low and data-independent leakages, high I_{ON}/I_{OFF} ratio, and large RBL voltage swing in near threshold and sub-threshold regions. The performance of the proposed cell is compared with 7T, 8T, 9T, and 10T cells at 32 nm technology node by simulating a column of 128 cells to demonstrate its versatility over others. The proposed cell shows enhanced I_{ON}/I_{OFF} ratio (71.2X), large RBL voltage swing and data-independent leakages at V_{DD} = 0.3 V in comparison to the conventional 8T SRAM cell. The results at different PVT corners are also captured to validate the impeccable performance of the proposed cell irrespective of operating conditions.

For details refer to https://doi.org/10.1002/cta.2951

A novel design for voltage inverting metamutator and its applications+

R. Arundeepakvel, Jatin, Parth Khatter, **Neeta Pandey*** and Shahram Minaei

Abstract: This paper presents a novel structure of a versatile 4 port network that is used as a voltage inverting metamutator (VIM). The desired port relationships of proposed structure are obtained through proper interconnection of differential amplifiers, current mirrors and an inverting stage. The port relations are verified through both small signal analysis and simulations using 180 nm generic process design kit (gpdk) in Cadence Virtuoso tool. The performance of the proposed VIM is also examined by performing corner analysis and Monte Carlo simulations. By using proper port terminations, the proposed VIM is configured as current mode universal Filter, transconductance amplifier, transimpedance amplifier and memristor. All these applications are also verified for functionality.

For details refer to https://doi.org/10.1016/j.mejo.2021.105096

A novel PVT-variation-tolerant Schmitt-trigger-based 12T SRAM cell with improved write ability and high I_{ON}/I_{OFF} ratio in sub-threshold region+

Monica Gupta, Kirti Gupta and **Neeta Pandey***

Abstract: This paper presents a process voltage temperature (PVT)-variation-tolerant Schmitt-trigger-based 12T SRAM cell at 32 nm. The cell uses a modified Schmitt-trigger action in all operating modes for performance improvement, a characteristic that is not exhibited by existing SRAM cells. The action improves the stability of stored data in read and hold modes and assists the write process to enable a faster and low-voltage write operation. Additionally, the cell uses negative bitline technique and fully-gated grounded scheme for achieving

**Corresponding Author*
+Eligible for Certificate only

further improvement in write ability and I_{ON}/I_{OFF} ratio. The proposed cell shows 34.9% reduced deviation in switching threshold voltage in comparison to conventional structure. Further, improvement of up to 211% in write ability and 169% in I_{ON}/I_{OFF} ratio is obtained over existing SRAM cells operating in sub-threshold region. The cell takes up to 86% and 99% lesser read and write access time, respectively. The Monte-Carlo simulations show the robust performance of proposed cell. The cell has reduced write, read, and hold failure probabilities resulting in overall Vmin of 425 mV, which is the least among the cells considered for comparison, thus making it an amenable design suitable for sub-threshold operation under PVT-variations.

For details refer to https://doi.org/10.1002/cta.3134

Adaptive biased current differencing trans-conductance amplifier+

Shashwat Singh, Sagar Jain, Rajeshwari Pandey and **Neeta Pandey***

Abstract: A power-efficient, high DC gain adaptive biased Current Differencing Trans-conductance Amplifier (AB-CDTA) is proposed in this paper. The proposed circuit consists of four sub-circuits namely Current Differencing Unit (CDU), Current Replication Unit (CRU), Current Squarer Unit (CSU) and Trans-conductance Amplifier Unit (TAU). The bias current of the TAU varies in a square relation with the input current difference. The proposed structure thus provides tunable gain depending on the input current difference with improved transient characteristics, reduced standby power dissipation and linearity for large range of inputs. Complete mathematical formulation has been presented to establish the characteristics of the proposed AB-CDTA. The proposed structure is validated through SPICE simulations using 180 nm CMOS technology. The proposed structure operates with a stand-by power dissipation of 47.6 µW only. Figure of merit (FoM) is also used to enumerate large signal performances of the proposed AB-CDTA. The proposed structure shows a 45.22 dB enhancement in the DC gain and a 94.29% reduction in the settling time compared to the conventional structure.

For details refer to https://doi.org/10.1016/j.aeue.2020.153494

Clock Aligned Input Adiabatic Logic+

Aditya S Kumar, Sagar Jain and **Neeta Pandey***

Abstract: Adiabatic logic families employing four phase trapezoidal power clock, require T/4 phase shift between the input and clock and therefore require insertion of additional buffer for synchronization. This manuscript proposes Clock Aligned Input Adiabatic Logic (CAIAL) which eliminates the T/4 phase shift requirement between the clock and inputs, having similar power requirements as existing adiabatic logic families. The proposed design (CAIAL) dissipates lesser power as compared to its CMOS and FinFET counterparts. Ripple Carry Adder (RCA) and Kogge Stone Adder (KSA) of varying bit widths using existing and proposed methodologies have been designed. The functionality of all the circuits is verified using 32 nm PTM HP technology parameters in Tanner T-Spice™. A significant reduction in buffer count and power saving of 35% in RCA and 22% in KSA is achieved across all bit widths at 500 MHz. The robustness of the proposed 2N2N2P-CAIAL combination to process, voltage and clock skew variations have also been proven.

For details refer to https://doi.org/10.1016/j.mejo.2021.105122

**Corresponding Author*
+Eligible for Certificate only

Comparative Analysis of the Design Techniques for Low Leakage SRAMs at 32nm+

Monica Gupta, Kirti Gupta and **Neeta Pandey***

Abstract: This paper presents a comprehensive overview of leakage reduction techniques prevailing in Static Random Access Memories (SRAMs) by classifying them in three categories namely latch, bitline and read port. The performance of the techniques are evaluated in terms of leakage reduction capability along with the impact on read performance and hold stability through extensive simulative investigations at 32 nm technology node by taking conventional SRAM cell as reference. Further, as SRAMs are susceptible to inter-die as well as intra-die process variations, the performance at different PVT corners is also captured to demonstrate the efficacy of each technique under PVT variations. It is found that among the techniques used for reducing latch leakages, Multi-threshold CMOS technique possess the highest leakage reduction capabilities followed by Drowsy mode and Substrate-bias techniques. The results also indicate that Negative word line technique is more effective at low supply voltages whereas the Leakage biased bitline technique is more effective at high supply voltages for reducing bitline leakages. Amongst the read port leakage reduction techniques, Stack-effect and Dynamic control of power supply rail techniques are capable of suppressing the leakages at high voltages whereas Virtual cell ground technique is more efficacious at low voltages. The impact of technology scaling on SRAM cell performance with leakage reduction techniques is also studied. For the sake of completeness, suggestions are put forward for adopting a particular technique to address leakages at latch, bitline and read port levels.

For details refer to https://doi.org/10.1016/j.micpro.2021.104281

Improved reversed nested miller frequency compensation techniques using flipped and folded flipped voltage follower with resistor for three stage amplifier+

Om Krishna Gupta, **Neeta Pandey*** and Maneesha Gupta

Abstract: This paper presents three circuits to improve frequency compensation in three stage amplifier for large capacitive load of 100 pF. The first proposed circuit introduces Flipped Voltage Follower (FVF) in inner loop of Reversed Nested Miller Compensation (RNMC) to combat RHP zero whereas both second and third proposed circuits employ A Folded Flipped Voltage Follower (FFVF). The third proposed circuit uses an additional resistor in the outer compensation loop for double pole-zero cancellation. Further feed forward path has been used in all proposed circuits to improve the large signal response. The functionality is verified using TSMC 0.18 µm CMOS technology parameters in Tanner tool. The simulation results show maximum gain-bandwidth product (GBW) of 30 MHz, minimum phase margin (PM) of 60° and slew rate (SR) of 10 V/µS, and minimum common mode rejection ratio (CMRR) of 37.2 dB at unity gain frequency. The input-referred noise of the proposed circuits varies from 16.6 nV/ to 18.2$\sqrt{Hz}$ nV/$\sqrt{Hz}$at unity gain frequency. Corner analysis is also included to show the robustness of the circuits.

For details refer to https://doi.org/10.1016/j.aeue.2021.154004

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

MS. NEETIKA YADAV

Department of Electronics and Communication Engineering

Ms. Neetika Yadav received her B.Tech in Electronics and Communication Engineering from Guru Gobind Singh Indraprastha University(GGSIPU), Delhi, India and M.Tech in VLSI Design from Guru Gobind Singh Indraprastha University(GGSIPU), Delhi, India. She is currently pursuing Ph.D. from Delhi Technological University (DTU), Delhi, India and working as assistant professor at Amity University, Noida. Her area of research is low power VLSI.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **N. Yadav,** N. Pandey and D. Nand, "Leakage reduction in dual mode logic through gated leakage transistors", *Microprocessors and Microsystems (Elsevier)*, vol. 84, pp. 104269, 202. Impact Factor: 1.525.

Leakage reduction in dual mode logic through gated leakage transistors

Neetika Yadav, Neeta Pandey and Deva Nand

Abstract: This contribution proposes a technique for leakage power reduction in Dual Mode Logic (DML) circuits by incorporating Gated Leakage Transistor (GLT). The resulting circuits are named as GALEOR with Dual Mode Logic (GDML). Further, GDML design is extended by including a footed diode transistor, the design so obtained is referred to as GALEOR with Dual Mode Logic with footed diode (GDMLD). The analysis is done using footed type A and type B DML gates, resulting in GDML and GDMLD variants referred to as GDML-TA, GDML-TB, GDMLD-TA and GDMLD-TB. Two input NAND and NOR gates along with a full adder and a 2-bit multiplier circuit are used to investigate the proposed techniques at 90 nm and 45 nm technology nodes in both static and dynamic mode using SymicaDE tool. Analysis of leakage power reveals that its value increases with technology scaling. Average leakage power saving is 44.69%-74.11% for GDML and 67.18%-90.76% for GDMLD in static mode. Similarly, in pre-charge phase of dynamic mode, this value varies from 5.47%-28.22% for GDML and 14.55%-77.51% for GDMLD. For evaluation phase, average leakage power saving of 44.69%-74.11% for GDML and 67.18%-90.76% for GDMLD is achieved. Analysis of delay reveals that both the techniques increase delay of the design while providing significant leakage power saving.

For details refer to https://doi.org/10.1016/j.micpro.2021.104269

BIOGRAPHY

MR. OM KRISHNA GUPTA

Department of Electronics and Communication Engineering

Mr. Om Krishna Gupta was born in 1988. He received B.Tech degree in Electronics & Communication Engineering from Uttar Pradesh Technical University, Uttar Pradesh in 2009 & M.Tech degree in VLSI Design from Dr. A.P.J. Abdul Kalam Technical University, Uttar Pradesh in 2015. Currently, he is pursuing Ph.D. in area of analog VLSI design from Delhi Technical University, New Delhi. He has teaching experience of 6 years in the field of electronics. His research interest includes analog VLSI design.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **O. K. Gupta**, N. Pandey and M. Gupta, "Improved reversed nested miller frequency compensation techniques using flipped and folded flipped voltage follower with resistor for three stage amplifier", *AEU - International Journal of Electronics and Communications*, vol. 142, pp. 154004, 2021. Impact Factor: 3.183.

Improved reversed nested miller frequency compensation techniques using flipped and folded flipped voltage follower with resistor for three stage amplifier

Om Krishna Gupta, Neeta Pandey and Maneesha Gupta

Abstract: This paper presents three circuits to improve frequency compensation in three stage amplifier for large capacitive load of 100 pF. The first proposed circuit introduces Flipped Voltage Follower (FVF) in inner loop of Reversed Nested Miller Compensation (RNMC) to combat RHP zero whereas both second and third proposed circuits employ A Folded Flipped Voltage Follower (FFVF). The third proposed circuit uses an additional resistor in the outer compensation loop for double pole-zero cancellation. Further feed forward path has been used in all proposed circuits to improve the large signal response. The functionality is verified using TSMC 0.18 µm CMOS technology parameters in Tanner tool. The simulation results show maximum gain-bandwidth product (GBW) of 30 MHz, minimum phase margin (PM) of 60° and slew rate (SR) of 10 V/µS, and minimum common mode rejection ratio (CMRR) of 37.2 dB at unity gain frequency. The input-referred noise of the proposed circuits varies from 16.6 nV/ to 18.2$\sqrt{Hz}$ nV/$\sqrt{Hz}$at unity gain frequency. Corner analysis is also included to show the robustness of the circuits.

For details refer to https://doi.org/10.1016/j.aeue.2021.154004

BIOGRAPHY

PROF. POORNIMA MITTAL

Department of Electronics and Communication Engineering

Prof. (Dr.) Poornima Mittal (Ph.D, M.Tech(H), B.Tech), Member IEEE has published 140+ research papers in international journals and conferences of repute. Her research interest includes design/modeling of flexible electronic devices, thin film fabrication, memory and low power VLSI circuits. She has published one patent on novel OTFT structure and a Text Book titled Organic Thin-Film-Transistor Applications: Materials to Circuits by CRC Press, Taylor and Francis in 2016. She is the reviewer of IEEE transactions and other reputed international journals of IEEE, IET, Elsevier, IOP, Wiley and Taylor & Francis. She has received the research awards in 2012 and 2015 for her dedicated research at Graphic Era University, Dehradun. Also, she has received Commendable Research Award in 2019, 2020 and 2021 at Delhi Technological University, Delhi. She is the recipient of Innovator of the Year Award at Uttarakhand State Science and Technology Congress in 2016. She has delivered many expert talks and chaired sessions in the reputed international conferences. She is the life member of many professional societies. She has more than 16 years of academic and research experience. Presently, she is working as Professor in the Department of Electronics and Communication Engineering at Delhi Technological University, Delhi, India.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01
Commendable Research Award	04

1. **P. Mittal**, S. Yadav and S. Negi, "Advancements for organic thin film transistors: Structures, materials, performance parameters, influencing factors, models, fabrication, reliability and applications", *Materials Science in Semiconductor Processing*, vol. 133, pp. 105975 2021. Impact Factor: 3.927.
2. **P. Mittal**, "Ditch and elevated organic thin film transistor-based improved common source voltage amplifier: Frequency response characteristics and analytical modeling", *Journal of the Society for Information Display*, vol. 29, no. 8, pp. 642-658, 2021. Impact Factor: 2.140.
3. S. Negi, **P. Mittal** and B. Kumar, "Modeling and Analysis of High-Performance Triple Hole Block Layer Organic LED Based Light Sensor for Detection of Ovarian Cancer", *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 68, no. 8, pp. 3254-3264, 2021. Impact Factor: 3.605.
4. B. Rawat and **P. Mittal**, "Single bit line accessed high-performance ultra-low voltage operating 7T static random access memory cell with improved read stability", *International Journal of Circuit Theory and Applications*, vol. 49, Issue 5 pp. 1435-1449, 2021. Impact Factor: 2.038.
5. B. Rawat and **P. Mittal**, "A 32 nm single-ended single-port 7T static random access memory for low power utilization", *Semiconductor Science and Technology*, vol. 36, no. 9, pp. 095006, 2021. Impact Factor: 2.352.

Advancements for organic thin film transistors: Structures, materials, performance parameters, influencing factors, models, fabrication, reliability and applications

Poornima Mittal, Sugandha Yadav and Shubham Negi

Abstract: This paper highlights the recent progress for organic small molecule and polymer type thin film transistors (OTFTs). In order to better understand the conduction process and mapping of limiting factors, the structural variation between top and bottom contact organic TFT is examined. Also, the analytical models concerning to empirical parameters are discussed for forecasting the performance of organic transistor before a real realization. Various organic materials for dielectric, substrate, semiconductor and electrode with their performance are emphasized. Organic devices are specially designed for fabricating cost-effective printing methods. Therefore, various solution processed organic TFTs are reviewed, where most transistors are analyzed based on bottom contact positioning. In order to enhance the transistor parameters; various techniques are deeply analyzed and a quantitative progress in threshold voltage, mobility, sub-threshold slope, on-off ratio and current is projected. The role of self-assembled mono-layer is highlighted along with reliability of organic transistors. Some of leading applications convincing potential usage of OTFTs are emphasized with the passage of time as well.

For details refer to https://doi.org/10.1016/j.mssp.2021.105975

Ditch and elevated organic thin film transistor-based improved common source voltage amplifier: Frequency response characteristics and analytical modeling

Poornima Mittal

Abstract: In this work, the frequency response of single gate organic thin film transistor (OTFT)-based common source (CS) voltage amplifier is analyzed. Also, the contact-channel resistance models are developed to validate the lower/upper cutoff frequency and mid-band gain. The bandwidth of single gate bottom contact (BC) OTFT-based amplifier is found to be 16 GHz, but the gain is quite low than the predicted due to its lower transconductance. Surprisingly, voltage gain is improved by four times (12.6 dB more) for dual gate TFT-based amplifier. Moreover, the bandwidth (1 MHz) is also reasonably good. On applying top gate, biasing the gain is enhanced by 46%. Furthermore, two modified single gate BC structures, ditch and elevated source/drain (*S*/*D*) contacts, are incorporated to further augment the amplifier characteristics. Correspondingly, it shows a significant enhancement of 45% and 39% in the gain than that of normal BC. Additionally, the bandwidth is observed to be large and obtained as 100 and 96 MHz, which is also close to the expected analytically.

For details refer to https://doi.org/10.1002/jsid.1007

Modeling and Analysis of High-Performance Triple Hole Block Layer Organic LED Based Light Sensor for Detection of Ovarian Cancer

Shubham Negi, **Poornima Mittal*** and Brijesh Kumar

Abstract: In this paper a novel triple hole block layer (HBL) structure of the OLED is proposed that depicts an enhanced luminescence of 25285 cd/m ^{2} with an improvement of 47% over multilayered OLED architecture. It also owes 74% improvement in luminous power efficiency. An in-depth numerical analysis based on Poisson and drift diffusion equation is undertaken and validated against the internal device analysis. The analysis results highlight an enhanced recombination rate within the proposed device. High electron injection and efficient

**Corresponding Author*

hole blocking contributes to improved recombination rate. Triple HBL OLED is therefore used for diagnosis of ovarian cancer. The device illustrated good response towards varying wavelengths generating a maximum photo current value of 93 mA. A healthy person can be differentiated from an oncological cancer patient based on fluorescence produced by their urine. The fluorescence values for healthy person and oncological cancer patient are in the range of 420 and 440 nm, correspondingly. The cathode current produced by OLED corresponding to these two wavelengths are 5 and 1 mA respectively. Hence, the proposed device can successfully diagnose the ovarian cancer patient. Further, the methodology proposed for diagnosis of ovarian cancer can help in developing a portable, flexible low cost biomedical sensor.

For details refer to https://doi.org/10.1109/TCSI.2021.3078510

Single bit line accessed high-performance ultra-low voltage operating 7T static random access memory cell with improved read stability+

Bhawna Rawat and **Poornima Mittal***

Abstract: Static random access memory (SRAM) bit cell is a prominent element for portable devices. The popularity of sleek designs and demand for longer battery life has driven memory cell into nanometer domain. This has also bolstered the need for low-voltage devices. But reduction in operational voltage for cell is limited by process variation. In this work, a single bit line seven-transistor (7T) SRAM bit cell is reported. The cell is designed for 32-nm technology node and is functional at 300 mV. The reported cell maintains a 90-mV hold and read static noise margins (SNMs), while the write margin is 190 mV. The pulse width needed to successfully write into the cell is 30 ns. The performance of proposed 7T cell is compared against different 6T, 7T, 8T, and 10T SRAM bit cells. The hold and read SNMs for proposed 7T are found to be 58.8%, better than single-ended 6T cell, while the write ability is improved by 71.4%. The leakage current is observed to have decreased by a factor of 14 for $Q = 0$ (Q being the data storage node) and by factor of 28 for $Q = 1$, compared to 6T cell. Also, the area footprint of the proposed 7T SRAM cell is 0.442 μm^2.

For details refer to https://doi.org/10.1002/cta.2960

A 32 nm single-ended single-port 7T static random access memory for low power utilization+

Bhawna Rawat and **Poornima Mittal***

Abstract: In this paper, a seven-transistor static random access memory (SRAM) bit cell with a single bitline architecture is proposed. This cell is designed at 32 nm and is operational at 300 mV. The static noise margin for the read and hold modes is 90 mV, while the write margin is 180 mV. Monte Carlo analysis for 6σ global variations and temperature variation analysis for temperatures in the range −10 °C to 80 °C validate its performance. The cell is compared with other single-ended 5T, 6T, 7T, 8T, 9T and 10T SRAM cells and is found to be superior in performance. As the leakage current is low, the I_{ON}/I_{OFF} ratio is high compared with the other cells. The power consumption of the bit cell is also found to be minimal for all modes of operation. The dynamic write analysis demonstrates that the proposed cell completes the write operation in a 10 ns pulse width. Moreover, the improvement in performance is obtained for an area as low as 0.539 μm^2. The area of 5T, 6T, 7T-1, 7T-2, 7T-4, 7T-5, 8T, 9T and 10T cells is greater than the 7TP bit cell area by 22.17%, 51.8%, 35.8%, 13.9%, 30.4%, 6.78%, 56.6%, 63.3% and 75.5%, respectively.

For details refer to https://doi.org/10.1088/1361-6641/ac07c8

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

DR. PRIYANKA GARG

Department of Electronics and Communication Engineering

Dr. Priyanka Garg has completed her PhD from Delhi Technological University, Delhi in 2020. She received her B.Tech degree (Electronics & communication) in 2013 from Uttarakhand Technical University, Uttarakhand, India, and M.Tech. (Digital Signal Processing) in 2016 from G.B. Pant Engineering College, Pauri, Uttarakhand, India. Her research is in the area of metamaterial based microwave components that includes design of efficient miniaturized microstrip antennas, ultrathin absorbers and wideband filters using metamaterials. She has published 12 research papers during her doctoral degree in various reputed journals, international and national conferences.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **P. Garg** and P. Jain, "Design and Analysis of a Bandpass Filter Using Dual Composite Right/Left Handed (D-CRLH) Transmission Line Showing Bandwidth Enhancement", *Wireless Personal Communications*, vol. 120, pp. 1705–1720, 2021. Impact Factor: 1.671.

Design and Analysis of a Bandpass Filter Using Dual Composite Right/Left Handed (D-CRLH) Transmission Line Showing Bandwidth Enhancement

Priyanka Garg and Priyanka Jain

Abstract: A compact, low-profile, Band Pass Filter (BPF) based on balanced Dual Composite Right/Left Handed (D-CRLH) Transmission Line (TL) is proposed in this article. A balanced D-CRLH TL can be used to provide wideband filter characteristics due to no frequency separation between the RH and LH frequency bands. The proposed D-CRLH TL is designed using U-shaped complementary split-ring resonator (UCSRR). The extraction of equivalent circuit model of the proposed structure is also performed. The proposed filter provides a 3 dB passband range from 2.44 to 5.58 GHz. Further, the bandwidth is enhanced by introducing a slot in UCSRR, which resulted in a 3 dB passband range from 1.43 to 5.56 GHz. The proposed via less BPF has a compact size of 15 × 15 mm2 designed on an FR-4 substrate with dielectric constant (ϵr) = 4.3. The design analysis of the proposed bandpass filter is presented in terms of reflection coefficient, transmission coefficient, propagation constant and group delay.

For details refer to https://doi.org/10.1007/s11277-021-08529-6

BIOGRAPHY

MR. R. ARUNDEEPAKVEL

Department of Electronics and Communication Engineering

Mr. R. Arundeepakvel completed his undergraduate studies from Delhi Technological University (DTU) in Electronics and Communication Engineering. He worked as an engineer in a semi-conductor industry (Western Digital) for 2 years where he got more exposed towards the industry level standards of what he had pursued in his UG. He is currently pursuing his master's from Indian Institute of Technology (IIT), Delhi in Integrated Electronics and Circuits. He has a keen interest towards Analog circuit design and mixed signal circuit design. His first research project based on Memristors, Implementation of a D-Latch using memristors was my first research paper published. Simulating memristors using MOS-based circuits were my subsequent areas of research. He is currently working on Noise Shaping SAR ADCs.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Arundeepakvel**, Jatin, P. Khatter, N. Pandey and S. Minaei, "A novel design for voltage inverting metamutator and its applications", *Microelectronics Journal*, vol. 113, pp. 105096, 2021. Impact Factor: 1.605.

A novel design for voltage inverting metamutator and its applications

R. Arundeepakvel, Jatin, Parth Khatter, Neeta Pandey and Shahram Minaei

Abstract: This paper presents a novel structure of a versatile 4 port network that is used as a voltage inverting metamutator (VIM). The desired port relationships of proposed structure are obtained through proper interconnection of differential amplifiers, current mirrors and an inverting stage. The port relations are verified through both small signal analysis and simulations using 180 nm generic process design kit (gpdk) in Cadence Virtuoso tool. The performance of the proposed VIM is also examined by performing corner analysis and Monte Carlo simulations. By using proper port terminations, the proposed VIM is configured as current mode universal Filter, transconductance amplifier, transimpedance amplifier and memristor. All these applications are also verified for functionality.

For details refer to https://doi.org/10.1016/j.mejo.2021.105096

BIOGRAPHY

PROF. RAJIV KAPOOR

Department of Electronics and Communication Engineering

Prof. Rajiv Kapoor is working as a Professor in the Department of Electronics and Communication Engineering, Delhi Technological University, Delhi, India. He is a Ex- Principal, AIACTR He has completed BE, ME, Ph.D.in E&C Engineering, His area of interest includes Vision/Speech based Tracking, Machine Learning, Activity Recognition Vision/Speech based, Signal Processing, Pattern Recognition, Cognitive Radio, Bio-Medical Equipment Design

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01
Commendable Research Award	02

1. **R. Kapoor**, D. Sharma and A. Kapoor, "Modified Sliding Singular Spectrum Analysis-Based Noncontact-Type Detection of Separated Instrument in Root Canal Therapy Using Low-Frequency Ultrasonic Pattern Transceiver Design", *IEEE Transactions on Instrumentation and Measurement*, vol. 70, pp. 1-9, 2021. Impact Factor: 4.016.
2. **R. Kapoor**, S. Verma and A. Kapoor, "Quaternions-based detection of power quality events", *Electrical Engineering*, vol. 103, pp. 2911–2927, 2021. Impact Factor: 1.836.
3. **R. Kapoor**, D. Sharma and T. Gulati, "State of the art content based image retrieval techniques using deep learning: a survey", *Multimedia Tools and Applications*, vol. 80, pp. 29561–29583, 2021. Impact Factor: 2.757.

Modified Sliding Singular Spectrum Analysis-Based Noncontact-Type Detection of Separated Instrument in Root Canal Therapy Using Low-Frequency Ultrasonic Pattern Transceiver Design

Rajiv Kapoor, Deepak Sharma and Aarchishya Kapoor

Abstract: In root canal therapy, breakage of the instrument in the root canal is the most common problem which may lead to failure of the treatment. The live localization of the separated instrument from root canal is a major challenge. The radiographic imaging and cone beam computed tomography (CBCT)-based detection methods are proposed by various researchers. In this article, a novel approach (noncontact type) is proposed which uses ultrasonic signal for detection and continuous localization of the separated instrument in the root canal. The ultrasonic signal is transmitted in the root canal using 20-80-kHz ultrasonic pattern generator designed using

dental gel without directly touching the ultrasound probe to the tooth (noncontact type). The signals from tooth are received by the designed ultrasonic sensor using dental gel again as interface and then analyzed using sliding singular spectrum analysis (SSSA) approach to extract the information about the position of the separated instrument. The detected position of the separated instrument is displayed in real-time on the screen in a doctor-friendly form. The design has been tested on extracted teeth and human jaws at Maulana Azad Institute of Dental Sciences, Delhi, India. This novel approach demonstrates an efficiency of approximately 87% and provides an ultraeconomical solution. The results show that this approach reduces the efforts to detect the position of the separated instrument without the loss of tooth anatomy and helps doctor extract the broken instrument out of root canal.

For details refer to https://doi.org/10.1109/TIM.2021.3094635

Quaternions-based detection of power quality events

Rajiv Kapoor, Swapnil Verma and Aarchishya Kapoor

Abstract: This paper presents a new method for the detection of voltage disturbances caused by various reasons in households and industries. The aim of the paper is to improve the power quality disturbance methods and implement it in real-time with a very high accuracy and use existing mitigation techniques after classification of the signal. The method involves a novel idea to use the quaternions for the purpose of signal tracking. The envelope formed by Hilbert envelope detection method is used as an input for the quaternions. The quaternions produce a spike whenever there is a deviation from the pure sine wave giving very accurate results in a very short period of time. Combination of SVM and DSmT classifier is used for recognizing and classification of different signals such as sags, swells, transients and other power quality disturbances, hence can be used to monitor the power quality.

For details refer to https://doi.org/10.1007/s00202-021-01263-z

State of the art content based image retrieval techniques using deep learning: a survey

Rajiv Kapoor, Deepak Sharma and Tarun Gulati

Abstract: In the recent years the rapid growth of multimedia content makes the image retrieval a challenging research task. Content Based Image Retrieval (CBIR) is a technique which uses features of image to search user required image from large image dataset according to the user's request in the form of query image. Effective feature representation and similarity measures are very crucial to the retrieval performance of CBIR. The key challenge has been attributed to the well known semantic gap issue. The machine learning has been actively investigated as possible solution to bridge the semantic gap. The recent success of deep learning inspires as a hope for bridging the semantic gap in CBIR. In this paper, we investigate deep learning approach used for CBIR tasks under varied settings from our empirical studies; we find some encouraging conclusions and insights for future research.

For details refer to https://doi.org/10.1007/s11042-021-11045-1

BIOGRAPHY

MS. RIYA JAIN

Department of Electronics and Communication Engineering

Ms. Riya Jain received her B.Tech in the discipline Electronics and Communication Engineering from Delhi Technological University (DTU) in 2020. She is a research enthusiast who aims to contribute in the field of Electronics and Communication in coming future. Her areas of interest are: Digital Very Large Scale Integration (VLSI) design, Digital Design, and Computer Architecture. She has been contributing to the field of Electronics since 2016 and has been rigorously involved in research since 2018. Being a novice researcher, she is still exploring multiple domains in the field of Electronics and is motivated enough for further contribution to technological advancement in the same. So far, her research has culminated in four journal, four conference, one book and one patent publication.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Jain** and N. Pandey, "Approximate Karatsuba multiplier for error-resilient applications", *AEU - International Journal of Electronics and Communications*, vol. 130, no. 153579, 2021. Impact Factor: 3.183.

Approximate Karatsuba multiplier for error-resilient applications

Riya Jain and Neeta Pandey

Abstract: Approximate computing is one of the most trending topics for research since the introduction of error-resilient applications. Approximate arithmetic helps reduce the power consumption, hardware utilization and delay time at the expense of accuracy. Out of all arithmetic operations, multiplication is the most widely used and it forms the crucial section in many applications. Therefore, it is necessary to optimize it as per the requirement of a system. This paper proposes an algorithm for approximate multiplication based on Karatsuba multiplication method which is compared with an existing approximate hybrid Wallace tree multiplier and it is found that the proposed approximate Karatsuba multiplier is better than existing approximate hybrid Wallace Tree multiplier in terms of hardware, latency as well as accuracy. The performance of proposed multiplier is also evaluated with the help of a application of image processing and it is found that proposed multiplier gives similar results as exact multiplier unit. Both the multipliers are implemented in Verilog HDL using Vivado 2018.3.

For details refer to https://doi.org/10.1016/j.aeue.2020.153579

BIOGRAPHY

PROF. S. INDU

Department of Electronics and Communication Engineering

Prof S. Indu did her PhD in the area of Visual Sensor Networks from University of Delhi, Delhi, India. She Joined Electronics and Communication Engineering Department of Delhi College of Engineering in 1999 . Currently she is working as Dean (student Welfare), Public Relations Officer and Professor of ECE Department of Delhi Technological University. She has taught various courses of ECE Department at UG and PG Level. She has guided around 45 M Tech students and produced 6 PhD students. There are 8 PhD students pursuing PhD under her. She has published around 200 papers in reputed Journals and National and International conferences. Her area of research interest is Computer Vision, Sensor Networks and Image Processing. She received Commendable research award, 2018, 2019 and 2020, of Delhi Technological university. She is recipient of Best Branch Councillor award from IEEE USA and also recipient of Outstanding Branch Councillor award of IEEE Delhi section for 5 consecutive years from 2013-2018. She has completed three DST sponsored project and currently she is PI of two DST sponsored projects

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. M. Gupta, L. Bhargava and **S. Indu**, "Dynamic workload-aware DVFS for multicore systems using machine learning", *Computing*, vol. 103, pp. 1747–1769, 2021. Impact Factor: 2.220.
2. M. Gupta, L. Bhargava and **S. Indu**, "Mapping techniques in multicore processors: current and future trends", *The Journal of Supercomputing*, vol. 77, pp. 9308–9363, 2021. Impact Factor: 2474.

Dynamic workload-aware DVFS for multicore systems using machine learning

Manjari Gupta, Lava Bhargava and **S. Indu***

Abstract: With growing heterogeneity and complexity in applications, demand to design an energy-efficient and fast computing system in multi-core architecture has heightened. This paper presents a regression-based dynamic voltage frequency scaling model which studies and utilizes workload characteristics to obtain optimal voltage–frequency (v–f) settings. The proposed framework leverages the workload profile information together with power constraints to compute the best-suited voltage–frequency (v–f) settings to (a) maintain global power budget at chip-level, (b) maximize performance while enforcing power constraints at the per-core level. The presented algorithm works in conjunction with the workload characterizer and senses change in application requirements and apply the knowledge to select the next setting for the core. Our results when compared with two state-of-the-art algorithms *MaxBIPS* and *TPEq* achieve the average power reduction of 33% and 25% respectively across 32-core architecture for PARSEC benchmarks.

For details refer to https://doi.org/10.1007/s00607-020-00845-2

Mapping techniques in multicore processors: current and future trends

Manjari Gupta, Lava Bhargava and **S. Indu***

Abstract: Multicore systems are in demand due to their high performance thus making application mapping an important research area in this field. Breaking an application into multiple parallel tasks efficiently and task-core assignment decisions can drastically influence system performance. This has created an urgency to find potent mapping techniques which can handle the complexity of these systems. Task assignment methods are governed by the application model, user-requirements, and architecture model. This paper provides an overview and classification of mapping algorithms that would facilitate graphical interpretation of the known techniques. It details the mapping methodologies along with performance, energy consumption, communication cost, reliability, or thermal management on different target architectures. Upcoming trends and open research areas have also been discussed.

For details refer to https://doi.org/10.1007/s11227-021-03650-6

**Corresponding Author*

BIOGRAPHY

DR. SACHIN TARAN

Department of Electronics and Communication Engineering

Dr. Sachin Taran is a motivated Teaching Professional with approximately ten years of teaching and research experience in Electronics and Communication Engineering. Dr. Taran presently working as an Assistant Professor at Delhi Technological University (DTU), Shahbad Daulatpur, New Delhi, 10042, India, Since July 2020. He received Ph.D. degree from the Indian Institute of Information Technology, Design and Manufacturing, Jabalpur, India, and done Postdoc from the Nanyang Technological University (NTU) Singapore, From 2019 to June 2020. Dr. Taran served as an Assistant Professor at the Department of Electronics and Communication at, Shangvi Innovative Academy, Indore, India during 2009-2010. He served as an Assistant Professor at the Department of Electronics and Communication at, Medicaps University, Indore, India during 2010-2015. He has authored/co-authored 35 research papers in various reputed international publishersâ€™ journals/conferences, such as IEEE, Elsevier, Springer, IET, and IOP. His last five-year citations are 662 with h-index 16 and i-10-index 21. His research interests include artiï¬cial intelligence, signal processing, and time-frequency analysis. He is a member of IEEE, Review Editor for Frontiers in signal processing, and technical reviewer of leading international journals of IEEE and IET etc. He is also the awardee of the Research excellence award-2020 at DTU for his publication.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Taran**, V. Bajaj, G. R. Sinha and K. Polat, “Detection of sleep apnea events using electroencephalogram signals”, *Applied Acoustics*, vol. 181, pp. 108137, 2021. Impact Factor: 2.639.

Detection of sleep apnea events using electroencephalogram signals

Sachin Taran, Varun Bajaj, G. R. Sinha and Kemal Polat

Abstract: Sleep apnea is breathing disorder that leads to other disorders related to the brain and heart. This paper proposes detection of sleep apnea using a single feature Lampel-Ziv complexity of electroencephalogram (EEG) signals. Firstly, tunable-Q wavelet transform (TQWT) analyzes EEG signal into sub-bands (SBs). The Lampel-Ziv complexity (LZC) feature is computed from each SB for the discrimination of sleep apnea and control events. The Kruskal–Wallis (KW) test is applied to assess the discriminative performance of LZC feature. The statistically significant LZC feature is applied to discriminant analysis, decision tree, and ensemble classifiers for the detection of apnea events. The ensemble classification technique subspace-K-nearest neighbor provided the best classification accuracy of 96% for apnea events identification. The other classification performance measures sensitivity, specificity, F1-score, and Matthew’s correlation coefficient are also attained higher values for the proposed method.

For details refer to https://doi.org/10.1016/j.apacoust.2021.108137

BIOGRAPHY

MR. SHASHWAT SINGH

Department of Electronics and Communication Engineering

Mr. Shashwat Singh was born in Varanasi, Uttar Pradesh, India. He completed his under-graduation in 2019 from Delhi Technological University. He currently holds the degree in Bachelor of Technology in Electronics and Communication Engineering. He currently works as a DFT Engineer in Qualcomm India Pvt Ltd. and holds more than 2 years of experience in semiconductor domain. His research interests include Analog and Low-Power VLSI Design. His past research works include Capacitance Multiplier circuits, Adaptive biased circuits, Finfet modelling etc. He has papers published in IEEE Conference - SPIN, Advances in Electronics Engineering -Springer and renowned Journals like IETE and AEU: International Journal of Electronics and Communications.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Singh**, S. Jain, R. Pandey and N. Pandey, "Adaptive biased current differencing trans-conductance amplifier", *AEU - International Journal of Electronics and Communications*, vol. 128, pp. 153494, 2021. Impact Factor: 3.183.

Adaptive biased current differencing trans-conductance amplifier

Shashwat Singh, Sagar Jain, Rajeshwari Pandey and Neeta Pandey

Abstract: A power-efficient, high DC gain adaptive biased Current Differencing Trans-conductance Amplifier (AB-CDTA) is proposed in this paper. The proposed circuit consists of four sub-circuits namely Current Differencing Unit (CDU), Current Replication Unit (CRU), Current Squarer Unit (CSU) and Trans-conductance Amplifier Unit (TAU). The bias current of the TAU varies in a square relation with the input current difference. The proposed structure thus provides tunable gain depending on the input current difference with improved transient characteristics, reduced standby power dissipation and linearity for large range of inputs. Complete mathematical formulation has been presented to establish the characteristics of the proposed AB-CDTA. The proposed structure is validated through SPICE simulations using 180 nm CMOS technology. The proposed structure operates with a stand-by power dissipation of 47.6 µW only. Figure of merit (FoM) is also used to enumerate large signal performances of the proposed AB-CDTA. The proposed structure shows a 45.22 dB enhancement in the DC gain and a 94.29% reduction in the settling time compared to the conventional structure.

For details refer to https://doi.org/10.1016/j.aeue.2020.153494

BIOGRAPHY

DR. SONAM REWARI

Department of Electronics and Communication Engineering

Dr. Sonam Rewari is working as an Assistant Professor in Department of Electronics and Communication Engineering at Delhi Technological University. She is generously engaged in research especially in guiding masters and doctorate students. She is involved in academic as well as extra-curricular growth of the institution. She has published one patent, five copy rights, 15 publications in SCI Journals, 19 papers in international conference and 2 papers in national conference

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Rewari**, "Core-Shell Nanowire Junctionless Accumalation Mode Field-Effect Transistor (CSN-JAM-FET) for High Frequency Applications - Analytical Study", *Silicon*, vol. 13, pp. 4371–4379, 2021. Impact Factor: 2.670.

Core-Shell Nanowire Junctionless Accumalation Mode Field-Effect Transistor (CSN-JAM-FET) for High Frequency Applications - Analytical Study

Sonam Rewari

Abstract: Here, an analytical model has been proposed for Core-Shell-Nanowire-Junctionless-Accumulation-Mode- Field-Effect Transistor (CSN-JAM-FET) for High Frequency Applications. CSN-JAM-FET has been contrasted with Nanowire- Junctionless- Accumulation- Mode- Field-Effect Transistor (NJAM-FET) under the similar device conditions by keeping the threshold voltage same for both. It is so found that CSN-JAM-FET shows much higher drain current (I_{ds}), transconductance (g_m), output conductance (g_d), I_{on}/I_{off} ratio, Subthreshold Slope (SS) and cut off frequency (f_T) because of the inherent property of core shell architecture to elevate the gate domination over the channel. The analytical results have also been modelled for CSN-JAM-FET by finding a result of the Two-Dimensional Poisson equation in accordance with the boundary conditions. The analytical results are much in coherence with the results obtained from the simulator.

For details refer to https://doi.org/10.1007/s12633-020-00744-3

BIOGRAPHY

DR. SUDIPTA MAJUMDAR

Department of Electronics and Communication Engineering

Dr. Sudipta Majumdar received her B.Tech. and M.Tech. degrees in Electronics and Communication Engineering from University of Allahabad, Allahabad, India and P.hD. degree from Delhi University, Delhi, India. She is currently working as Assistant Professor in Electronics and Communication Enggineering Department, Delhi Technolological University, Delhi, India. She also worked as Teaching-cum-Research Fellow at Netaji Shubhas Institute of Technology, Delhi, India. She also worked as Project Associate at Indian Institute of Technology, Delhi and Indian Institute of Information Technology, Allahabad, India. She is a reviewer of several International journals. Her current research interests include signal processing, image processing, linear and non-linear system identification.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01

1. R. Bansal, **S. Majumdar** and H. Parthasarthy, "Stochastic Filtering in Electromagnetics", *IEEE Transactions on Antennas and Propagation*, vol. 69, no. 4, pp. 2165-2180, 2021. Impact Factor: 4.388.

Stochastic Filtering in Electromagnetics

Rahul Bansal, **Sudipta Majumdar*** and Harish Parthasarthy

Abstract: This article presents the estimation of electric and magnetic fields using the Kalman filter (KF). The electric and magnetic fields in the entire space have been estimated using the scalar and vector potential. For this estimation, the measurements at a sparse discrete set of spatial pixels have been used. To implement the KF, the state space model has been obtained using the wave equations with sources satisfied by the scalar and vector potential. The proposed method has been implemented on a Hertzian dipole antenna. The fields estimated using KF have been compared with the recursive least squares (RLS) method. The KF presents better estimation than RLS, as it is an optimal estimator. This work uses the Kronecker product for compact representation of discretized fields in the form of vectors and partial differential operators in the form of matrices.

For details refer to https://doi.org/10.1109/TAP.2020.3027054

**Corresponding Author*

BIOGRAPHY

MS. SUMEDHA GUPTA

Department of Electronics and Communication Engineering

Ms. Sumedha Gupta received the B.Tech degree and M.Tech degree from Guru Gobind Singh Indraprastha University, Delhi, India in the year 2011 and 2013 respectively. She is currently pursuing Ph.D. with the Department of Electronics and Communication, Delhi Technological University, Delhi, India. She has publications in peer-reviewed journals and also presented her work in International Conferences as well, for which she also received the Best Paper Award. Her area of research is Modeling of Microelectronic Devices.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **S. Gupta**, N. Pandey and R. S. Gupta , "Analytical modeling of dual-metal gate stack engineered junctionless accumulation-mode cylindrical surrounding gate (DMGSE-JAM-CSG) MOSFET", *Applied Physics A*, vol. 127, no. 520, 2021. Impact Factor: 2.584.
2. **S. Gupta**, N. Pandey and R. S. Gupta, "Temperature dependency and linearity assessment of dual-metal gate stack junctionless accumulation-mode cylindrical surrounding gate (DMGS-JAM-CSG) MOSFET", *Physica Scripta*, vol. 96, no. 12, pp. 124055, 2021. Impact Factor: 2.487.

Analytical modeling of dual-metal gate stack engineered junctionless accumulation-mode cylindrical surrounding gate (DMGSE-JAM-CSG) MOSFET

Sumedha Gupta, Neeta Pandey and R. S. Gupta

Abstract: This paper proposes a physics-based 2-D analytical model for a dual- material gate stack engineered junctionless accumulation-mode cylindrical surrounding gate (DMGSE-JAM-CSG) MOSFET. Analytical modeling is performed using 2-D Poisson's equation in cylindrical co-ordinate system based upon parabolic potential approximation. This analysis derives the expressions for center potential, electric field, subthreshold drain current, transconductance, output conductance and switching speed. It is seen that this device possesses enhanced drain current, higher transconductance and lower output conductance. The gate-induced drain leakage current for this device has also been investigated. The subthreshold slope of this device is approximately 71 mV/decade and I_{on}/I_{off} ratio is also high, which leads to its usage for low power and high speed switching applications. The electrical characteristics and short channel effects of this device are also examined for different gate stack materials. It is observed that the device characteristics improve when permittivity of the gate stack is increased. Further, the results acquired using analytical modeling is mapped with the simulated data results to affirm and validate the device model structure. The simulation is implemented using ATLAS-3D device simulator.

For details refer to https://doi.org/10.1007/s00339-021-04652-0

Temperature dependency and linearity assessment of dual-metal gate stack junctionless accumulation-mode cylindrical surrounding gate (DMGS-JAM-CSG) MOSFET

Sumedha Gupta, Neeta Pandey and R. S. Gupta

Abstract: A physics-based temperature-dependent analytical model for a Dual- Metal Gate Stack Junctionless Accumulation-Mode Cylindrical Surrounding Gate (DMGS-JAM-CSG) MOSFET has been presented in this paper by solving the 2D Poisson's equation utilizing the suitable boundary conditions. The device performance is examined at various temperatures (T = 100K, 300K and 500K) by observing several parameters like potential, electric field, electron concentration and electron velocity. The obtained outcomes are also contrasted with the outcomes acquired after simulation. Further, the device is also analyzed for its analog performance. Lastly, to check the relevancy of the device for RFIC applications, linearity assessment is performed by evaluating its several figure of merits (FOMs) like second-order and third-order Voltage Intercept Points (VIP2, VIP3), third-order Intercept Input Power (IIP3), third-order Intermodulation Distortion (IMD3) and various higher order transconductances. The obtained results are contrasted with an analogous device and it is discovered that DMGS- JAM- CSG MOSFET device acquires better electrical and linearity characteristics. ATLAS 3D device simulator has been utilized to conduct the simulations.

For details refer to https://doi.org/10.1088/1402-4896/ac33fd

BIOGRAPHY

DR. TEJ SINGH

Department of Electronics and Communication Engineering

Dr. Tej Singh received B.Tech. Degree from Madan Mohan Malaviya University of Technology, Gorakhpur, India, in 2010 and M.E degree from the Thapar Institute of Engineering and Technology, Patiala, India, in 2014 and Ph.D. from Delhi Technological University (DTU) Delhi, India, in 2020. He is currently working as an Assistant Professor in the Department of Information Technology at Madhav Institute of Science and Technology, Gwalior, M.P. His research interests include computer vision, deep learning, Pattern Recognition, Image Processing, Human action and activity recognition. He has received the research excellence awards in the year 2020 from the Delhi Technological University.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **T. Singh** and D. K. Vishwakarma, "A deep multimodal network based on bottleneck layer features fusion for action recognition", *Multimedia Tools and Applications*, vol. 80, pp. 33505–33525, 2021. Impact Factor: 2.757.

2. **T. Singh** and D. K. Vishwakarma, "A deeply coupled ConvNet for human activity recognition using dynamic and RGB images", *Neural Computing and Applications*, vol. 33, pp. 469–485, 2021. Impact Factor: 5.606.

A deep multimodal network based on bottleneck layer features fusion for action recognition

Tej Singh and Dinesh Kumar Vishwakarma

Abstract: Human Activity Recognition (HAR) in videos using convolution neural network become the preferred choice for researcher due to the tremendous success of deep learning models for visual recognition applications. After the invention of the low-cost depth sensor, multiple modalities based activity recognition systems were successfully developed in the past decade. Although it is always challenging to recognize the complex human activities in videos. In this work, we proposed a deep bottleneck multimodal feature fusion (D-BMFF) framework that fused three different modalities of RGB, RGB-D(depth) and 3D coordinates information for activity classification. It helps to better recognize and make full use of information available simultaneously from a depth sensor. During the training process RGB and depth, frames are fed at regular intervals for an activity video while 3D coordinates are first converted into single RGB skeleton motion history image (RGB-SklMHI). We have extracted the features from multimodal data inputs using the latest deep pre-trained network architecture. The multimodal feature obtained from bottleneck layers before the top layer is fused by using multiset discriminant correlation analysis (M-DCA), which allows for robust visual action modeling. Finally, using a linear multiclass support vector machine (SVM) method, the fused features are categorized. The proposed approach is evaluated over four standard RGB-D datasets: UT-Kinect, CAD-60, Florence 3D and SBU Interaction. Our framework produces outstanding results and outperformed the state-of-the-art methods.

For details refer to https://doi.org/10.1007/s11042-021-11415-9

A deeply coupled ConvNet for human activity recognition using dynamic and RGB images

Tej Singh and Dinesh Kumar Vishwakarma

Abstract: This work is motivated by the tremendous achievement of deep learning models for computer vision tasks, particularly for human activity recognition. It is gaining more attention due to the numerous applications in real life, for example smart surveillance system, human–computer interaction, sports action analysis, elderly healthcare, etc. Recent days, the acquisition and interface of multimodal data are straightforward due to the invention of low-cost depth devices. Several approaches have been developed based on RGB-D (depth) evidence at the cost of additional equipment's setup and high complexity. Contrarily, the methods that utilize RGB frames provide inferior performance due to the absence of depth evidence and these approaches require to less hardware, simple and easy to generalize using only color cameras. In this work, a deeply coupled ConvNet for human activity recognition proposed that utilizes the RGB frames at the top layer with bi-directional long short-term memory (Bi-LSTM). At the bottom layer, the CNN model is trained with a single dynamic motion image. For the RGB frames, the CNN-Bi-LSTM model is trained end-to-end learning to refine the feature of the pre-trained CNN, while dynamic images stream is fine-tuned with the top layers of the pre-trained model to extract temporal information in videos. The features obtained from both the data streams are fused at decision level after the softmax layer with different late fusion techniques and achieved high accuracy with max fusion. The performance accuracy of the model is assessed using four standard single as well as multiple person activities RGB-D (depth) datasets. The highest classification accuracies achieved on human action datasets are compared with similar state of the art and found significantly higher margin such as 2% on SBU Interaction, 4% on MIVIA Action, 1% on MSR Action Pair, and 4% on MSR Daily Activity.

For details refer to https://doi.org/10.1007/s00521-020-05018-y

BIOGRAPHY

MR. ALI REZA NOORI

Department of Environmental Engineering

Mr. Ali Reza Noori is currently a Ph.D. Candidate from Afghanistan at the department of environmental engineering of DTU. He was born on 03-02-1986 in the Ghazni province of Afghanistan. He finished high school at Shina Deh high school in the Malistan district of Ghazni Provence in 2004. He joined Kabul polytechnic University in 2005 and finished his BSc. in 2009. In 2010, he was hired as a faculty at Kabul Polytechnic University. Ali Reza Noori got a governmental scholarship from the Republic of Kazakhstan in 2013 and, after successfully completing a year of Russian language and a two-year master's degree, in 2016 he successfully graduated from the Kazakh National Research Technical University named after K.I. Satbayev. He applied for Indian government scholarships (ICCR) in 2019 and after successfully passing the exams and fulfilling the scholarship requirements, he obtained admission to Delhi Technological University in August of 2019 in the department of environmental engineering.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **A. R. Noori** and S. K. Singh, "Status of groundwater resource potential and its quality at Kabul, Afghanistan: a review", *Environmental Earth Sciences*, vol. 80, no. 654, 2021. Impact Factor: 2.784.
2. **A. R. Noori** and S. K. Singh, "Spatial and temporal trend analysis of groundwater levels and regional groundwater drought assessment of Kabul, Afghanistan", *Environmental Earth Sciences*, vol. 80, no. 698, 2021. Impact Factor: 2.784.

Status of groundwater resource potential and its quality at Kabul, Afghanistan: a review

Ali Reza Noori and S. K. Singh

Abstract: Groundwater is an integral part of water resources. Groundwater has a vital role in water use in Kabul, Afghanistan. Nowadays, it is the only available source for water supply in Kabul city. The study aimed to comprehensively review the spatiotemporal groundwater distribution, physicochemical and bacteriological specifications of groundwater, and its consumption in Kabul, Afghanistan. Based on developed specific search terms to locate appropriate literature, the cited material is evaluated for relevance and reliability. Due to several causes, the mean annual decrease in groundwater levels between 2008 and 2016 is 1.7 m. About 33% of supply wells are not in operation due to declining groundwater tables. According to most reports, the physicochemical and bacteriological contents of groundwater in Kabul city exceeds World Health Organization (WHO) and National Drinking Water Quality Standard (NDWQS) limits. Individuals use water through four significant suppliers: Private wells, private suppliers, public water supply, and public wells. The study provides further insight into groundwater's current condition, and some recommendations are also presented to improve the sustainable development of groundwater.

For details refer to https://doi.org/10.1007/s12665-021-09954-3

Spatial and temporal trend analysis of groundwater levels and regional groundwater drought assessment of Kabul, Afghanistan

Ali Reza Noori and S. K. Singh

Abstract: Groundwater is the dominant source of water supply in Kabul city in Afghanistan, but water levels in the region are steadily declining. This study was undertaken to assess groundwater level trends and examine its drought dynamics in Kabul city. The observation wells were classified using cluster analysis to categorize long-term trends of groundwater water level data. The seasonal and annual variations in groundwater depth have been determined utilizing the Mann–Kendall statistical test. To measure groundwater drought, the Standardized Groundwater Level Index (SGI) was utilized. Based on trend analysis, the water levels in 82% of the observation wells were significantly decreasing. From 2014 to 2020, most of the wells in the study area suffered increasingly severe and persistent drought, as per the SGI results. The analysis of land use and land cover (LULC) indicates that the built-up area is increased from about 15% in 2005 to 32% in 2020 in the study area. Bare land had decreased from about 67% in 2005 to 52% in 2020. The severe decline in groundwater level can be attributed to changes in LULC, overexploitation of groundwater, and declining annual precipitation. The findings of this study indicate that long-term groundwater management measures are required in the city area to maintain groundwater availability.

For details refer to https://doi.org/10.1007/s12665-021-10005-0

BIOGRAPHY

PROF. ANIL KUMAR HARITASH

Department of Environmental Engineering

Dr. A. K. Haritash is Professor in the Department of Environmental Engineering, Delhi Technological University. He has about 14 years of teaching experience, and has around 18 years of research experience. His area of interest is environmental monitoring of Polycyclic Aromatic Hydrocarbons (PAHs), water quality assessment, wetland monitoring, Advanced Oxidation Processes (AOPs), and bioremediation. He has around 70 publications in the form of research papers, conference abstracts, articles, and an edited book. His research on biodegradation of PAHs has been conferred the status of FAST BREAKING RESEARCH in Environmental Engineering by Thomson Reuters and ScienceWatch. Dr. Haritash has been conferred state level Outstanding Faculty Award for his contribution in academics and research, and he is also the recipient of Commendable Research Award of DTU consecutively for four years (2017 to 2020). He has been on the panel of subject experts in National Science Centre (Polland); Ministry of Drinking Water and Sanitation, Govt. of India; Shastri Indo-Canadian Institute; TERI School of Advanced Studies etc. He is member of Editorial Board of Indian Journal of Waste Management and Applied Chemical Engineering journal. Dr. Haritash has organized and participated in several national and international seminars, conferences, and workshops.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	05

1. A. Aggarwal, J. Soni, K. Sharma, M. Sapra, Chitrakshi, O. Karaca and **A. K. Haritash**, "Hydrogeochemical Assessment of Groundwater for Drinking and Agricultural Use: A Case Study of Rural Areas of Alwar, Rajasthan", *Environmental Management*, vol. 67, pp. 513–521, 2021. Impact Factor: 3.266.
2. H. Pipil, **A. K. Haritash** and K. R. Reddy, "Seasonal variability and kinetics of phosphate removal in a Phragmites-based engineered wetland", *Rendiconti Lincei. Scienze Fisiche e Naturali*, vol. 32, pp. 729–735, 2021. Impact Factor: 1.627.
3. Sakshi, S. K. Singh and **A. K. Haritash**, "Catabolic enzyme activities during biodegradation of three-ring PAHs by novel DTU-1Y and DTU-7P strains isolated from petroleum-contaminated soil ", *Archives of Microbiology*, vol. 203, pp. 3101–3110, 2021. Impact Factor: 2.552.
4. Sakshi, S. K. Singh and **A. K. Haritash**, "Catabolic enzyme activity and kinetics of pyrene degradation by novel bacterial strains isolated from contaminated soil", *Environmental Technology & Innovation*, vol. 23, pp. 101744, 2021. Impact Factor: 5.263.
5. V. Shan, S. K. Singh and **A. K. Haritash**, "Evaluation of water quality and potential metal contamination in ecologically important Bhindawas bird sanctuary, India", *Applied Water Science*, vol. 11, no. 8, 2021. Impact Factor: 3.874.

Hydrogeochemical Assessment of Groundwater for Drinking and Agricultural Use: A Case Study of Rural Areas of Alwar, Rajasthan

Ankur Aggarwal, Jigyasa Soni, Khyati Sharma, Mohnish Sapra, Chitrakshi, Oznur Karaca and **A. K. Haritash***

Abstract: Groundwater contributes substantially to the development of arid and semi-arid regions around the globe. The present study integrates groundwater quality and its suitability for drinking and irrigation around Alwar city of Rajasthan state, where agriculture is the major land use. The application for drinking was assessed by comparing the observed value with prescribed standards of WHO. Groundwater was found suitable for drinking at most of the locations. The suitability of groundwater for irrigation was determined by calculating ion-based ratios and comparing them against the suggested ratios and indices for agricultural quality. Suitability for irrigation was assessed against electrical conductivity (EC), percentage sodium (%Na), residual Na_2CO_3 (RSC), per cent soluble sodium (SSP), sodium adsorption ratio (SAR), Mg hazard and permeability index (PI) etc., and the quality was compromised for EC, %Na and Mg Hz. Since the soil was sandy, the groundwater was found suitable for irrigation over long-term use, with the only problem of magnesium hazard. Based on the different ratios of anions and cations, silicate weathering was observed to be regulating groundwater chemistry, and the groundwater belonged to mixed CaMgCl and $CaHCO_3^-$ type based on Piper's classification and relative abundance of ions. Further, meteoric genesis classification showed that the groundwater in the study region had direct base exchange and shallow meteoric water percolation. Presence of kaolinite and quartz minerals in soil confirmed that silicate weathering is the major process controlling groundwater chemistry.

For details refer to https://doi.org/10.1007/s00267-020-01361-x

Seasonal variability and kinetics of phosphate removal in a *Phragmites*-based engineered wetland

Harsh Pipil, **A. K. Haritash*** and Krishna R. Reddy

Abstract: Phosphate is a critical pollutant leading to eutrophication in water bodies and significant adverse effect on water quality around the globe. The present study assessed the role of *Phragmites*-based constructed wetland (CW) towards the removal of phosphate from wastewater under natural environment and to assess the influence of meteorological parameters and seasonal changes. The *Phragmites*-based wetland removed phosphate with average efficiency of 80% at HRT of 24 h, and the removal efficiency increased with ambient temperature and amendment of ammonium in wastewater. Rhizospheric environment with slightly reducing conditions ($Fe^{3+}/Fe^{2+} < 1.0$) and pH less than 8.0 do not favour binding of phosphate with Fe and Ca/Mg, respectively. The study concluded that *Phragmites* spp. plays the dominant role in phosphate removal (based on kinetics of removal) up to 20 mg/l-PO_4^{3-} in wastewater. While the treatment is observed without input of chemicals or energy, it is a sustainable eco-friendly option for decentralised wastewater treatment throughout the year.

For details refer to https://doi.org/10.1007/s12210-021-01017-w

Catabolic enzyme activities during biodegradation of three-ring PAHs by novel DTU-1Y and DTU-7P strains isolated from petroleum-contaminated soil

Sakshi, S. K. Singh and **A. K. Haritash***

Abstract: Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous pollutants having health hazards. PAH-utilizing bacterial strains were isolated from petroleum-contaminated soil from siding area, Bijwasan supply location of BPCL, Delhi, India. Bacterial strains with different morphology were isolated and acclimatized to a mixture of low molecular weight PAH compounds in the concentration range of 50–10,000 mg/L. Two bacterial strains surviving at 10,000 mg/L PAH concentration were identified as *Kocuria flava* and *Rhodococcus pyridinivorans,* based on 16S rRNA gene sequencing and phylogenetic analysis over MEGA X, are reported for the first time for PAH degradation. The strain *K. flava* could degrade phenanthrene, anthracene, and fluorene with efficiency of 55.13%, 59.01%, and

**Corresponding Author*

63.46%, whereas *R. pyridinivorans* exhibited 62.03%, 64.99%, and 66.79% degradation for respective PAHs at initial PAH concentration of 10 mg/L. Slightly lower degradation of phenanthrene could be attributed to its more stable chemical structure. The consortium of both the strains degraded 61.32%, 64.72%, and 66.64%, of 10 mg/L of phenanthrene, anthracene, and fluorene, respectively, in 15 days of incubation period indicating no synergistic or antagonistic effect towards degradation. Catechol 2,3-dioxygenase (C23O), dehydrogenase and peroxidase enzyme activities during PAH degradation coincided with degradation of PAHs, thus highlighting the role of these enzymes in catabolising three-ring PAHs. This is the first investigation confirming the participation of C23O, dehydrogenase and peroxidases enzyme profiles throughout the period of degradation. The study concludes that these strains can play significant role in microbial remediation of PAH-contaminated environment.

For details refer to https://doi.org/10.1007/s00203-021-02297-4

Catabolic enzyme activity and kinetics of pyrene degradation by novel bacterial strains isolated from contaminated soil+

Sakshi, S. K. Singh and **A. K. Haritash***

Abstract: Polycyclic aromatic hydrocarbons (PAHs) with high molecular weight are difficult to degrade owing to their chemical structure and stability. This study reports degradation of pyrene by two potent Gram-positive bacterial strains isolated from petroleum-contaminated soil from Bijwasan supply location of Bharat Petroleum Corporation Limited (BPCL), India. The bacteria were identified as Kocuria flava and Rhodococcus pyridinivorans based on 16S rRNA gene sequencing. The degradation of pyrene, enzyme activity of Catechol 2,3-dioxygenase (C23O), dehydrogenase, and peroxidase, and the rate kinetics of degradation were investigated using the isolated bacteria. K. flava and R. pyridinivorans could degrade pyrene with an efficiency of 53.8% and 56.2%, within 15 days of incubation period under laboratory conditions. The consortium revealed 56.4% degradation of pyrene indicating that there is no significant synergistic/inhibitive effect. The activity (maximum on 9th day of incubation) of peroxidase enzyme (9.4×10^{-4} and 16.9×10^{-4} M/ml/min) was followed by dehydrogenase (2.6×10^{-4} and 2.3×10^{-4} M/ml/min) and C23O (2.2×10^{-4} and 2.8×10^{-4} M/ml/min) for K. flava and R. pyridinivorans, respectively, suggesting their involvement in ring-cleavage, diol-formation, and subsequent oxidation of the intermediates. Analysis of rate kinetics exhibited degradation of pyrene to be the first order reaction indicating that an increase in initial concentration of pyrene will not compromise with the ability of studied bacteria towards degradation. Analysis of initial and final concentration of treated media over HPLC confirmed significant pyrene degradation within 15 days. The study concludes that K. flava and R. pyridinivorans can play an active role in remediation of hydrocarbon-contaminated sites.

For details refer to https://doi.org/10.1016/j.eti.2021.101744

Evaluation of water quality and potential metal contamination in ecologically important Bhindawas bird sanctuary, India+

Vandana Shan, S. K. Singh and **A. K. Haritash***

Abstract: Considering the environmental, agricultural, and ecological significance of Bhindawas wetland, the present study is the first comprehensive investigation to assess the water quality, determine the suitability of water for aquatic life in the wetland; and its suitability for irrigation in areas around the wetland. Twenty samples of water from Bhindawas wetland were analyzed and spatial variations of dissolved oxygen (DO), dissolved phosphate, nitrate, and biological oxygen demand (BOD_5) were observed. The concentration of DO was higher in areas with shallow depth and rich growth of submerged vegetation compared to deeper areas with no vegetation. Spatial variations of phosphate, nitrate, and heavy metals correlated with nesting zone of birds, runoff from agricultural fields, and wastewater from adjoining villages, respectively. Values of heavy metal pollution index (HPI), heavy metal evaluation index (HEI), and degree of contamination (C_d) in water confirmed high level of metal contamination of the medium. Based on the water quality index (WQI), the water was unsuitable for aquatic life and use in agricultural utilization. It can be concluded that water quality of Bhindawas wetland was adversely affected by heavy metals, which is a cause of concern since this wetland is a temporary resort of migratory birds. Immediate intervention is required to improve the water quality, especially scrutiny and inspection of the added wastewater from surrounding villages, and runoff from adjoining agricultural fields.

For details refer to https://doi.org/10.1007/s13201-020-01334-9

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

MR. HARSH PIPIL

Department of Environmental Engineering

Mr. Harsh Pipil has completed his Civil Engineering in 2012 from NIET, Greater Noida, followed by it, he had completed M. Tech. in Environmental Engineering from DTU, Delhi in 2014. He went to Auckland, New Zealand to study Construction Project Management in 2016. Currently, he is a research scholar in Environmental Engineering Department, DTU, Delhi since 2019.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **H. Pipil**, A. K. Haritash and K. R. Reddy, "Seasonal variability and kinetics of phosphate removal in a Phragmites-based engineered wetland", *Rendiconti Lincei. Scienze Fisiche e Naturali*, vol. 32, pp. 729–735, 2021. Impact Factor: 1.627.

Seasonal variability and kinetics of phosphate removal in a *Phragmites*-based engineered wetland

Harsh Pipil, A. K. Haritash and Krishna R. Reddy

Abstract: Phosphate is a critical pollutant leading to eutrophication in water bodies and significant adverse effect on water quality around the globe. The present study assessed the role of *Phragmites*-based constructed wetland (CW) towards the removal of phosphate from wastewater under natural environment and to assess the influence of meteorological parameters and seasonal changes. The *Phragmites*-based wetland removed phosphate with average efficiency of 80% at HRT of 24 h, and the removal efficiency increased with ambient temperature and amendment of ammonium in wastewater. Rhizospheric environment with slightly reducing conditions ($Fe^{3+}/Fe^{2+} < 1.0$) and pH less than 8.0 do not favour binding of phosphate with Fe and Ca/Mg, respectively. The study concluded that *Phragmites* spp. plays the dominant role in phosphate removal (based on kinetics of removal) up to 20 mg/l-PO_4^{3-} in wastewater. While the treatment is observed without input of chemicals or energy, it is a sustainable eco-friendly option for decentralised wastewater treatment throughout the year.

For details refer to https://doi.org/10.1007/s12210-021-01017-w

BIOGRAPHY

MS. LOVLEEN GUPTA

Department of Environmental Engineering

Ms. Lovleen Gupta is an engineer with more than 20 years of experience in research, capacity building and outreach in varied field of environment. Mrs. Gupta has earned in B.Tech. in Civil Engineering from Punjab Engineering College, India, M.S. in Environmental Engineering from Lehigh University, USA and is currently pursuing her PhD in Environmental Engineering from IIT Delhi. Before joining DTU, Mrs. Gupta worked in the industry both in USA and India. She has worked in different segments of environment like air pollution, solid waste management, measuring greenhouse gas emissions, developing clean development mechanism (CDM) projects, human health risk assessment, to name a few. Her research has been published in high impact journals. Also, Mrs. Gupta is a member of American Association of Aerosol Research (AAAR), Association of Environmental Engineering and Science Professors (AEESP), Indian Institution of Engineers (IoE).

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **L. Gupta**, R. Dev, K. Zaidi, R. S. Raman, G. Habib and B. Ghosh, "Assessment of PM_{10} and $PM_{2.5}$ over Ghaziabad, an industrial city in the Indo-Gangetic Plain: spatio-temporal variability and associated health effects", *Environmental Monitoring and Assessment*, vol. 193, no. 735, 2021. Impact Factor: 2.513.

Assessment of PM_{10} and $PM_{2.5}$ over Ghaziabad, an industrial city in the Indo-Gangetic Plain: spatio-temporal variability and associated health effects

Lovleen Gupta, Rishabh Dev, Kumail Zaidi, Ramya Sunder Raman, Gazala Habib and Bipasha Ghosh

Abstract: This study examined the PM_{10} and $PM_{2.5}$ concentration, associated mortality, and transport pathways in Ghaziabad which is an industrial city in the Indo-Gangetic Plain. To achieve this, PM (both PM_{10} and $PM_{2.5}$) and meteorological parameters were measured from June 2018 to May 2019 at 2 locations and analyzed together with data from a 3rd location in Ghaziabad. The highest daily average PM_{10} and $PM_{2.5}$ concentrations were ~1000 μg m^{-3} and ~450 μg m^{-3}, respectively. At each of the three locations, the annual mean PM_{10} concentrations were ~260±150 μg m^{-3} while the $PM_{2.5}$ concentrations were 140±90 μg m^{-3}. Nonparametric Spearman rank correlation analysis between meteorological parameters and PM concentrations indicated that ventilation coefficient was anti-correlated with PM concentration during the post-monsoon and winter seasons (the most polluted seasons) with rank correlation values of approximately −0.50. Multiple linear regression (MLR) revealed that the variability in local meteorological parameters account for ~50% variability (maximum) in PM_{10} mass during the monsoon and $PM_{2.5}$ during the post-monsoon season. For long-range sources, cluster and concentrated weighted trajectory (CWT) analyses utilizing regional meteorology showed the impact of transported PM from sources in Arabian sea through western India in monsoon and from parts of South Asia through Northwestern IGP and neighboring cities in Uttar Pradesh in other seasons. Finally, mortality estimates show that the number of deaths attributable to ambient $PM_{2.5}$ in Ghaziabad were ~873 per million individuals which was ~70% higher than Delhi.

For details refer to https://doi.org/10.1007/s10661-021-09411-

BIOGRAPHY

DR. RAJEEV KUMAR MISHRA

Department of Environmental Engineering

Dr. Rajeev Kumar Mishra is working as an Assistant Professor in Department of Environmental Engineering. The thrust areas of his research are Environmental Implications of Urban Transport Systems, Air Quality Analysis and Modeling, Ultrafine Particles, Traffic Noise Pollution Analysis and Modeling, Knowledge Based Decision Support System, Impact of Urban Transport on Climate Change and Environmental Impact Assessment. One Ph.D. and 13 M.Tech. thesis has already been awarded under his guidance. Presently he is supervising 07 Ph.D. and 05 M.Tech. students. He has published 50 International & National research papers in various reputed journals. He has also presented 40 International and 07 National Conference papers. Dr. Mishra has also written four book chapters published in Springer. He has also handled different projects funded by different agencies like Central Pollution Control Board (CPCB) etc.. He is also a recipient of three times research excellence award by the University i.e. DTU. He has reviewed the different research papers of various journals like Environment and Sustainable Development, Transport Reviews, International Journal of Environmental Science & Technology, Sustainable Cities & Society, Environmental Progress and Sustainable Energy, Environmental Impact Assessment Review, International Journal of Sustainable Built Environment, Urban Climate, Scientific Report, Transportation Research Part D, Ecological Engineering etc.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	04

1. **R. K. Mishra**, K. Nair, K. Kumar and A. Shukla, "Dynamic noise mapping of road traffic in an urban city", *Arabian Journal of Geosciences*, vol. 14, no. 122, 2021. Impact Factor: 2.334.
2. R. Kumar, **R. K. Mishra**, S. Chandra and A. Hussain, "Evaluation of urban transport-environment sustainable indicators during Odd–Even scheme in India", *Environment, Development and Sustainability*, vol. 23, pp. 17240–17262, 2021. Impact Factor: 3.219.
3. S. K. Yadav, S. K. Kompalli, B. R. Gurjar and **R. K. Mishra**, "Aerosol number concentrations and new particle formation events over a polluted megacity during the COVID-19 lockdown", *Atmospheric Environment*, vol. 259, pp. 118526, 2021. Impact Factor: 4.798.
4. S. K. Yadav, R. Sharma, S. Kumar, A. Agarwal, V. Mohan, **R. K. Mishra** and A. Shukla, "Urban air pollution reduction: evidence from phase-wise analysis of COVID-19 pandemic lockdown", *Arabian Journal of Geosciences*, vol. 14, no. 1413, 2021. Impact Factor: 1.827.

Dynamic noise mapping of road traffic in an urban city

Rajeev Kumar Mishra, Kartik Nair, Kranti Kumar and Ankita Shukla

Abstract: This study is an attempt to analyse the spatial distribution of traffic noise levels in the city of Delhi through the creation of noise maps with the help of GIS. Field measurements were conducted at 10 locations consisting of different land-use patterns. It was observed that the measured ambient noise levels at all the locations were violating the prescribed limits as prescribed by CPCB. Noise levels were found to be in proportion to the vehicular population. Noise level values obtained from the developed noise maps have given very close results to the measured values. The percentage difference between the predicted noise level and the monitored noise level was found to be between 4 and 7%. This study will help the concerned authorities to identify the hot spots of noise within the city and to take appropriate actions to curb the noise pollution in those particular areas.

For details refer to https://doi.org/10.1007/s12517-020-06373-9

Evaluation of urban transport-environment sustainable indicators during Odd–Even scheme in India

Ravindra Kumar, **Rajeev Kumar Mishra***, Satish Chandra and Asif Hussain

Abstract: Identification of the most relevant parameters of a sustainable transportation system is regarded as a significant choice that influences the success of policy-related intervention to improve efficiency. A hybrid-based approach has been used to analyze the data in multiple steps to improve accuracy and objectivity. In the first step, evidence on social, economic, and environmental indicators was formed for each opinion and then combined. The second step proposed a mathematical framework to treat indecision on the indicators collected from multiple sources, viz. expert and public opinion survey, models, and actual measurement during pre- and post-implementation stages of the Odd–Even scheme. By setting up, a reliability function and consistency index are used to evaluate and rank the Odd–Even transportation scheme introduced by the Government of Delhi. A case study in South Delhi's surrounding areas has been examined to demonstrate the proposed hybrid approach and evaluate the parameters in terms of the index. The result shows that the indicators like trip cost, trip time, safety and security, user's satisfaction, congestion level, parking demand, and fuel consumption affected positively by 1766.6, 22.9, 283.3, 19.1, 187.5, 200, and 17.2 percent, respectively, after the implementation of the scheme. The overall increase in the index was found as 28.2%, which favors the "Odd–Even" scheme as a sustainable transportation measure in Delhi.

For details refer to https://doi.org/10.1007/s10668-021-01353-9

Aerosol number concentrations and new particle formation events over a polluted megacity during the COVID-19 lockdown

Shailendra Kumar Yadav, Sobhan Kumar Kompalli, Bhola Ram Gurjar and **Rajeev Kumar Mishra***

Abstract: The present study investigates the particle number concentrations and size distributions in the ultrafine and fine-sized regimes over a polluted megacity, New Delhi (28.75° N, 77.12° E), India. The experiments were conducted during the periods (April–May 2020) of strict social and travel restrictions (lockdown) imposed by the Government of India aiming to contain the spread of Coronavirus Disease 19 (COVID-19) pandemic. The different phases of the COVID-19 lockdown witnessed restrictions of varying magnitudes with the significant cessation of anthropogenic sources, viz., industrial, road, railways, and air traffic emissions. Using this unique opportunity, the impact of varying urban emissions on particle number size distributions and new particle

**Corresponding Author*

formation events were examined. The mean total number concentrations were in the range of ~ (2–3.5) x 10^4 cm^{-3} and depicted a gradual increase (~26%) with progressive unlock of the anthropogenic activities. At the same time, accumulation particle concentrations were doubled. However, ultrafine particles (UFP) (diameter < 100 nm) dominated (50–88%) the total number concentrations during most of the days and several new particle formation (NPF) events resulting in elevated (2–5 fold) UFP concentrations were observed. Subsequently, the particles grew to larger sizes with rates ~3.31–8.37 nm h^{-1}. The NPF events occurred during the daytime, and during the events, a clear enhancement in the concentrations of [H_2SO_4] proxy (2–3.5 × 10^7 molecules cm^{-3}; 2–3 orders higher than the non-event values) suggesting the role of strong gas-phase photochemistry. Also, some of the NPF events were associated with increased odd oxygen concentrations [$O_x = O_3+NO_2$], indicating the regional nature of the precursors and participation of VOC precursors in nucleation/growth. Interestingly, different classes of NPF events were seen during the strictest lockdown period, whereas more frequent and well-defined NPF events were witnessed when anthropogenic activities were opened up with conditional relaxations. These events demonstrated the competition between source strengths of precursor vapors from anthropogenic activities and primary particles acting as condensation sink restricting NPF. This study highlighted that urban pollution mitigation policies need to consider ultrafine particles emanating from the secondary aerosol formation process from traffic emissions.

For details refer to https://doi.org/10.1016/j.atmosenv.2021.118526

Urban air pollution reduction: evidence from phase-wise analysis of COVID-19 pandemic lockdown+

Shailendra Kumar Yadav,Raghav Sharma, Sankalp Kumar, Aviral Agarwal, Vignesh Mohan, **Rajeev Kumar Mishra*** and Ankita Shukla

Abstract: Until 31 May 2020, more than six million confirm COVID-19 cases had been reported worldwide. Lockdown has resulted in significant air quality improvement, especially in urban regions. The lockdown has acted as a natural experiment empowering researchers, policymakers, and governing bodies. The present study focuses on quantifying and analysing the effect of lockdown on India's metropolitan cities, namely New Delhi, Mumbai, Kolkata, Chennai, and Bangalore. The study analyses the phase-wise and diurnal variations in the air quality from 24 March 2020 to 31 May 2020 while focussing on-peak and off-peak duration concentrations. To investigate the reason behind pollutant reduction, correlation of drop percentages in pollutant concentrations with vehicle population, extent of construction activity, and meteorological parameters are analysed. The 24-h drop in PM_{10} and $PM_{2.5}$ showed a high correlation (R^2 = 0.97 and 0.72, respectively) with the city's vehicle population. During peak hours, the inland cities (Delhi and Bangalore), with a more extensive vehicle fleet, recorded a higher drop in PM_{10} and $PM_{2.5}$ concentrations than coastal cities (Mumbai, Chennai, and Kolkata). With respect to 2019 concentration, the maximum decrease in pollutant concentrations averaged across the five study locations was recorded in NO_2 (46%), followed by $PM_{2.5}$ (40%), PM_{10} (37%), and CO (19%). SO_2 and O_3 contrarily recorded an overall increase of 40% and 41%. These results wherein vehicular pollutants recorded the maximum drop indicate that reduced vehicular traffic primarily influenced air quality improvement during the lockdown.

For details refer to https://doi.org/10.1007/s12517-021-07777-x

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

PROF. S. K. SINGH

Department of Environmental Engineering

Prof. S. K. Singh, Professor & Head, Delhi Technological University, Delhi, Ph.D. from BITS, Pilani and M. Tech. from IIT-BHU, Varanasi, is engaged in teaching, research, administration and consultancy for the last 30 years. Presently, he is a Professor of Civil & Environmental Engineering from last 21 years at Delhi Technological University, Delhi; and also Independent Director of WAPCOS Limited (a Mini-Ratna â€“I company, GOI). He has received numerous felicitations and awards by professional bodies; organised many National and International Conferences in the area of Environment and Water Resources; and published more than 190 research papers in national and international journals of repute.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. D. Goyal, A. K. Haritash and **S. K. Singh**, "A comprehensive review of groundwater vulnerability assessment using index-based, modelling, and coupling methods", *Journal of Environmental Management*, vol. 296, pp. 113161, 2021. Impact Factor: 6.789.
2. R. Sarma and **S. K. Singh**, "Simulating contaminant transport in unsaturated and saturated groundwater zones", *Water Environment Research*, vol. 93, no. 9, pp. 1496-1509, 2021. Impact Factor: 1.946.
3. A. R. Noori and **S. K. Singh**, "Spatial and temporal trend analysis of groundwater levels and regional groundwater drought assessment of Kabul, Afghanistan", *Environmental Earth Sciences*, vol. 80, no. 698, 2021. Impact Factor: 2.784.

A comprehensive review of groundwater vulnerability assessment using index-based, modelling, and coupling methods

Deepali Goyal, A. K. Haritash and **S. K. Singh***

Abstract: Groundwater has become increasingly vulnerable to quality degradation. An elaborate understanding of its flow, draft, recharge and pollutant transport processes needs to be developed to understand its risk to contamination. This paper has discussed different tools and methods that are used to map groundwater vulnerability around the world. To maintain the quality and impact of the study, rigorous search for relevant literature published in high impact scientific journals has been done, and the comprehensive information on groundwater vulnerability assessment methods being used, has been compiled. The GIS based overlay and index-based methods like DRASTIC, GALDIT, GOD, COP and PI takes into consideration various thematic layers, overlays them to calculate weighted index and identifies vulnerability classes. They have been criticised for the lack of numerical basis in their formulation. Therefore, over the years, many of the proposed indices have been modified to provide quantitative estimates of groundwater potential to degrade and deplete. However,

where the data and software are not a constraint, the use of numerical based simulation models can be done for more elaborate and numerical based quantification of the vulnerability. These numerical models typically require extensive data and are exceedingly becoming more sophisticated with the introduction of new parameters. This study concludes that integrating the GIS with numerical models offers the advantage of data management and assists to spatially analyse the datasets. The difficulties that are associated with the differences between GIS and numerical model's data structures should be thoroughly understood, prior to coupling, to develop uniform conversion software.

For details refer to https://doi.org/10.1016/j.jenvman.2021.113161

Simulating contaminant transport in unsaturated and saturated groundwater zones

Riki Sharma and **Santosh Kumar Singh***

Abstract: The demand for clean and adequate water is rising rapidly with increasing population. This growing demand for water necessitates the measurement of the quantity and quality of water. Simulation modeling has become increasingly popular in the last two decades largely because of their predictive ability. This paper reviews the approaches for simulation modeling in groundwater resources management, focusing on models that have been used to simulate contaminant transport through the aquifer system. Recent research papers that have integrated the models for unsaturated and saturated zones have also been studied and described. Integrated models require assessment of the complex interactions between the groundwater zones and the movement of water and solute through them. Due to this, integrated models provide a more accurate modeling approach than models that have been independently developed for saturated and unsaturated zones. Application of such models is encouraged at the regional level to arrive at the best groundwater management decisions.

For details refer to https://doi.org/10.1002/wer.1555

Spatial and temporal trend analysis of groundwater levels and regional groundwater drought assessment of Kabul, Afghanistan

Ali Reza Noori and **S. K. Singh***

Abstract: Groundwater is the dominant source of water supply in Kabul city in Afghanistan, but water levels in the region are steadily declining. This study was undertaken to assess groundwater level trends and examine its drought dynamics in Kabul city. The observation wells were classified using cluster analysis to categorize long-term trends of groundwater water level data. The seasonal and annual variations in groundwater depth have been determined utilizing the Mann–Kendall statistical test. To measure groundwater drought, the Standardized Groundwater Level Index (SGI) was utilized. Based on trend analysis, the water levels in 82% of the observation wells were significantly decreasing. From 2014 to 2020, most of the wells in the study area suffered increasingly severe and persistent drought, as per the SGI results. The analysis of land use and land cover (LULC) indicates that the built-up area is increased from about 15% in 2005 to 32% in 2020 in the study area. Bare land had decreased from about 67% in 2005 to 52% in 2020. The severe decline in groundwater level can be attributed to changes in LULC, overexploitation of groundwater, and declining annual precipitation. The findings of this study indicate that long-term groundwater management measures are required in the city area to maintain groundwater availability.

For details refer to https://doi.org/10.1007/s12665-021-10005-0

**Corresponding Author*

BIOGRAPHY

DR. SAKSHI

Department of Environmental Engineering

Dr. Sakshi had received her Ph.D. in Deciphering bacterial catabolic genes for PAH-degradation from Department of Environmental Engineering, Delhi Technological University, Delhi. She did her Masters in Technology in Bioinformatics from Department of Environmental Engineering, Delhi Technological University and Bachelor of Technology in Biotechnology from Dr. B. R. Ambedkar National Institute of Technology, Jalandhar. Being a graduate in Biotechnology she did 6 week Industrial training in IGIB (Institute of Genomics and Integrative Biology, CSIR) and did her M.Tech project in IGIB-CSIR. She had qualified GATE and received MHRD fellowship during M.Tech. She had received DTU fellowship during her Ph.D. She has presented research papers in 03 International conferences. She has 05 year experience of teaching. She has published 5 research papers in peer reviewed international SCI indexed journals.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **Sakshi**, S. K. Singh and A. K. Haritash, "Catabolic enzyme activities during biodegradation of three-ring PAHs by novel DTU-1Y and DTU-7P strains isolated from petroleum-contaminated soil", *Archives of Microbiology*, vol. 203, pp. 3101–3110, 2021. Impact Factor: 2.552.
2. **Sakshi**, S. K. Singh and A. K. Haritash, "Catabolic enzyme activity and kinetics of pyrene degradation by novel bacterial strains isolated from contaminated soil", *Environmental Technology & Innovation*, vol. 23, pp. 101744, 2021. Impact Factor: 5.263.

Catabolic enzyme activities during biodegradation of three-ring PAHs by novel DTU-1Y and DTU-7P strains isolated from petroleum-contaminated soil

Sakshi, S. K. Singh and A. K. Haritash

Abstract: Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous pollutants having health hazards. PAH-utilizing bacterial strains were isolated from petroleum-contaminated soil from siding area, Bijwasan supply location of BPCL, Delhi, India. Bacterial strains with different morphology were isolated and acclimatized to a mixture of low molecular weight PAH compounds in the concentration range of 50–10,000 mg/L. Two bacterial strains surviving at 10,000 mg/L PAH concentration were identified as *Kocuria flava* and *Rhodococcus pyridinivorans,* based on 16S rRNA gene sequencing and phylogenetic analysis over MEGA X, are reported for the first time for PAH degradation. The strain *K. flava* could degrade phenanthrene, anthracene, and fluorene with efficiency of 55.13%, 59.01%, and 63.46%, whereas *R. pyridinivorans* exhibited 62.03%, 64.99%, and 66.79% degradation for respective PAHs at initial PAH concentration of 10 mg/L. Slightly lower degradation of phenanthrene could be attributed to its more stable chemical structure. The consortium of both the strains degraded 61.32%, 64.72%, and 66.64%, of 10 mg/L of phenanthrene, anthracene, and fluorene, respectively, in 15 days of incubation period indicating no synergistic or antagonistic effect towards degradation. Catechol 2,3-dioxygenase (C23O), dehydrogenase and peroxidase enzyme activities during PAH degradation coincided with degradation of PAHs, thus highlighting the role of these enzymes in catabolising three-ring PAHs. This is the first investigation confirming the participation of C23O, dehydrogenase and peroxidases enzyme profiles throughout the period of degradation. The study concludes that these strains can play significant role in microbial remediation of PAH-contaminated environment.

For details refer to https://doi.org/10.1007/s00203-021-02297-4

Catabolic enzyme activity and kinetics of pyrene degradation by novel bacterial strains isolated from contaminated soil

Sakshi, S. K. Singh and A. K. Haritash

Abstract: Polycyclic aromatic hydrocarbons (PAHs) with high molecular weight are difficult to degrade owing to their chemical structure and stability. This study reports degradation of pyrene by two potent Gram-positive bacterial strains isolated from petroleum-contaminated soil from Bijwasan supply location of Bharat Petroleum Corporation Limited (BPCL), India. The bacteria were identified as Kocuria flava and Rhodococcus pyridinivorans based on 16S rRNA gene sequencing. The degradation of pyrene, enzyme activity of Catechol 2,3-dioxygenase (C23O), dehydrogenase, and peroxidase, and the rate kinetics of degradation were investigated using the isolated bacteria. K. flava and R. pyridinivorans could degrade pyrene with an efficiency of 53.8% and 56.2%, within 15 days of incubation period under laboratory conditions. The consortium revealed 56.4% degradation of pyrene indicating that there is no significant synergistic/inhibitive effect. The activity (maximum on 9th day of incubation) of peroxidase enzyme (9.4×10^{-4} and 16.9×10^{-4} M/ml/min) was followed by dehydrogenase (2.6×10^{-4} and 2.3×10^{-4} M/ml/min) and C23O (2.2×10^{-4} and 2.8×10^{-4} M/ml/min) for K. flava and R. pyridinivorans, respectively, suggesting their involvement in ring-cleavage, diol-formation, and subsequent oxidation of the intermediates. Analysis of rate kinetics exhibited degradation of pyrene to be the first order reaction indicating that an increase in initial concentration of pyrene will not compromise with the ability of studied bacteria towards degradation. Analysis of initial and final concentration of treated media over HPLC confirmed significant pyrene degradation within 15 days. The study concludes that K. flava and R. pyridinivorans can play an active role in remediation of hydrocarbon-contaminated sites.

For details refer to https://doi.org/10.1016/j.eti.2021.101744

BIOGRAPHY

DR. SAURAV KUMAR AMBASTHA

Department of Environmental Engineering

Dr. Saurav Kumar Ambastha has done B.Tech. in the Biotechnology from Dr. MGR University in 2009 followed by it, M.Tech. in the Environmental Engineering from BIT Mesra, Ranchi, in 2011. Currently, he is pursing PhD. in Environmental Engineering from DTU since 2015. He had 10 years of experience in industry, teaching and consultancy.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. K. Ambastha** and A. K. Haritash, "Prevalence and risk analysis of fluoride in groundwater around sandstone mine in Haryana, India", *Rendiconti Lincei. Scienze Fisiche e Naturali*, vol. 32, pp. 577–584, 2021. Impact Factor: 1.627.

Prevalence and risk analysis of fluoride in groundwater around sandstone mine in Haryana, India

Saurav Kumar Ambastha and A. K. Haritash

Abstract: Groundwater contamination by fluoride is a typical problem associated with most of the regions in India. Mining of minerals can accelerate the dissolution of fluoride resulting in the further contamination of groundwater resources. The present study was undertaken to determine the concentration of fluoride in groundwater around the Bakhrija sandstone mine located in Haryana state, India. It was observed that the groundwater in immediate vicinity of the mine had relatively higher level of dissolved fluoride. The risk associated with consumption of fluoride contaminated groundwater was also observed to be higher in villages adjacent to the mines. The geochemical investigation suggested that dissolution of carbonate minerals may have resulted in solubilisation of fluoride in groundwater through the process of ion-exchange. The study concluded that fluoride level may rise in the other nearby regions if the intensity of mining increases. It may result in further spread of fluoride to other aquifers located around Bakhrija mine, if suitable environmental management plan is not developed.

For details refer to https://doi.org/10.1007/s12210-021-00997-z

BIOGRAPHY

MR. SHAILENDRA KUMAR YADAV

Department of Environmental Engineering

Mr. Shailendra Kumar Yadav, is a research scholar in the Department of Environmental Engineering and doing his research on "formation, growth and quantification of ultrafine particles at selected microenvironment in megacity Delhi". He had done research on Diwali air pollution, Odd-even Policy and Covid-19 Lockdown in concern of ambient air quality.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **S. K. Yadav**, S. K. Kompalli, B. R. Gurjar and R. K. Mishra, "Aerosol number concentrations and new particle formation events over a polluted megacity during the COVID-19 lockdown", *Atmospheric Environment*, vol. 259, pp. 118526, 2021. Impact Factor: 4.798.
2. **S. K. Yadav**, R. Sharma, S. Kumar, A. Agarwal, V. Mohan, R. K. Mishra and A. Shukla, "Urban air pollution reduction: evidence from phase-wise analysis of COVID-19 pandemic lockdown", *Arabian Journal of Geosciences*, vol. 14, no. 1413, 2021. Impact Factor: 1.827.

Aerosol number concentrations and new particle formation events over a polluted megacity during the COVID-19 lockdown

Shailendra Kumar Yadav, Sobhan Kumar Kompalli, Bhola Ram Gurjar and Rajeev Kumar Mishra

Abstract: The present study investigates the particle number concentrations and size distributions in the ultrafine and fine-sized regimes over a polluted megacity, New Delhi (28.75° N, 77.12° E), India. The experiments were conducted during the periods (April–May 2020) of strict social and travel restrictions (lockdown) imposed by the Government of India aiming to contain the spread of Coronavirus Disease 19 (COVID-19) pandemic. The different phases of the COVID-19 lockdown witnessed restrictions of varying magnitudes with the significant cessation of anthropogenic sources, viz., industrial, road, railways, and air traffic emissions. Using this unique opportunity, the impact of varying urban emissions on particle number size distributions and new particle formation events were examined. The mean total number concentrations were in the range of ~ (2–3.5) x 10^4 cm^{-3} and depicted a gradual increase (~26%) with progressive unlock of the anthropogenic activities. At the same time,

accumulation particle concentrations were doubled. However, ultrafine particles (UFP) (diameter < 100 nm) dominated (50–88%) the total number concentrations during most of the days and several new particle formation (NPF) events resulting in elevated (2–5 fold) UFP concentrations were observed. Subsequently, the particles grew to larger sizes with rates ~3.31–8.37 nm h^{-1}. The NPF events occurred during the daytime, and during the events, a clear enhancement in the concentrations of [H_2SO_4] proxy (2–3.5 × 10^7 molecules cm^{-3}; 2–3 orders higher than the non-event values) suggesting the role of strong gas-phase photochemistry. Also, some of the NPF events were associated with increased odd oxygen concentrations [$O_x = O_3+NO_2$], indicating the regional nature of the precursors and participation of VOC precursors in nucleation/growth. Interestingly, different classes of NPF events were seen during the strictest lockdown period, whereas more frequent and well-defined NPF events were witnessed when anthropogenic activities were opened up with conditional relaxations. These events demonstrated the competition between source strengths of precursor vapors from anthropogenic activities and primary particles acting as condensation sink restricting NPF. This study highlighted that urban pollution mitigation policies need to consider ultrafine particles emanating from the secondary aerosol formation process from traffic emissions.

For details refer to https://doi.org/10.1016/j.atmosenv.2021.118526

Urban air pollution reduction: evidence from phase-wise analysis of COVID-19 pandemic lockdown

Shailendra Kumar Yadav,Raghav Sharma, Sankalp Kumar, Aviral Agarwal, Vignesh Mohan, Rajeev Kumar Mishra and Ankita Shukla

Abstract: Until 31 May 2020, more than six million confirm COVID-19 cases had been reported worldwide. Lockdown has resulted in significant air quality improvement, especially in urban regions. The lockdown has acted as a natural experiment empowering researchers, policymakers, and governing bodies. The present study focuses on quantifying and analysing the effect of lockdown on India's metropolitan cities, namely New Delhi, Mumbai, Kolkata, Chennai, and Bangalore. The study analyses the phase-wise and diurnal variations in the air quality from 24 March 2020 to 31 May 2020 while focussing on-peak and off-peak duration concentrations. To investigate the reason behind pollutant reduction, correlation of drop percentages in pollutant concentrations with vehicle population, extent of construction activity, and meteorological parameters are analysed. The 24-h drop in PM_{10} and $PM_{2.5}$ showed a high correlation (R^2 = 0.97 and 0.72, respectively) with the city's vehicle population. During peak hours, the inland cities (Delhi and Bangalore), with a more extensive vehicle fleet, recorded a higher drop in PM_{10} and $PM_{2.5}$ concentrations than coastal cities (Mumbai, Chennai, and Kolkata). With respect to 2019 concentration, the maximum decrease in pollutant concentrations averaged across the five study locations was recorded in NO_2 (46%), followed by $PM_{2.5}$ (40%), PM_{10} (37%), and CO (19%). SO_2 and O_3 contrarily recorded an overall increase of 40% and 41%. These results wherein vehicular pollutants recorded the maximum drop indicate that reduced vehicular traffic primarily influenced air quality improvement during the lockdown.

For details refer to https://doi.org/10.1007/s12517-021-07777-x

BIOGRAPHY

MS. VANDANA SHAN

Department of Environmental Engineering

Ms. Vandana Shan is an Assistant Professor in Keshav Mahavidyalaya, Pitampura (Delhi University) in Delhi. Prior to this she worked as a contractual Faculty in Delhi Technological University in Delhi. She has 4 years of teaching experience and has around 6 years of research experience. Her research expertise is water quality monitoring. She has around 14 publications in the form of research papers, conference proceedings and 3 book chapter.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **V. Shan**, S. K. Singh and A. K. Haritash, "Evaluation of water quality and potential metal contamination in ecologically important Bhindawas bird sanctuary, India", *Applied Water Science*, vol. 11, no. 8, 2021. Impact Factor: 3.874.

Evaluation of water quality and potential metal contamination in ecologically important Bhindawas bird sanctuary, India

Vandana Shan, S. K. Singh and A. K. Haritash

Abstract: Considering the environmental, agricultural, and ecological significance of Bhindawas wetland, the present study is the first comprehensive investigation to assess the water quality, determine the suitability of water for aquatic life in the wetland; and its suitability for irrigation in areas around the wetland. Twenty samples of water from Bhindawas wetland were analyzed and spatial variations of dissolved oxygen (DO), dissolved phosphate, nitrate, and biological oxygen demand (BOD_5) were observed. The concentration of DO was higher in areas with shallow depth and rich growth of submerged vegetation compared to deeper areas with no vegetation. Spatial variations of phosphate, nitrate, and heavy metals correlated with nesting zone of birds, runoff from agricultural fields, and wastewater from adjoining villages, respectively. Values of heavy metal pollution index (HPI), heavy metal evaluation index (HEI), and degree of contamination (C_d) in water confirmed high level of metal contamination of the medium. Based on the water quality index (WQI), the water was unsuitable for aquatic life and use in agricultural utilization. It can be concluded that water quality of Bhindawas wetland was adversely affected by heavy metals, which is a cause of concern since this wetland is a temporary resort of migratory birds. Immediate intervention is required to improve the water quality, especially scrutiny and inspection of the added wastewater from surrounding villages, and runoff from adjoining agricultural fields.

For details refer to https://doi.org/10.1007/s13201-020-01334-9

BIOGRAPHY

PROF. NAND KUMAR

Department of Humanities

Dr. Nand Kumar is a Professor of Economics in the department of Humanities at Delhi Technological University, Delhi and is presently heading the Department. Prof. Kumar has done his M.A. in Economics from Jawahar Lal Nehru University, Delhi. He has done his PhD from Delhi Technological University, Delhi. He has published a number of seminal research papers in the area of Economics in different international journals of repute. Currently there are 10 research scholars registered for PhD under his supervision. Prior to joining DTU, Delhi, Prof. Kumar has served as a probation officer in the department of Home Jail in the province of Bihar.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. A. Shita, **N. Kumar** and S. Singh, "Technology, poverty and income distribution nexus: The case of fertilizer adoption in Ethiopia", *African Development Review - Revue Africaine De Developpement*, vol. 33, no. 4, pp. 742-755, 2021. Impact Factor: 1.878.

Technology, poverty and income distribution nexus: The case of fertilizer adoption in Ethiopia

Aynalem Shita, **Nand Kumar*** and Seema Singh

Abstract: Adoption of agricultural technology is believed to be the pertinent strategy for poverty alleviation through productivity increment. However, it may simultaneously affect the distribution of income among rural households. This paper, therefore, investigated the poverty and income distribution effect of fertilizer adoption in Northern Western Ethiopia based on the propensity score matching technique and dose–response function. The study indicates that the adoption of fertilizer significantly increases household per adult consumption expenditure by US$53.98–57.89 and reduce incidence of poverty by 17.4%–18.2%. Even though adoption improves the income of households by about US$292.92–374.85, it simultaneously worsens income inequality as measured by both the Lorenz curve and Gini coefficient. Moreover, estimates of the dose–response functions indicate that annual income and consumption expenditure of farm households increase with the intensity of fertilizer adoption. On the other hand, the incidence of poverty was found to be reduced when intensity of fertilizer utilization increases. The results imply that technology adoption worsens income distribution by increasing the income of large and medium farmers more proportionately compared to small farmers. Hence, further efforts should be exerted to achieve balanced adoption of fertilizer for the betterment of the welfare of the society.

For details refer to https://doi.org/10.1111/1467-8268.12600

**Corresponding Author*

BIOGRAPHY

DR. ASHISH KUMAR

Department of Information Technology

Dr. Ashish Kumar has obtained his B.E. degree in Information Technology from SATI, Vidisha. In 2013, He received his M-Tech degree and from the Department of Information Technology, Delhi Technological University, Delhi. In 2020, He received his Ph.D degree and from the Department of Information Technology, Delhi Technological University, Delhi. In his Ph.D. dissertation work, the first two problems are identified to achieve authentication and confidentiality in communication. The third problem is formulated to secure information in IoT networks. Based on these problems, real-time application for the examination system is proposed to preserve integrity in academic institutes. He has participated in several FDPs, Training programs, workshops, and published research papers in conferences and journals. He has also qualified GATE (2011), UGC-NET (2017). Currently, Dr. Ashish Kumar is an assistant professor in Vivekananda Institute of professional studies-Technical Campus, Delhi. His area of Research includes Information and network security, steganography, Multimedia systems, Internet of things, Dynamic systems and chaotic systems, Image processing, Development of real-time applications for education.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Kumar** and N. S. Raghava, "An efficient image encryption scheme using elementary cellular automata with novel permutation box", *Multimedia Tools and Applications*, vol. 80, pp. 21727–21750, 2021. Impact Factor: 2.757.

An efficient image encryption scheme using elementary cellular automata with novel permutation box

Ashish Kumar and N. S. Raghava

Abstract: Digital image communication over public networks requires a high level of security to protect picture elements that represent information. Security is an important and challenging issue that can be solved using cryptography techniques. Generally, image encryption techniques are based on multiple rounds and iterations. In this paper, a secured lightweight cryptosystem is designed based on lookup table operations that reduce computational overhead, resource requirement and power consumption compared to traditional security mechanisms. In this context, one-dimensional elementary cellular automaton has been combined with Henon chaotic map to design a cryptosystem, which can produce unprecedented results in cryptography. Initially, state attractors for rule space are investigated and analyzed in Wolfram's cellular automata to extract the properties and functional abilities to perform cryptographic operations. A novel algorithm of keyed transposition cipher is applied to digital image in P-Box module to produce shuffled image. Then, the extracted properties of ECA are preserved in a tabular form and further used in the diffusion process. Based on the simulation and comparison with other existing mechanisms, it is evident that the proposed algorithm is promising and obstructive to all kinds of statistical attacks, and it yields security primacy in various areas of cryptography. Encryption/Decryption is based on indexed based lookup tables principal using ECA and can be easily implemented using logic gates. The proposed algorithm provides confidentiality and can be adopted in IoT networks that require lightweight cryptography modules. Experimental results of color and gray images demonstrate flourishing results in the real-time environment of cryptography.

For details refer to https://doi.org/10.1007/s11042-021-10750-1

BIOGRAPHY

DR. BINDU VERMA

Department of Information Technology

Dr. Bindu Verma is working as an Assistant Professor in the Department of Information Technology at Delhi Technological University (Formerly known as Delhi College of Engineering). She earned the doctorate degree in Automated Intent Recognition using Hand Gesture and Face Expression Analysis from School of Computer and Systems Sciences, Jawaharlal Nehru University, New Delhi. She is passionate to work in the area of computer vision, machine learning, human-computer interaction, intelligent systems, affective state monitoring. She has made substantial contributions to the field of human-computer interaction, emotion recognition, and intent recognition with many research articles published in international conferences and journals. She is a reviewer of many international journals such as IET intelligent transport system, IEEE Transactions on Circuits and Systems for Video Technology, intelligent transportation system conferences, etc.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **B. Verma** and A. Choudhary, "Affective state recognition from hand gestures and facial expressions using Grassmann manifolds", *Multimedia Tools and Applications*, vol. 80, pp. 14019–14040, 2021. Impact Factor: 2.757.

Affective state recognition from hand gestures and facial expressions using Grassmann manifolds

Bindu Verma and Ayesha Choudhary

Abstract: The emotional state of a person is important to understand their affective state. Affective states are an important aspect of our being "human". Therefore, for man-machine interaction to be natural and for machines to understand people, it is becoming necessary to understand a person's emotional state. Non-verbal behavioral cues such as facial expression and hand gestures provide a firm basis for understanding the affective state of a person. In this paper, we proposed a novel, real-time framework that focuses on extracting the dynamic information from a videos for multiple modalities to recognize a person's affective state. In the first step, we detect the face and hands of the person in the video and create the motion history images (MHI) of both the face and gesturing hands to encode the temporal dynamics of both these modalities. In the second step, features are extracted for both face and hand MHIs using deep residual network ResNet-101 and concatenated into one feature vector for recognition. We use these integrated features to create subspaces that lie on a Grassmann manifold. Then, we use Geodesic Flow Kernel (GFK) of this Grassmann manifold for domain adaptation and apply this GFK to adapt GGDA to robustly recognize a person's affective state from multiple modalities. An accuracy of 93.4% on FABO (Gunes and Piccardi 19) dataset and 92.7% on our own dataset shows that integrated face and hand modalities perform better than state-of-the-art methods for affective state recognition.

For details refer to https://doi.org/10.1007/s11042-020-10341-6

BIOGRAPHY

MS. CHAHAT RAJ

Department of Information Technology

Ms. Chahat Raj received her M.Tech degree in Information Systems from Delhi Technological University (DTU), India, in 2021. She is currently a visiting scholar at the University of Technology Sydney (UTS), Australia. She completed her B.Tech degree in Computer Science and Engineering at Indira Gandhi Delhi Technical University for Women (IGDTUW), India, in 2019. Her research interests lie at the intersection of Artificial Intelligence and Social Computing spanning Deep Learning, Social Media Analysis, Online Network Dynamics, and Computational Social Science.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **C. Raj** and P. Meel, "ConvNet frameworks for multi-modal fake news detection", *Applied Intelligence*, vol. 51, pp. 8132–8148, 2021. Impact Factor: 5.086.

ConvNet frameworks for multi-modal fake news detection

Chahat Raj and Priyanka Meel

Abstract: An upsurge of false information revolves around the internet. Social media and websites are flooded with unverified news posts. These posts are comprised of text, images, audio, and videos. There is a requirement for a system that detects fake content in multiple data modalities. We have seen a considerable amount of research on classification techniques for textual fake news detection, while frameworks dedicated to visual fake news detection are very few. We explored the state-of-the-art methods using deep networks such as CNNs and RNNs for multi-modal online information credibility analysis. They show rapid improvement in classification tasks without requiring pre-processing. To aid the ongoing research over fake news detection using CNN models, we build textual and visual modules to analyze their performances over multi-modal datasets. We exploit latent features present inside text and images using layers of convolutions. We see how well these convolutional neural networks perform classification when provided with only latent features and analyze what type of images are needed to be fed to perform efficient fake news detection. We propose a multi-modal Coupled ConvNet architecture that fuses both the data modules and efficiently classifies online news depending on its textual and visual content. We thence offer a comparative analysis of the results of all the models utilized over three datasets. The proposed architecture outperforms various state-of-the-art methods for fake news detection with considerably high accuracies.

For details refer to https://doi.org/10.1007/s10489-021-02345-y

BIOGRAPHY

MS. DEEPIKA VARSHNEY

Department of Information Technology

Ms. Deepika Varshney is a Assistant Professor in the Department of Computer Science, Bharati Vidyapeeth College of Engineering, India. She has done M.Tech from Indira Gandhi Delhi Technical University for Womens, New Delhi India 2017 and pursuing Ph.D from Delhi Technological University. Her research interest includes Online Social Media Privacy and Security, Machine Learning and Data Science. She has published 4 SCI Indexed papers in a high reputed journal and 3 International Conferences. She has been awarded with a commendable research award in the year 2020 by the Delhi Technological University.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. **D. Varshney** and D. K. Vishwakarma, "A review on rumour prediction and veracity assessment in online social network", *Expert Systems with Applications*, vol. 168, pp. 114208, 2021. Impact Factor: 6.954.
2. **D. Varshney** and D. K. Vishwakarma, "A unified approach for detection of Clickbait videos on YouTube using cognitive evidences", *Applied Intelligence*, vol. 51, pp. 4214–4235, 2021. Impact Factor: 5.086.
3. **D. Varshney** and D. K. Vishwakarma, "Hoax news-inspector: a real-time prediction of fake news using content resemblance over web search results for authenticating the credibility of news articles", *Journal of Ambient Intelligence and Humanized Computing*, vol. 12, pp. 8961–8974, 2021. Impact Factor: 7.104.

A review on rumour prediction and veracity assessment in online social network

Deepika Varshney and Dinesh Kumar Vishwakarma

Abstract: In the present era, the social network is used as an important medium for sharing thoughts and opinions of an individual. The main reason behind this is, it provides a fast-spreading of information among the public easily, requiring a very low cost of access. This leads to having online social media as one of the stepping stones to encourage false content and influencing public opinion and its decision. Rumour is one of the prominent forms of misleading information on social media and should be detected as early as possible for avoiding their significant effects. Due to these reasons, the researchers have put their keen interest in developing an effective rumour detection framework in the last years. In this paper, we mainly focused on six main aspects. Firstly, we discuss rumours from a definition perspective that have been considered in the state-of-the-art and describe the generalized model of rumour detection. Secondly, we discuss how to get access to data from different social media platforms, and presents various state-of-the-art methods to gather these data, as well as publicly available datasets. Third, we describe a different set of features that have been considered in rumour detection approaches. Fourth, we provide deep insight into the various methods used to employ rumour detection and its veracity

assessment on multimedia data (Text and Images) with some practical implications. Whereas in the fifth aspect, the constraints of the study have been discussed. Finally, we concluded with useful findings and suggested future directions.

For details refer to https://doi.org/10.1016/j.eswa.2020.114208

A unified approach for detection of Clickbait videos on YouTube using cognitive evidences

Deepika Varshney and Dinesh Kumar Vishwakarma

Abstract: Clickbait is one of the form of false content, purposely designed to attract the user's attention and make them curious to follow the link and read, view, or listen to the attached content. The teaser aim behind this is to exploit the curiosity gap by giving information within the short statement. Still, the given statement is not sufficient enough to satisfy the curiosity without clicking through the linked content and lure the user to get into the respective page via playing with human psychology and degrades the user experience. To counter this problem, we develop a Clickbait Video Detector (CVD) scheme. The scheme leverages to learn three sets of latent features based on User Profiling, Video-Content, and Human Consensus, these are further used to retrieve cognitive evidence for the detection of clickbait videos on YouTube. The first step is to extract audio from the videos, which is further transformed to textual data, and later on, it is utilized for the extraction of video content-based features. Secondly, the comments are analyzed, and features are extracted based on human responses/ reactions over the posted content. Lastly, user profile based features are extracted. Finally, all these features are fed into the classifier. The proposed method is tested on the publicly available fake video corpus [FVC], [FVC-2018] dataset, and a self-generated misleading video dataset [MVD]. The achieved result is compared with other state-of-the-art methods and demonstrates superior performance.

For details refer to https://doi.org/10.1007/s10489-020-02057-9

Hoax news-inspector: a real-time prediction of fake news using content resemblance over web search results for authenticating the credibility of news articles

Deepika Varshney and Dinesh Kumar Vishwakarma

Abstract: Nowadays social media is one of the important medium of sharing thoughts and opinions of the individual due to its easy access and also it provides an opportunity to the malicious user to post deliberately fabricated false content to influence people for creating controversies, playing with public emotions, etc. The spread of contaminated information such as Rumours, Hoax, Accidental misinformation, etc. over the web is becoming an emergency situation that can have a very harmful impact on society and individuals. In this paper, we have developed an automated system "Hoax-News Inspector" for the detection of fake news that propagates through the web and social media in the form of text. To distinguish fake and real reports on an early basis, we identified prominent features by exploring two sets of attributes that lead to information spread: Article/ post-content-based features, Sentiment based features and the mixture of both called as Hybrid features. The proposed algorithm is trained and tested on the self-generated dataset as well as one of the popular existing datasets *Liar*. It has been found that the proposed algorithm gives the best results using the Random Forest classifier with an accuracy of 95% by considering all sets of features. Detecting and verifying news have many practical applications for business markets, news consumers, and time-sensitive services, which generally help to minimize the spread of false information. Our proposed system Hoax News-Inspector can automatically collect fabricated news data and classify it into binary classes Fake or Real, which later benefits further research for predicting and understanding Fake news.

For details refer to https://doi.org/10.1007/s12652-020-02698-1

BIOGRAPHY

PROF. DINESH K. VISHWAKARMA

Department of Information Technology

Prof. Dinesh Kumar Vishwakarma is currently a Professor with the Department of Information Technology, Delhi Technological University. His current research interests include computer vision, deep learning, sentiment analysis, fake news detection, malicious manipulation of digital data, crowd analysis, and human action and activity recognition. He received the research excellence awards from the Delhi Technological University in 2017, 2018, 2019, 2020, and 2021, and these awards include Premium Research Award and Commendable Research Award. He is a reviewer of various journals/transactions of the ACM IEEE, Elsevier, and Springer. He is a senior member of IEEE, an ACM member, and a lifetime member of ISTE. He was awarded the Best Research Paper Award in 2020 by SRM University, Chennai. Recently, he has been featured in the list of top 2% scientists of the world.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01
Commendable Research Award	08

1. K. Chaturvedi, **D. K. Vishwakarma** and N. Singh, "COVID-19 and its impact on education, social life and mental health of students: A survey", *Children and Youth Services Review*, vol. 121, pp. 105866, 2021. Impact Factor: 2.393.
2. P. Meel and **D. K. Vishwakarma**, "HAN, image captioning, and forensics ensemble multimodal fake news detection", *Information Sciences*, vol. 567, pp. 23-41, 2021. Impact Factor: 6.795.
3. D. Varshney and **D. K. Vishwakarma**, "Hoax news-inspector: a real-time prediction of fake news using content resemblance over web search results for authenticating the credibility of news articles", *Journal of Ambient Intelligence and Humanized Computing*, vol. 12, pp. 8961–8974, 2021. Impact Factor: 7.104.
4. C. Dhiman, **D. K. Vishwakarma** and P. Agarwal, "Part-wise Spatio-temporal Attention Driven CNN-based 3D Human Action Recognition", ACM Transactions on Multimedia Computing, Communications, and Applications, vol. 17, no. 3, pp. 1-24, 2021. Impact Factor: 3.144.
5. T. Singh and **D. K. Vishwakarma**, "A deep multimodal network based on bottleneck layer features fusion for action recognition", *Multimedia Tools and Applications*, vol. 80, pp. 33505–33525, 2021. Impact Factor: 2.757.
6. T. Singh and **D. K. Vishwakarma**, "A deeply coupled ConvNet for human activity recognition using dynamic and RGB images", *Neural Computing and Applications*, vol. 33, pp. 469–485, 2021. Impact Factor: 5.606.
7. D. Varshney and **D. K. Vishwakarma**, "A review on rumour prediction and veracity assessment in online social network", *Expert Systems with Applications*, vol. 168, pp. 114208, 2021. Impact Factor: 6.954.
8. P. Meel and **D. K. Vishwakarma**, "A temporal ensembling based semi-supervised ConvNet for the detection of fake news articles", *Expert Systems with Applications*, vol. 177, pp. 115002, 2021. Impact Factor: 6.954.
9. D. Varshney and **D. K. Vishwakarma**, "A unified approach for detection of Clickbait videos on YouTube using cognitive evidences", *Applied Intelligence*, vol. 51, pp. 4214–4235, 2021. Impact Factor: 5.086.

COVID-19 and its impact on education, social life and mental health of students: A survey

Kunal Chaturvedi, **Dinesh Kumar Vishwakarma*** and Nidhi Singh

Abstract: The outbreak of COVID-19 affected the lives of all sections of society as people were asked to self-quarantine in their homes to prevent the spread of the virus. The lockdown had serious implications on mental health, resulting in psychological problems including frustration, stress, and depression. In order to explore the impacts of this pandemic on the lives of students, we conducted a survey of a total of 1182 individuals of different age groups from various educational institutes in Delhi - National Capital Region (NCR), India. The article identified the following as the impact of COVID-19 on the students of different age groups: time spent on online classes and self-study, medium used for learning, sleeping habits, daily fitness routine, and the subsequent effects on weight, social life, and mental health. Moreover, our research found that in order to deal with stress and anxiety, participants adopted different coping mechanisms and also sought help from their near ones. Further, the research examined the student's engagement on social media platforms among different age categories. This study suggests that public authorities should take all the necessary measures to enhance the learning experience by mitigating the negative impacts caused due to the COVID-19 outbreak.

For details refer to https://doi.org/10.1016/j.childyouth.2020.105866

HAN, image captioning, and forensics ensemble multimodal fake news detection

Priyanka Meel and **Dinesh Kumar Vishwakarma***

Abstract: Nowadays, news publication, propagation, and consumption have been diverted to online social media networks and web portals, which has given rise to falsified and fabricated news articles containing both textual and visual information formats. Most of the research to date is centered on textual fake news detection using machine learning approaches, where multimedia data forgery is hardly addressed. Hence, a multimodal fake news detection framework is proposed, which unitedly exploits hidden pattern extraction capabilities from text using Hierarchical Attention Network (HAN) and visual image features using image captioning and forensic analysis. We specifically focused on four different techniques of multimodal data analysis, such as HAN deep model for text, generating image caption and headline matching with news text (CHM), Noise Variance Inconsistency (NVI), and Error Level Analysis (ELA). All these algorithms have been tested, first independently and then collectively using the max voting Ensemble method on three different datasets. The experimental results and comparisons with contemporary techniques put forward the fact that the proposed method outperforms state-of-the-art with 95.90% highest accuracy on the Fake News Samples dataset. The achieved results also prove that the combined model beats individual methods' capabilities in classifying fake news accurately.

For details refer to https://doi.org/10.1016/j.ins.2021.03.037

Hoax news-inspector: a real-time prediction of fake news using content resemblance over web search results for authenticating the credibility of news articles

Deepika Varshney and **Dinesh Kumar Vishwakarma***

Abstract: Nowadays social media is one of the important medium of sharing thoughts and opinions of the individual due to its easy access and also it provides an opportunity to the malicious user to post deliberately fabricated false content to influence people for creating controversies, playing with public emotions, etc. The spread of contaminated information such as Rumours, Hoax, Accidental misinformation, etc. over the web is becoming an emergency situation that can have a very harmful impact on society and individuals. In this paper,

**Corresponding Author*

we have developed an automated system "Hoax-News Inspector" for the detection of fake news that propagates through the web and social media in the form of text. To distinguish fake and real reports on an early basis, we identified prominent features by exploring two sets of attributes that lead to information spread: Article/ post-content-based features, Sentiment based features and the mixture of both called as Hybrid features. The proposed algorithm is trained and tested on the self-generated dataset as well as one of the popular existing datasets *Liar*. It has been found that the proposed algorithm gives the best results using the Random Forest classifier with an accuracy of 95% by considering all sets of features. Detecting and verifying news have many practical applications for business markets, news consumers, and time-sensitive services, which generally help to minimize the spread of false information. Our proposed system Hoax News-Inspector can automatically collect fabricated news data and classify it into binary classes Fake or Real, which later benefits further research for predicting and understanding Fake news.

For details refer to https://doi.org/10.1007/s12652-020-02698-1

Part-wise Spatio-temporal Attention Driven CNN-based 3D Human Action Recognition

Chhavi Dhiman, **Dinesh Kumar Vishwakarma*** and Paras Agarwal

Abstract: Recently, human activity recognition using skeleton data is increasing due to its ease of acquisition and finer shape details. Still, it suffers from a wide range of intra-class variation, inter-class similarity among the actions and view variation due to which extraction of discriminative spatial and temporal features is still a challenging problem. In this regard, we present a novel Residual Inception Attention Driven CNN (RIAC-Net) Network, which visualizes the dynamics of the action in a part-wise manner. The complete skeletonis partitioned into five key parts: Head to Spine, Left Leg, Right Leg, Left Hand, Right Hand. For each part, a Compact Action Skeleton Sequence (CASS) is defined. Part-wise skeleton-based motion dynamics highlights discriminative local features of the skeleton that helps to overcome the challenges of inter-class similarity and intra-class variation with improved recognition performance. The RIAC-Net architecture is inspired by the concept of inception-residual representation that unifies the Attention Driven Residues (ADR) with inception-based Spatio-Temporal Convolution Features (STCF) to learn efficient salient action features. An ablation study is also carried out to analyze the effect of ADR over simple residue-based action representation. The robustness of the proposed framework is evaluated by performing an extensive experiment on four challenging datasets: UT Kinect Action 3D, Florence 3D action, MSR Daily Action3D, and NTU RGB-D datasets, which consistently demonstrate the superiority of the proposed method over other state-of-the-art methods.

For details refer to https://doi.org/10.1145/3441628

A deep multimodal network based on bottleneck layer features fusion for action recognition+

Tej Singh and **Dinesh Kumar Vishwakarma***

Abstract: Human Activity Recognition (HAR) in videos using convolution neural network become the preferred choice for researcher due to the tremendous success of deep learning models for visual recognition applications. After the invention of the low-cost depth sensor, multiple modalities based activity recognition systems were successfully developed in the past decade. Although it is always challenging to recognize the complex human activities in videos. In this work, we proposed a deep bottleneck multimodal feature fusion (D-BMFF) framework that fused three different modalities of RGB, RGB-D(depth) and 3D coordinates information for activity classification. It helps to better recognize and make full use of information available simultaneously from a depth sensor. During the training process RGB and depth, frames are fed at regular intervals for an activity video while 3D coordinates are first converted into single RGB skeleton motion history image (RGB-SklMHI). We have extracted the features from multimodal data inputs using the latest deep pre-trained network architecture. The

**Corresponding Author*
+Eligible for Certificate only

multimodal feature obtained from bottleneck layers before the top layer is fused by using multiset discriminant correlation analysis (M-DCA), which allows for robust visual action modeling. Finally, using a linear multiclass support vector machine (SVM) method, the fused features are categorized. The proposed approach is evaluated over four standard RGB-D datasets: UT-Kinect, CAD-60, Florence 3D and SBU Interaction. Our framework produces outstanding results and outperformed the state-of-the-art methods.

For details refer to https://doi.org/10.1007/s11042-021-11415-9

A deeply coupled ConvNet for human activity recognition using dynamic and RGB images+

Tej Singh and **Dinesh Kumar Vishwakarma***

Abstract: This work is motivated by the tremendous achievement of deep learning models for computer vision tasks, particularly for human activity recognition. It is gaining more attention due to the numerous applications in real life, for example smart surveillance system, human–computer interaction, sports action analysis, elderly healthcare, etc. Recent days, the acquisition and interface of multimodal data are straightforward due to the invention of low-cost depth devices. Several approaches have been developed based on RGB-D (depth) evidence at the cost of additional equipment's setup and high complexity. Contrarily, the methods that utilize RGB frames provide inferior performance due to the absence of depth evidence and these approaches require to less hardware, simple and easy to generalize using only color cameras. In this work, a deeply coupled ConvNet for human activity recognition proposed that utilizes the RGB frames at the top layer with bi-directional long short-term memory (Bi-LSTM). At the bottom layer, the CNN model is trained with a single dynamic motion image. For the RGB frames, the CNN-Bi-LSTM model is trained end-to-end learning to refine the feature of the pre-trained CNN, while dynamic images stream is fine-tuned with the top layers of the pre-trained model to extract temporal information in videos. The features obtained from both the data streams are fused at decision level after the softmax layer with different late fusion techniques and achieved high accuracy with max fusion. The performance accuracy of the model is assessed using four standard single as well as multiple person activities RGB-D (depth) datasets. The highest classification accuracies achieved on human action datasets are compared with similar state of the art and found significantly higher margin such as 2% on SBU Interaction, 4% on MIVIA Action, 1% on MSR Action Pair, and 4% on MSR Daily Activity.

For details refer to https://doi.org/10.1007/s00521-020-05018-y

A review on rumour prediction and veracity assessment in online social network+

Deepika Varshney and **Dinesh Kumar Vishwakarma***

Abstract: In the present era, the social network is used as an important medium for sharing thoughts and opinions of an individual. The main reason behind this is, it provides a fast-spreading of information among the public easily, requiring a very low cost of access. This leads to having online social media as one of the stepping stones to encourage false content and influencing public opinion and its decision. Rumour is one of the prominent forms of misleading information on social media and should be detected as early as possible for avoiding their significant effects. Due to these reasons, the researchers have put their keen interest in developing an effective rumour detection framework in the last years. In this paper, we mainly focused on six main aspects. Firstly, we discuss rumours from a definition perspective that have been considered in the state-of-the-art and describe the generalized model of rumour detection. Secondly, we discuss how to get access to data from different social media platforms, and presents various state-of-the-art methods to gather these data, as well as publicly available datasets. Third, we describe a different set of features that have been considered in rumour detection approaches. Fourth, we provide deep insight into the various methods used to employ rumour detection and its veracity

*Corresponding Author
+Eligible for Certificate only

assessment on multimedia data (Text and Images) with some practical implications. Whereas in the fifth aspect, the constraints of the study have been discussed. Finally, we concluded with useful findings and suggested future directions.

For details refer to https://doi.org/10.1016/j.eswa.2020.114208

A temporal ensembling based semi-supervised ConvNet for the detection of fake news articles+

Priyanka Meel and **Dinesh Kumar Vishwakarma***

Abstract: Internet-based information circulation has given rise to the proliferation of fake and misleading contents, which has extreme hostile effects on individuals and humanity. Supervised artificial intelligence techniques require a huge amount of annotated data which is a time-consuming, expensive and laborious task as the speed and volume of social media news generation is very high. To counter this situation, we propose an innovative Convolutional Neural Network semi-supervised framework built on the self-ensembling concept to take leverage of the linguistic and stylometric information of annotated news articles, at the same time explore the hidden patterns in unlabelled data as well. Self-ensembling provides consensus predictions of the labels of unannotated data using previous epochs outputs of network-in-training. These accumulated ensemble predictions are supposed to be a better predictor for the unknown labels than the output of most recent training epoch, thus suitable to be used as a proxy for the labels of unannotated data. The uniqueness of the framework is that it ensembles all the outputs of previous training epochs of the neural network to use them as an unsupervised target for comparing them with current output prediction of unlabelled articles. The framework is validated with extensive experiments on three datasets for different proportions of labelled and unlabelled data. It can achieve highest 97.45% fake news classification accuracy using 50% labelled articles on Fake News Data Kaggle dataset. Contemporary baseline methods are placed in juxtaposition with the proposed architecture which demonstrates the robustness of our work compared to the state-of-the-art.

For details refer to https://doi.org/10.1016/j.eswa.2021.115002

A unified approach for detection of Clickbait videos on YouTube using cognitive evidences+

Deepika Varshney and **Dinesh Kumar Vishwakarma***

Abstract: Clickbait is one of the form of false content, purposely designed to attract the user's attention and make them curious to follow the link and read, view, or listen to the attached content. The teaser aim behind this is to exploit the curiosity gap by giving information within the short statement. Still, the given statement is not sufficient enough to satisfy the curiosity without clicking through the linked content and lure the user to get into the respective page via playing with human psychology and degrades the user experience. To counter this problem, we develop a Clickbait Video Detector (CVD) scheme. The scheme leverages to learn three sets of latent features based on User Profiling, Video-Content, and Human Consensus, these are further used to retrieve cognitive evidence for the detection of clickbait videos on YouTube. The first step is to extract audio from the videos, which is further transformed to textual data, and later on, it is utilized for the extraction of video content-based features. Secondly, the comments are analyzed, and features are extracted based on human responses/reactions over the posted content. Lastly, user profile based features are extracted. Finally, all these features are fed into the classifier. The proposed method is tested on the publicly available fake video corpus [FVC], [FVC-2018] dataset, and a self-generated misleading video dataset [MVD]. The achieved result is compared with other state-of-the-art methods and demonstrates superior performance.

For details refer to https://doi.org/10.1007/s10489-020-02057-9

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

DR. ISHA SINGH

Department of Information Technology

Dr. Isha Singh received the PhD degree from Delhi technological University in December 2020. Received the M.Tech. degree from Delhi Technological University in 2012. She has completed her B.Tech. degree in 2009 from UPTU. Her research area include image processing and soft computing.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **I. Singh** and O. P. Verma, "Impulse noise removal in color image sequences using fuzzy logic", *Multimedia Tools and Applications*, vol. 80, pp. 18279–18300, 2021. Impact Factor: 2.757.

Impulse noise removal in color image sequences using fuzzy logic

Isha Singh and Om Prakash Verma

Abstract: This paper presents a two-step fuzzy filter to remove impulse noise from a color image sequence in RGB color space. The primary filter recognizes the pixels corrupted by impulse noise. It also computes the extent of noise and afterward rectifies them. The output of the first filter acts as an input to the secondary filter and further refines the outcome to give the final output. Excellent alignment is seen between noise removal and structure conservation of an image due to the classifying nature of the algorithm. To minimize blurring, noisy pixels are exclusively rectified and noise-free pixels remain intact. The proposed filter is a 3-D Spatio-temporal filter that considers spatial, temporal as well as color information. A pixel of one color component is compared to its neighboring pixels within the same frame and with the corresponding pixels in neighboring frames. It is likewise compared with the pixels of the other two color components. Peak Signal to Noise Ratio (*PSNR*) and structural similarity index (*SSIM*), Miss Detection (*MD*), and False Alarm (*FA*) rates are utilized as a performance metric. The experimental result of several color image sequences demonstrates the efficacy of the proposed fuzzy filter both qualitatively and quantitatively.

For details refer to https://doi.org/10.1007/s11042-021-10643-3

BIOGRAPHY

PROF. KAPIL SHARMA

Department of Information Technology

Prof. Kapil Sharma is working as a Professor and the Head of Department of Information Technology, Delhi Technological University, Delhi. He has completed Ph.D. Degree in Computer Science from M.D. University, India. He has obtained his B.E. and M.Tech. degree in Computer Science from M.D. University and IASE, India, respectively. His research interests include system design, pattern recognition, computer vision and soft computing. He has published more than 100 research papers in referred journals.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	02
Commendable Research Award	03

1. A. K. Tripathi, **K. Sharma**, M. Bala, A. Kumar, V. G. Menon and A. K. Bashir, "A Parallel Military-Dog-Based Algorithm for Clustering Big Data in Cognitive Industrial Internet of Things", *IEEE Transactions on Industrial Informatics*, vol. 17, no. 3, pp. 2134-2142, 2021. Impact Factor: 10.215.
2. K. Gupta, G. S. Walia and **K. Sharma**, "Novel approach for multimodal feature fusion to generate cancelable biometric", *The Visual Computer*, vol. 37, pp. 1401–1413, 2021. Impact Factor: 2.601.
3. S. Sharda, **K. Sharma** and M. Singh, "A real-time automated scheduling algorithm with PV integration for smart home prosumers", *Journal of Building Engineering*, vol. 44, pp. 102828, 2021. Impact Factor: 5.318.
4. A. Kumar, **K. Sharma** and A. Sharma, "Genetically optimized Fuzzy C-means data clustering of IoMT-based biomarkers for fast affective state recognition in intelligent edge analytics", *Applied Soft Computing*, vol. 109, pp. 107525, 2021. Impact Factor: 6.725.
5. S. Sharda, M. Singh and **K. Sharma**, "RSAM: Robust Self-Attention Based Multi-Horizon Model for Solar Irradiance Forecasting", *IEEE Transactions on Sustainable Energy*, vol. 12, no. 2, pp. 1394-1405, 2021. Impact Factor: 7.917.

A Parallel Military-Dog-Based Algorithm for Clustering Big Data in Cognitive Industrial Internet of Things

Ashish Kumar Tripathi, **Kapil Sharma***, Manju Bala, Akshi Kumar, Varun G. Menon and Ali Kashif Bashir

Abstract: With the advancement of wireless communication, Internet of Things (IoT), and big data, high performance data analytic tools and algorithms are required. Data clustering, a promising analytic technique is widely used to solve the IoT and big-data-based problems, since it does not require labeled datasets. Recently, metaheuristic algorithms have been efficiently used to solve various clustering problems. However, to handle big datasets produced from IoT devices, these algorithm fail to respond within the desired time due to high computation cost. This article presents a new metaheuristic-based clustering method to solve the big data problems by leveraging the strength of MapReduce. The proposed methods leverages the searching potential of military dog squad to find the optimal centroids and MapReduce architecture to handle the big datasets. The optimization efficacy the proposed method is validated against 17 benchmark functions, and the results are compared with five other recent algorithms, namely, bat, particle swarm optimization, artificial bee colony, multiverse optimization, and whale optimization algorithm. Furthermore, a parallel version of the proposed method is introduced using MapReduce [MapReduce-based MDBO (MR-MDBO)] for clustering the big datasets produced from industrial IoT. Moreover, the performance of MR-MDBO is studied on two benchmark UCI datasets and three real IoT-based datasets produced from industry. The F-measure and computation time of the MR-MDBO is compared with the six other state-of-the-art methods. The experimental results witness that the proposed MR-MDBO-based clustering outperforms the other considered algorithms in terms of clustering accuracy and computation times.

For details refer to https://doi.org/10.1109/TII.2020.2995680

Novel approach for multimodal feature fusion to generate cancelable biometric

Keshav Gupta, Gurjit Singh Walia and **Kapil Sharma***

Abstract: Biometric systems provide various benefits over traditional pin-based authentication systems. However, the issue of data privacy and theft is of great concern. To resolve these issues, a novel cancelable multimodal biometric system is proposed that combines multiple traits by means of a projection-based approach. The proposed approach generates a cancelable biometric feature that is used to obtain revocable and noninvertible templates. Cancelable features are generated by projecting the feature points onto a random plane obtained using a user-specific key. The point of projection is then transformed into cylindrical coordinates and a combined cancelable feature is obtained. Extensive experiments are performed over 3 chimeric multimodal databases and results reveal high performance. The average DI and EER achieved by the proposed method are 16.63 and 0.004, respectively. Also, the proposed method is successfully analyzed for privacy concerns, namely revocability, non-invertibility, and unlinkability. Moreover, the proposed system demonstrated tolerance against various security attacks like brute force attacks, attacks via record multiplicity, and substitution attacks.

For details refer to https://doi.org/10.1007/s00371-020-01873-x

A real-time automated scheduling algorithm with PV integration for smart home prosumers

Swati Sharda, **Kapil Sharma*** and Mukhtiar Singh

Abstract: This paper proposes an IoT-based automated home energy management system (HEMS) focusing on cloud computing infrastructure for real-time demand response (DR). The stochastic real-time scheduling algorithm has been developed for solving the multi-objective optimization problem of minimizing electricity cost while preserving comfort. First, an IoT-enabled smart plug has been created to store load profiles of home appliances and control them through the cloud platform. Next, scheduling optimization with PV integration and various types of constraints has been discussed. Finally, an autonomous, efficient, and real-time energy

*Corresponding Author

scheduling scheme utilizing forecasted PV power for different pricing scenarios has been developed. The priority-driven algorithm schedules appliances every 5-min based on a trade-off between the current price and the consumer's comfort. The appliance-level dispatch with smart plugs, and the flexibility analysis could help the HEMS to achieve better energy efficiency without causing major discomfort to the consumer. The performance of the proposed algorithm has been demonstrated under different request patterns, PV generation, and pricing scenarios. On average, the potential cost saving achieved under different pricing schemes using RTP, ToU, and CPP pricing is 40%, 45%, 48%, respectively.

For details refer to https://doi.org/10.1016/j.jobe.2021.102828

Genetically optimized Fuzzy C-means data clustering of IoMT-based biomarkers for fast affective state recognition in intelligent edge analytics

Akshi Kumar, **Kapil Sharma*** and Aditi Sharma

Abstract: IoMT sensors such as wearables, moodables, ingestible sensors and trackers have the potential to provide a proactive approach to healthcare. But grouping, traversing and selectively tapping the IoMT data traffic and its immediacy makes data management & decision analysis a pressing issue. Evidently, the selection process for real-world, time-constrained health problems involves looking at multivariate time-series data generated simultaneously from various wearables resulting in data overload and accuracy issues. Computational intelligence of edge analytics can extend predictive capability by quickly turning digital biomarker data into actions for remote monitoring and trigger alarm during emergency incidents without relying on backend servers. But the pervasive generation of data streams from IoMT levies significant issues in data visualization and exploratory data analysis. This paper presents a genetically optimized Fuzzy C-means data clustering technique for affective state recognition on the edge. Clustering segregates the biomarker data in chunks and generates a summarized data for each subject which is then genetically optimized to avoid stagnation in local optima. A multi-level convolution neural network is finally used to classify the affective states into the baseline, stress and amusement categories. The model is evaluated on the publicly available WESAD dataset and compares favorably to state-of-the-art with less time complexity. It demonstrates the use of data clustering technique for numerosity reduction of real-time data streams in intelligent edge analytics which facilitates fast analysis of affective state of the user.

For details refer to https://doi.org/10.1016/j.asoc.2021.107525

RSAM: Robust Self-Attention Based Multi-Horizon Model for Solar Irradiance Forecasting

Swati Sharda, Mukhtiar Singh and **Kapil Sharma***

Abstract: With the widespread adoption of renewable energy sources in the smart grid era, there is an utmost requirement to develop prediction models that can accurately forecast solar irradiance. The stochastic nature of solar irradiance considerably affects photo-voltaic (PV) power generation. Since weather conditions have a high impact on solar irradiance; therefore, we need weather-conscious forecasting models to boost predictive accuracy. Although Recurrent Neural Networks (RNNs) has shown considerable performance in time-series forecasting problems, its sequential nature prohibits parallelized computing. Recently, architectures based on self-attention mechanism have shown remarkable success in natural language programming (NLP), while being computationally superior. In this paper, we propose an RSAM (Robust Self-Attention Multi-horizon) forecasting architecture, which mainly works in two parts: First, multi-horizon forecasting of solar irradiance using multiple weather parameters; Second, prediction interval analysis for model robustness using quantile regression. A self-attention based Transformer model belonging to the family of deep learning models has been utilized for multi-variate solar time-series forecasting. Using the National Renewable Energy Laboratory (NREL) benchmark datasets of two different sites, we demonstrate that the proposed approach exhibit enhanced performance in comparison to RNN models in terms of RMSE, MAE, MBE, and Forecast skill at each forecasted interval.

For details refer to https://doi.org/10.1109/TSTE.2020.3046098

**Corresponding Author*

BIOGRAPHY

MR. NARESH KUMAR

Department of Information Technology

Mr. Naresh Kumar received the B.Tech degree in Computer Engineering from Malviya National Institute of Technology, Jaipur, India in 2009, and the M.Tech degree in Computer Science and Automation from Indian Institute of Science, Bengluru, India in 2012. He joined Central Research Laboratory, Bharat Electronics Ltd as research staff member in 2012. He is currently pursuing the Ph.D. degree in the Department of Information Technology at Delhi Technological University (DTU), India. His research interests are in the area of Soft Computing and Time series forecasting.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **N. Kumar** and S. Susan, "Particle swarm optimization of partitions and fuzzy order for fuzzy time series forecasting of COVID-19", *Applied Soft Computing*, vol. 110, pp. 107611, 2021. Impact Factor: 6.725.

Particle swarm optimization of partitions and fuzzy order for fuzzy time series forecasting of COVID-19

Naresh Kumar and Seba Susan

Abstract: Major hyperparameters which affect fuzzy time series (FTS) forecasting are the number of partitions, length of partition intervals in the universe of discourse, and the fuzzy order. There are very few studies which have considered an integrated solution to optimize all the hyperparameters. In this paper, we strive to achieve optimum values of all three hyperparameters for fuzzy time series forecasting of the COVID-19 pandemic using the Particle Swarm Optimization (PSO) algorithm. We specifically propose two techniques, namely nested FTS-PSO and exhaustive search FTS-PSO for determining the optimal interval length, as an augmentation to the FTS-PSO model that optimizes the interval length and the fuzzy order. Nested PSO has two PSO loops: (i) the inner PSO optimizes the combination of fuzzy order and boundaries of intervals for a given number of partitions defined by the outer loop, and the resultant cost is fed back to the outer PSO; (ii) the outer PSO optimizes the number of partitions to reduce the cost while meeting the defined constraint. Exhaustive search FTS-PSO also has two loops where the inner loop is similar to nested FTS-PSO while the outer loop iterates over a pre-defined search space of number of partitions. We analyze the effectiveness of the two approaches by comparing with ARIMA, FbProphet, and the state-of-the-art FTS and FTS-PSO models. We adopt COVID-19 highly affected 10 countries worldwide to perform forecasting of coronavirus confirmed cases. We consider two phases of COVID-19 spread, one from the year 2020 and another from 2021. Our study provides an analytical aspect of the COVID-19 pandemic, and aims to achieve optimal number and length of intervals along with fuzzy order for FTS forecasting of COVID-19. The results prove that the exhaustive search FTS-PSO outperformed all the methods whereas nested FTS-PSO performed moderately well.

For details refer to https://doi.org/10.1016/j.asoc.2021.107611

BIOGRAPHY

MS. PRIYANKA MEEL

Department of Information Technology

Ms. Priyanka Meel received a Bachelor of Technology (B.Tech.) Degree from the Indian Institute of Information Technology and Management, Gwalior, India, in 2011 and Master of Technology (M.Tech.) Degree from the Indian Institute of Information Technology and Management, Gwalior, India, in 2013. She joined as an Assistant Professor in the Department of Information Technology, Delhi Technological University, New Delhi, India, in 2016. She enrolled for a Doctor of Philosophy (Ph. D.) degree in the Department of Information Technology, Delhi Technological University, New Delhi, India in 2018. Currently, she is working towards the fulfillment of Ph. D. degree. Her current research interests include Artificial Intelligence, Data Analytics, Fake News Detection, Image Processing, Pattern Analysis, Machine Learning, and Deep Learning.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. **P. Meel** and D. K. Vishwakarma, "A temporal ensembling based semi-supervised ConvNet for the detection of fake news articles", *Expert Systems with Applications*, vol. 177, pp. 115002, 2021. Impact Factor: 6.954.
2. C. Raj and **P. Meel**, "ConvNet frameworks for multi-modal fake news detection", *Applied Intelligence*, vol. 51, pp. 8132–8148, 2021. Impact Factor: 5.086.
3. **P. Meel** and D. K. Vishwakarma, "HAN, image captioning, and forensics ensemble multimodal fake news detection", *Information Sciences*, vol. 567, pp. 23-41, 2021. Impact Factor: 6.795.

A temporal ensembling based semi-supervised ConvNet for the detection of fake news articles

Priyanka Meel and Dinesh Kumar Vishwakarma

Abstract: Internet-based information circulation has given rise to the proliferation of fake and misleading contents, which has extreme hostile effects on individuals and humanity. Supervised artificial intelligence techniques require a huge amount of annotated data which is a time-consuming, expensive and laborious task as the speed and volume of social media news generation is very high. To counter this situation, we propose an innovative Convolutional Neural Network semi-supervised framework built on the self-ensembling concept to take leverage of the linguistic and stylometric information of annotated news articles, at the same time explore the hidden patterns in unlabelled data as well. Self-ensembling provides consensus predictions of the labels of unannotated data using previous epochs outputs of network-in-training. These accumulated ensemble predictions are supposed to be a better predictor for the unknown labels than the output of most recent training epoch, thus suitable to be used as a proxy for the labels of unannotated data. The uniqueness of the framework is that it ensembles all the outputs of previous training epochs of the neural network to use them as an unsupervised target for comparing them with current output prediction of unlabelled articles. The framework is validated with

extensive experiments on three datasets for different proportions of labelled and unlabelled data. It can achieve highest 97.45% fake news classification accuracy using 50% labelled articles on Fake News Data Kaggle dataset. Contemporary baseline methods are placed in juxtaposition with the proposed architecture which demonstrates the robustness of our work compared to the state-of-the-art.

For details refer to https://doi.org/10.1016/j.eswa.2021.115002

ConvNet frameworks for multi-modal fake news detection

Chahat Raj and **Priyanka Meel***

Abstract: An upsurge of false information revolves around the internet. Social media and websites are flooded with unverified news posts. These posts are comprised of text, images, audio, and videos. There is a requirement for a system that detects fake content in multiple data modalities. We have seen a considerable amount of research on classification techniques for textual fake news detection, while frameworks dedicated to visual fake news detection are very few. We explored the state-of-the-art methods using deep networks such as CNNs and RNNs for multi-modal online information credibility analysis. They show rapid improvement in classification tasks without requiring pre-processing. To aid the ongoing research over fake news detection using CNN models, we build textual and visual modules to analyze their performances over multi-modal datasets. We exploit latent features present inside text and images using layers of convolutions. We see how well these convolutional neural networks perform classification when provided with only latent features and analyze what type of images are needed to be fed to perform efficient fake news detection. We propose a multi-modal Coupled ConvNet architecture that fuses both the data modules and efficiently classifies online news depending on its textual and visual content. We thence offer a comparative analysis of the results of all the models utilized over three datasets. The proposed architecture outperforms various state-of-the-art methods for fake news detection with considerably high accuracies.

For details refer to https://doi.org/10.1007/s10489-021-02345-y

HAN, image captioning, and forensics ensemble multimodal fake news detection

Priyanka Meel and Dinesh Kumar Vishwakarma

Abstract: Nowadays, news publication, propagation, and consumption have been diverted to online social media networks and web portals, which has given rise to falsified and fabricated news articles containing both textual and visual information formats. Most of the research to date is centered on textual fake news detection using machine learning approaches, where multimedia data forgery is hardly addressed. Hence, a multimodal fake news detection framework is proposed, which unitedly exploits hidden pattern extraction capabilities from text using Hierarchical Attention Network (HAN) and visual image features using image captioning and forensic analysis. We specifically focused on four different techniques of multimodal data analysis, such as HAN deep model for text, generating image caption and headline matching with news text (CHM), Noise Variance Inconsistency (NVI), and Error Level Analysis (ELA). All these algorithms have been tested, first independently and then collectively using the max voting Ensemble method on three different datasets. The experimental results and comparisons with contemporary techniques put forward the fact that the proposed method outperforms state-of-the-art with 95.90% highest accuracy on the Fake News Samples dataset. The achieved results also prove that the combined model beats individual methods' capabilities in classifying fake news accurately.

For details refer to https://doi.org/10.1016/j.ins.2021.03.037

**Corresponding Author*

BIOGRAPHY

MR. SAHIL RAHEJA

Department of Information Technology

Mr. Sahil Raheja is a research scholar in the department of Information and Technology, Delhi Technological University. He has completed his M.Tech in Information systems from Delhi Technological University in 2012. He also worked as an Assistant professor in School of computing science and engineering at Galgotias University, Greater Noida, India and has a total teaching experience of 10 years. His area of interests are Image and Video processing, Machine Vision, Soft computing.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **S. Raheja** and A. Kumar, "Edge detection based on type-1 fuzzy logic and guided smoothening", *Evolving Systems*, vol. 12, pp. 447–462, 2021. Impact Factor: 1.908.
2. A. Kumar and **S. Raheja**, "Edge Detection in Digital Images Using Guided L_0 Smoothen Filter and Fuzzy Logic", *Wireless Personal Communications*, vol. 121, pp. 2989–3007, 2021. Impact Factor: 1.671.

Edge detection based on type-1 fuzzy logic and guided smoothening

Sahil Raheja and Akshi Kumar

Abstract: Edge detection is an important phenomenon in computer vision. Edge detection is helpful in contour detection and thus helpful in obtaining the important information. Edge detection process heavily depends on chosen technique. Soft computing techniques are considered as powerful edge detection methods due to their adaptability. This paper presents a fuzzy logic based edge detection method where the quality of edges is controlled using sharpening guided filter and noise due to the sharpening is controlled using Gaussian filter. The accuracy of the method is judged using a variety of statistical measures. It has been found that by proper selecting the smoothening parameters a significant improvement in the detected edges can be obtained.

For details refer to https://doi.org/10.1007/s12530-019-09304-6

Edge Detection in Digital Images Using Guided L_0 Smoothen Filter and Fuzzy Logic

Akshi Kumar and **Sahil Raheja***

Abstract: Image segmentation is an important process in computer vision. Recently fuzzy logic based edge detection is heavily investigated as by changing the number of rules edge detection can be improved. However, due to large colour variations in the images false edges are detected and even using fuzzy rules they cannot be reduced significantly. These falsely detected edges can be controlled by using smoothen filter while controlling the degree of smoothness. This paper, presents fuzzy logic based edge detection mechanism while using Guided L_0 smoothen filter for the smoothening of image under various degree of smoothens. Simulation results for edge detection is presented for Canny, Sobel, Fuzzy logic based edge detection and finally fuzzy logic edge detection with inclusion of L_0 smoothen filter. The results are compared with classical and modern methods. Simulation is performed on Berkley Segmentation Database (BSD) and USC-SIPI Image Database while considering more than 100 images. The obtained F-measure is as high as 0.848.

For details refer to https://doi.org/10.1007/s11277-021-08860-y

*Corresponding Author

BIOGRAPHY

PROF. SEBA SUSAN

Department of Information Technology

Dr. Seba Susan is a Professor in the Department of Information Technology at Delhi Technological University (DTU). She completed her B.Tech in Electronics Engineering from Cochin University of Science & Technology (2002), M.E. in Electronics & Communication (2008) from Delhi College of Engineering and Ph.D from Electrical Engineering Department of IIT Delhi (2014). Her research areas are Computer Vision, Data Mining, Speech and Natural Language Processing with the area of specialization being the use of statistical and soft computing tools for Pattern Recognition and Machine Learning. She is a member of the IEEE Computational Intelligence Society, IEEE Signal Processing Society and the IEEE Computer Society and a life member of the Computer Society of India (CSI).

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Susan** and J. Malhotra, "Learning image by-parts using early and late fusion of auto-encoder features", *Multimedia Tools and Applications*, vol. 80, pp. 29601–29615, 2021. Impact Factor: 2.757.

Learning image by-parts using early and late fusion of auto-encoder features

Seba Susan and Jatin Malhotra

Abstract: A novel sub-part learning scheme is introduced in our work for the purpose of recognizing handwritten numeral images. The idea is borrowed from the concept of visual perception and part-wise integration of visual information by the cortical regions of the brain. In this context, each numeral image is divided into four half-parts: top-half, bottom-half, left-half and right-half; the other half of the image being kept masked. An efficient data representation is derived in an unsupervised manner, from each image part, using convolutional auto-encoders (CAE), for our learning scheme that involves both early and late fusion of features. The chief advantage of the features derived from convolutional auto-encoders is the preservation of 2D spatial locality while the features are being filtered layer-by-layer through the convolutional architecture. The features derived from each individual CAE are fused by concatenation in our early fusion scheme, and learnt using an appropriate classifier. The late fusion strategy involves learning the probability density pertaining to the predicted values emanating from the four base classifiers using a meta-learner classifier. The early-cum-late fusion is proposed in the later stage of our work to combine the goodness of both schemes and enhance the performance. The support vector machine is used in all the classification stages. Experiments on the benchmark MNIST dataset of handwritten English numerals prove that our method competes favorably to the state of the art, as inferred from the high classification scores achieved. Our method thus provides a computationally simple and effective methodology for sub-part learning and part-wise integration of information from different parts of the image. The method also contributes to saving in computational expense since, at a time, only a small part of the image is processed, speeding up the inferencing process.

For details refer to https://doi.org/10.1007/s11042-021-11092-8

BIOGRAPHY

DR. SHALINI GAKHAR

Department of Information Technology

Dr. Shalini Gakhar received her Bachelor of Technology (B.Tech.) degree from PDM College of Engineering (Affiliated to Maharishi Dayanand University), Haryana, India in the year 2014 and the Master of Technology (M.Tech.) from Centre for Development of Advanced Computing (C-DAC), Noida, India in the year 2016. Presently, she has completed her PhD in the Department of Information Technology (IT), Delhi Technological University, Delhi, India in year 2021. She has also worked as a Junior/Senior Research Fellow (JRF/SRF) in a â€œClustered based Networked Project on Imaging Spectrometer and its Applications (NISA)â€ funded by Department of Science and Technology (DST), Government of India, and as a Research Associate (RA) in â€œPhenomics of moisture deficit stress tolerance and nitrogen use efficiency in rice and wheatâ€ funded by ICAR-NASF, Government of India. She has co-authored Technical Brochure, â€œManual on Drone Remote Sensingâ€ TB-ICN 259-2021 and is an active resource person in many workshops and webinars. Her research interests include urban remote sensing, Hyperspectral Image processing, satellite image interpretation, machine learning and deep learning.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Gakhar** and K. C. Tiwari, "Spectral – spatial urban target detection for hyperspectral remote sensing data using artificial neural network", *The Egyptian Journal of Remote Sensing and Space Science*, vol. 24, no. 2, pp. 173-180, 2021. Impact Factor: 5.188.

Spectral – spatial urban target detection for hyperspectral remote sensing data using artificial neural network

Shalini Gakhar and Kailash Chandra Tiwari

Abstract: Hyperspectral remote sensing is opening new gateways for a multitude of applications with an added advantage of high spectral and spatial resolution. Target detection of urban objects has gained prominence during the past decade for maintaining a pace with increasing urbanization. This paper aims to identify roads and roofs as urban targets using a hybrid approach of the spectral and spatial aspect of hyperspectral data. The work highlights a brief taxonomy of morphological operators namely, Dilation, Erosion, Opening and Closing with fused spectral signatures of urban targets considered. Artificial neural network (ANN) has been used as a machine learning measure due to its high prediction capability and its effectiveness over conventional target detection approaches.

For details refer to https://doi.org/10.1016/j.ejrs.2021.01.002

BIOGRAPHY

MS. SRISHTI VASHISHTHA

Department of Information Technology

Ms. Srishti Vashishtha has received the B.Tech. degree in Information Technology from the Maharaja Surajmal Institute of Technology, Guru Gobind Singh Indraprastha University (GGSIPU), New Delhi, India, and the M.Tech. degree in Computer Science from the University School of Information, Communication and Technology, GGSIPU. She is currently pursuing the Ph.D. degree with the Information Technology Department, Delhi Technological University, New Delhi. Her current research interests include data mining, natural language processing, fuzzy logic and machine learning. She has received DTU research excellence awards for the year 2019 and 2020.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Vashishtha** and S. Susan, "Highlighting keyphrases using senti-scoring and fuzzy entropy for unsupervised sentiment analysis", *Expert Systems with Applications*, vol. 169, pp. 114323, 2021, Impact Factor: 6.954.

Highlighting keyphrases using senti-scoring and fuzzy entropy for unsupervised sentiment analysis

Srishti Vashishtha and Seba Susan

Abstract: Sentiment Analysis is a process that aids in assessing the performance of products or services from user generated online posts. In present time, there are various websites that allow customers to post reviews about movies, products, events or services, etc. This has led to cumulative aggregation of a lot of reviews written in natural language. Prevailing factors such as availability of online reviews and raised end-user expectations have motivated the evolution of opinion mining systems that can automatically classify customers' reviews. It is observed that in Sentiment Analysis (SA), to highlight the significant keyphrases which contribute towards correct sentiment cognition is a tedious task. In this paper, we have proposed an unsupervised sentiment classification system that comprehensively formulates phrases, computes their senti-scores (sentiment scores) and polarity using the SentiWordNet lexicon and fuzzy linguistic hedges. Further it extracts the keyphrases significant for SA using fuzzy entropy filter and k-means clustering. We have deployed document level SA on online reviews using n-gram techniques, specifically combination of unigram, bigram and trigram. Experiments on two benchmark movie review datasets- polarity dataset by Pang and Lee and IMDB dataset, achieve high accuracy for our approach as compared to the other state-of-the-art-methods for phrase-level SA.

For details refer to https://doi.org/10.1016/j.eswa.2020.114323

BIOGRAPHY

MS. SWATI SHARDA

Department of Information Technology

Ms. Swati Sharda (TRF) in Department of Information Technology, Delhi Technological University. She is pursing Ph.D. under the supervision of Prof. Kapil Sharma and Prof. Mukhtiar Singh. Her research inclues "Smart Grid Energy Management based on IoT and Computational Intelligence ".

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01
Commendable Research Award	02

1. **S. Sharda**, K. Sharma and M. Singh, "A real-time automated scheduling algorithm with PV integration for smart home prosumers", *Journal of Building Engineering*, vol. 44, pp. 102828, 2021. Impact Factor: 5.318.
2. **S. Sharda**, M. Singh and K. Sharma, "RSAM: Robust Self-Attention Based Multi-Horizon Model for Solar Irradiance Forecasting", *IEEE Transactions on Sustainable Energy*, vol. 12, no. 2, pp. 1394-1405, 2021. Impact Factor: 7.917.
3. **S. Sharda**, M. Singh and K. Sharma, "Demand side management through load shifting in IoT based HEMS: Overview, challenges and opportunities", *Sustainable Cities and Society*, vol. 65, pp. 102517, 2021. Impact Factor: 7.587.

A real-time automated scheduling algorithm with PV integration for smart home prosumers

Swati Sharda, Kapil Sharma and Mukhtiar Singh

Abstract: This paper proposes an IoT-based automated home energy management system (HEMS) focusing on cloud computing infrastructure for real-time demand response (DR). The stochastic real-time scheduling algorithm has been developed for solving the multi-objective optimization problem of minimizing electricity cost while preserving comfort. First, an IoT-enabled smart plug has been created to store load profiles of home appliances and control them through the cloud platform. Next, scheduling optimization with PV integration and various types of constraints has been discussed. Finally, an autonomous, efficient, and real-time energy scheduling scheme utilizing forecasted PV power for different pricing scenarios has been developed. The priority-driven algorithm schedules appliances every 5-min based on a trade-off between the current price and the consumer's comfort. The appliance-level dispatch with smart plugs, and the flexibility analysis could help the HEMS to achieve better energy efficiency without causing major discomfort to the consumer. The performance of the proposed algorithm has been demonstrated under different request patterns, PV generation, and pricing scenarios. On average, the potential cost saving achieved under different pricing schemes using RTP, ToU, and CPP pricing is 40%, 45%, 48%, respectively.

For details refer to https://doi.org/10.1016/j.jobe.2021.102828

RSAM: Robust Self-Attention Based Multi-Horizon Model for Solar Irradiance Forecasting

Swati Sharda, Mukhtiar Singh and Kapil Sharma

Abstract: With the widespread adoption of renewable energy sources in the smart grid era, there is an utmost requirement to develop prediction models that can accurately forecast solar irradiance. The stochastic nature of solar irradiance considerably affects photo-voltaic (PV) power generation. Since weather conditions have a high impact on solar irradiance; therefore, we need weather-conscious forecasting models to boost predictive accuracy. Although Recurrent Neural Networks (RNNs) has shown considerable performance in time-series forecasting problems, its sequential nature prohibits parallelized computing. Recently, architectures based on self-attention mechanism have shown remarkable success in natural language programming (NLP), while being computationally superior. In this paper, we propose an RSAM (Robust Self-Attention Multi-horizon) forecasting architecture, which mainly works in two parts: First, multi-horizon forecasting of solar irradiance using multiple weather parameters; Second, prediction interval analysis for model robustness using quantile regression. A self-attention based Transformer model belonging to the family of deep learning models has been utilized for multi-variate solar time-series forecasting. Using the National Renewable Energy Laboratory (NREL) benchmark datasets of two different sites, we demonstrate that the proposed approach exhibit enhanced performance in comparison to RNN models in terms of RMSE, MAE, MBE, and Forecast skill at each forecasted interval.

For details refer to https://doi.org/10.1109/TSTE.2020.3046098

Demand side management through load shifting in IoT based HEMS: Overview, challenges and opportunities

Swati Sharda, Mukhtiar Singh and Kapil Sharma

Abstract: In smart grid era, demand side management (DSM) plays an indispensable role in development of sustainable cities and societies. This paper presents practical challenges imposed while implementing DSM using load shifting for IoT enabled home energy management systems (HEMS). The main objective of the manuscript is to provide thorough information to the researchers working towards the development of advanced and realistic optimization algorithms for DSM implementation. Here, the issues related to the characterization of home appliances, integration of intermittent renewable energy sources, load categorization, various constraints, dynamic pricing, consumer categorization has been discussed. DSM being a stochastic optimization problem, an extensive survey of different optimization techniques solving the multi-objective energy management problem has been discussed. The DSM implementation issues in distribution network, mainly related to grid constraints, consumer incentives and utility policies are described in detail. This manuscript also provides a deeper insight into challenges, constraints and future opportunities to meet the desired objectives of DSM.

For details refer to https://doi.org/10.1016/j.scs.2020.102517

BIOGRAPHY

PROF. AKHILESH ARORA

Department of Mechanical Engineering

Dr. Akhilesh Arora is working as an Professor in the Department of Mechanical Engineering at Delhi Technological University (erstwhile Delhi College of Engineering) Delhi since 2004. Prior to joining Delhi College of Engineering, he worked at College of Military Engineering, Pune in the capacity of Lecturer for two years. He has also served as Associate professor and Head of Mechanical and Automation Engineering Department at Indira Gandhi Delhi Technical University of Women, Delhi during the period from Aug. 2012 to Dec. 2014. He obtained his masters and Ph.D. degrees from the Indian Institute of Technology, Delhi in the year 1997 and 2010 respectively. His research areas are Alternative Refrigerants, Novel cycles, Energy and exergy analysis; Energy Conservation and Waste Heat Recovery. He has published number of research papers in International and national journals. He is an active member of ASHRAE and ISHRAE. He has guided five students for their PhD and presently guiding 8 research scholars.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01

1. A. Dubey and **A. Arora**, "High-Temperature Distillation Using N-Parallel Evacuated Tube Collector Integrated With Double Slope Solar Still in Force Mode", *Journal of Thermal Science and Engineering Applications*, vol. 1, no. 3, 2021, pp. 031002, 2021, Impact Factor: 1.470.

High-Temperature Distillation Using N-Parallel Evacuated Tube Collector Integrated With Double Slope Solar Still in Force Mode

Aseem Dubey and **Akhilesh Arora***

Abstract: In the present communication, a performance investigation of a double-slope solar still augmented with parallel evacuated tubes under forced mode is carried out for a modified geometry. A comprehensive mathematical model is used for the numerical simulation using the experimental data and incorporating the effect of variable flowrate, water depth, and the number of tubes. An optimum flowrate range ~0.006–0.007 kg/s/tube is found irrespective of the number of tubes and basin water depth to extract optimal energy. The flowrate is validated with other experiments, carried out by various authors. At optimal flowrate with ten tubes and 0.005 m basin water depth, the system yields 6.644 kg, while overall energetic and exergetic efficiencies are observed as ~33.8% and 4.9%, respectively. With an increase in the tubes as 20 and 30, the respective yields are found to be increased by ~2.64% and ~6.62% for nearly the same collector output temperature attainable (≈98.5°C), while the energy and exergy efficiencies decreased significantly by ~24.6% and ~38.6%, compared with ten tubes arrangement. Daily yield and overall exergy efficiency are increased by 13.3% and 19.3%, respectively, using a diffused reflector.

For details refer to https://doi.org/10.1115/1.4047941

**Corresponding Author*

BIOGRAPHY

MR. ANAND KUSHWAH

Department of Mechanical Engineering

Mr. Anand Kushwah is currently working as Assistant Professor at Madhav Institute of Technology and Science, Gwalior, India since 2017. Here, using the research facilities he has gained the knowledge about quantitative and analytical skills, successfully filing two patents on Apparatus for Heating Automotive/Industrial Coolant Using Solar Evacuated Tubes and System of the Same (Patent No. 201821045563) and Method and Apparatus for Controlling the Temperature of Solar Dryer (Patent No. 201921001878). Through his patents and interest in research and innovation he has published 7 papers in International Conference, 4 papers in National Conference, 2 papers in Scopus Journals, 4 papers in other journals and 1 paper in SCI Journal.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Kushwah**, A. Kumar, M. K. Gaur and A. Pal, "Garlic dehydration inside heat exchanger-evacuated tube assisted drying system: Thermal performance, drying kinetic and color index", *Journal of Stored Products Research*, vol. 93, pp. 101852, 2021, Impact Factor: 2.643.

Garlic dehydration inside heat exchanger-evacuated tube assisted drying system: Thermal performance, drying kinetic and color index

Anand Kushwah, Anil Kumar, Manoj Kumar Gaur and Amit Pal

Abstract: An experimental investigation was done on an advanced evacuated tube-assisted solar drying system without and with load conditions at various water flow rates (10 L/h, 20 L/h, and 30 L/h) to evaluate its performance analysis. 79.56 °C maximum greenhouse air temperature was recorded without load at 30 L/h water flow rate with an average solar intensity of 850 W/m^2. Highest value of drying rate (DR) is 1.48 kgH_2O/kg dry solid/h and the maximum efficiency of solar collector (SC) and solar dryer (SD) is 43.62% and 55.28%, respectively, at 30 L/h water flow rate. Garlic was dehydrating from 70% to 8% (wb) moisture content (MC). The maximum exergy efficiency (EE) and minimum exergy loss were 57.64% at 30 L/h water flow rate and 4.58 W at 10 L/h water flow rate. Quality assessment is also carried out for dried garlic samples in the heat exchanger –evacuated tube assisted drying system (HE-ETADS). Color conservation (indices) of dehydrated garlic sample is best in HE-ETADS (L_o = 60.42, a_o = −0.92, and b_o = 11.54) in comparison to old-style (traditional) drying process (L_o = 58.89, a_o = - 0.67, and b_o = 5.99). Therefore, the developed drying system represented not only good financial returns but also better product quality. The present system provides interesting options for the entry of this type of collectors in medium-scale applications in the agricultural and industrial sectors.

For details refer to https://doi.org/10.1016/j.jspr.2021.101852

BIOGRAPHY

DR. ANIL KUMAR

Department of Mechanical Engineering

Dr. Anil Kumar is Associate Professor in Department of Mechanical Engineering, with an additional charge of Additional Coordinator-Centre for Energy and Environment, Delhi Technological University, Delhi, India. He completed his Ph.D. in Solar Energy from Centre for Energy Studies, Indian Institute of Technology Delhi, India, in 2007. He was Post-Doctoral Researcher at Energy Technology Research Center, Department of Mechanical Engineering, Faculty of Engineering, Prince of Songkla University, Hat Yai, Songkhla, Thailand in the discipline of Energy Technology from June 2015 to May 2017. He has also served as assistant professor at Energy Centre, Maulana Azad National Institute of Technology Bhopal, India from 2010 to 2018, and Assistant Professor-Grade II in Department of Mechanical Engineering, University Institute of Technology, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, India from 2005 to 2010. His nature of experience in Teaching and Research (Science, Technology, Society, and Sustainable Development). His areas of specialization are; Energy Technology, Renewable Energy, Solar Energy Applications, Energy Economics, Heat Transfer, Natural Rubber Sheet Drying, and Environmental Issues. He has completed many research funded projects in these areas. He has more than 16 years of experience in energy technology. He has published 157 papers in international peer-reviewed journals and 75 papers in the International/National conferences proceeding. His paper is being cited in all the reputed relevant journals. He has received more than 4587+ citations with 37h-index (Google Scholar) and 2750+ citations with 29 h-index (SCOPUS). 01 granted patent and 03 published patents in his credit. He has supervised 9 Ph.D. scholars, 37 master students. Dr. Kumar has visited countries, namely UK, Thailand, and Malaysia. He has received various awards and appreciation from reputed sources. Some of them are presented below:

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	05

1. S. Basu, A. John, Akshay and **A. Kumar**, "Design and feasibility analysis of hydrogen based hybrid energy system: A case study", *International Journal of Hydrogen Energy*, vol. 46, no. 70, pp. 34574-34586, 2021. Impact Factor: 5.816.
2. S. Kumar, A. Agarwal and **A. Kumar**, "Financial viability assessment of concentrated solar power technologies under Indian climatic conditions", *Sustainable Energy Technologies and Assessments*, vol. 43, pp. 100928, 2021. Impact Factor: 5.353.
3. **A. Kumar**, R. Kant and Samsher, "Review on Spray-Assisted Solar Desalination: Concept, Performance and Modeling", *Arabian Journal for Science and Engineering*, vol. 46, pp. 11521–11541, 2021. Impact Factor: 2.334.
4. A. Kushwah, **A. Kumar**, M. K. Gaur and A. Pal, "Garlic dehydration inside heat exchanger-evacuated tube assisted drying system: Thermal performance, drying kinetic and color index", *Journal of Stored Products Research*, vol. 93, pp. 101852, 2021. Impact Factor: 2.643.
5. G. Richhariya and **A. Kumar**, "Performance evaluation of mixed synthetic organic dye as sensitizer based dye sensitized solar cell", *Optical Materials*, vol. 111, pp. 110658, 2021. Impact Factor: 3.080.

Design and feasibility analysis of hydrogen based hybrid energy system: A case study

Srijit Basu, Alfred John, Akshay and **Anil Kumar***

Abstract: Renewable energy sources can produce less carbon than conventional energy sources, which has the significant disadvantage of being intermittent, which triggers a stable storage system. This work focuses on the issues of hydrogen energy storage which can solve the fluctuating output power problem by simulating results on HOMER software. Three combinations of the Solar-Hydrogen system, Wind-Hydrogen system, and Solar-Wind-Hydrogen hybrid system are presented to find the most optimum one. Levelized Cost of Energy (LCOE) for Hybrid System has proven to be the most economical while the Wind Turbine cost 1.476% higher and the Solar Photovoltaics (PV) System costs 108.03% more. LCOE for Hybrid Model is $0.3387, while for Solar System it is $ 0.7046 and for Wind System it is $ 0.3437. These results show that a hydrogen-based energy storage system is viable for the considered.

For details refer to https://doi.org/10.1016/j.ijhydene.2021.08.036

Financial viability assessment of concentrated solar power technologies under Indian climatic conditions

Sankalp Kumar, Aviral Agarwal and **Anil Kumar***

Abstract: In the present work, the financial viability of three CSP technologies viz. PTC, SPT and LFR for 50 MW, CSP power plants, has been studied for 10 different locations of diverse climate conditions in India. Latest fiscal guidelines laid by the Central Electricity Regulatory Commission (CERC) in 2016 have been followed in the System Advisor Model. Levelized cost of electricity (LCOE), Payback Period (PBP), Discounted Payback Period (DPP), Net Present Value (NPV), and Capital Recovery Factor (CRF) have been estimated to obtain a holistic extensive research view of the CSP projects. The highest NPV is 2626.68, 1311.25, and 827.90 million ₹, and the lowest LCOE calculated is 9.89, 10.63, and 10.99 ₹/kWh for SPT, PTC and LFR. Jodhpur has been identified as the most suitable location for the installation of a CSP plant. A 50 MW Solar Power Tower based CSP plant has LCOE of 9.89 ₹/kWh, PBP of 2.20 years, and NPV of 2626.68 million ₹, which is the best among all selected locations. The findings of this research will help in selecting locations and CSP technology for the installation of power plants. It will also assist investors to understand the financial viability of the project beforehand.

For details refer to https://doi.org/10.1016/j.seta.2020.100928

Review on Spray-Assisted Solar Desalination: Concept, Performance and Modeling

Anil Kumar, Ravi Kant and Samsher

Abstract: This article presents a review on performance, thermal modeling and numerical modeling of spray-assisted solar desalination systems (SLTD). Spray assisted has the benefits of higher rates of heat and mass transfer, the ability to work at moderately low-temperature differences, ease of system design, less scaling and fouling issues, and lower initial cost than conventional thermal desalination. Thermal models are handy tools to expect the performance of well-designed SLTD before its fabrication and saves cost and time. Software applications play a crucial role in developing and analyzing the mathematical model and assessing the performance of SLTD. CFD simulation is useful in the analysis as it can show the precise distribution of temperature inside the evaporation tower. It is used to model and analyze the evaporation process of brine spray and a powerful tool for guiding the selection of operating conditions. Highest productivity obtained as 9 L/m^2 per day, and the maximum daily

**Corresponding Author*

efficiency was 87%. Maximum value of the performance ratio reached 1.42 in the double stage constant heat source spray assisted desalination system. Steam jet ejector contributes over 40% of the total energy degradation. Rate of production and performance ratio increases with the increase in top brine temperature. Productivity of SLTD was more compared to conventional distillation systems due to higher rate of heat transfer and a higher rate of evaporation.

For details refer to https://doi.org/10.1007/s13369-021-05846-7

Garlic dehydration inside heat exchanger-evacuated tube assisted drying system: Thermal performance, drying kinetic and color index+

Anand Kushwah, **Anil Kumar***, Manoj Kumar Gaur and Amit Pal

Abstract: An experimental investigation was done on an advanced evacuated tube-assisted solar drying system without and with load conditions at various water flow rates (10 L/h, 20 L/h, and 30 L/h) to evaluate its performance analysis. 79.56 °C maximum greenhouse air temperature was recorded without load at 30 L/h water flow rate with an average solar intensity of 850 W/m^2. Highest value of drying rate (DR) is 1.48 kgH_2O/kg dry solid/h and the maximum efficiency of solar collector (SC) and solar dryer (SD) is 43.62% and 55.28%, respectively, at 30 L/h water flow rate. Garlic was dehydrating from 70% to 8% (wb) moisture content (MC). The maximum exergy efficiency (EE) and minimum exergy loss were 57.64% at 30 L/h water flow rate and 4.58 W at 10 L/h water flow rate. Quality assessment is also carried out for dried garlic samples in the heat exchanger –evacuated tube assisted drying system (HE-ETADS). Color conservation (indices) of dehydrated garlic sample is best in HE-ETADS (L_o = 60.42, a_o = −0.92, and b_o = 11.54) in comparison to old-style (traditional) drying process (L_o = 58.89, a_o = - 0.67, and b_o = 5.99). Therefore, the developed drying system represented not only good financial returns but also better product quality. The present system provides interesting options for the entry of this type of collectors in medium-scale applications in the agricultural and industrial sectors.

For details refer to https://doi.org/10.1016/j.jspr.2021.101852

Performance evaluation of mixed synthetic organic dye as sensitizer based dye sensitized solar cell+

Geetam Richhariya and **Anil Kumar***

Abstract: A combination of two synthetic organic dyes, namely eosin Y and bromophenol were utilized as a novel category of dye for dye-sensitized solar cells (DSSCs). XRD study revealed the anatase form of titanium dioxide. SEM showed roughly spherical and non-homogenous nature of particles. Energy dispersive spectroscopy (EDS) spectrum analysis showed no impurity in TiO_2 and ZnO, thus revealing purity in photo electrode materials. The absorbance of dyes was observed by using UV–Vis absorbance spectroscopy. The dyes showed absorbance from visible to near infra red region. Electrochemical impedance spectroscopy (EIS) measures dye solar cell internal resistance. The performance of photovoltaic cells was studied under 100 mW/cm^2 illumination. An enhancement in the power conversion was achieved by using mixed dye (2.31%) that is much higher than single dyed cell (1.62%; eosin Y). The mixed dye exhibiting good device performance and high electrocatalytic activity can provide a sufficiently low cost dye for ruthenium free DSSCs.

For details refer to https://doi.org/10.1016/j.optmat.2020.110658

**Corresponding Author*
+Eligible for Certificate only

BIOGRAPHY

DR. ANKIT SONTHALIA

Department of Mechanical Engineering

Dr. Ankit Sonthalia has a B. Tech in Mechanical Engineering from the VIT, Vellore, M.Tech in Automotive Engineering from the VIT, Vellore in collaboration with ARAI Pune. He joined the Department of Automobile Engineering of SRM IST, NCR Campus in the year 2015. During this period he has published more than 20 research papers in SCI journals. He has written four book chapters and is an invited reviewer for several international journals. He has worked on several projects such as converting waste engine oil to fuel, waste plastic oil to fuel, converted a petrol engine to run on hydrogen. Currently, he is working on producing green hydrogen through environmentally sustainable methods. He is a member of Society of Automotive Engineers and life member of Institution of Engineers, India.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **A. Sonthalia**, S. Garg, R. Sharma, T. Subramanian and N. Kumar, "Effect of electrostatic precipitator on exhaust emissions in biodiesel fuelled CI engine", *Environmental Science and Pollution Research*, vol. 28, pp. 11850–11859, 2021. Impact Factor: 4.223.
2. **A. Sonthalia** and N. Kumar, "Comparison of fuel characteristics of hydrotreated waste cooking oil with its biodiesel and fossil diesel", *Environmental Science and Pollution Research*, vol. 28, pp. 11824–11834, 2021. Impact Factor: 4.223.

Effect of electrostatic precipitator on exhaust emissions in biodiesel fuelled CI engine

Ankit Sonthalia, Shivam Garg, Rishav Sharma, Thiyagarajan Subramanian and Naveen Kumar

Abstract: The exhaust emissions from the compression ignition engines are harmful to both human beings and the environment. After-treatment devices placed in the exhaust are designed to reduce these emissions. These devices have significant conversion efficiency but have various drawbacks such as the cost and availability of the precious catalyst for catalytic converters. In this work, an emission reduction setup was developed that can reduce NO, HC, CO and smoke simultaneously. The emission reduction setup is based on the concept of an electrostatic precipitator (ESP) and plasma generation by corona discharge technique. Both diesel and waste cooking oil biodiesel (WCO) were separately used for the test. The results show that HC emissions at full load with ESP system reduced from 0.71 to 0.27 g/kWh for diesel and for WCO it reduced from 0.81 to 0.31 g/kWh. Similarly, the CO emissions reduced from 1.50 to 0.6 g/kWh for diesel and from 1.95 to 0.92 g/kWh for WCO. The smoke emission and NO emission were also reduced by 30.86 and 29.3% for diesel and WCO and 17 and 18% for diesel and WCO, respectively. However, the carbon dioxide emissions were found to increase as the HC and CO generated were also converted to CO_2. The study shows that the emission reduction setup can effectively reduce the emissions without any effect on the engine performance.

For details refer to https://doi.org/10.1007/s11356-019-07359-1

Comparison of fuel characteristics of hydrotreated waste cooking oil with its biodiesel and fossil diesel

Ankit Sonthalia and Naveen Kumar

Abstract: Compression ignition engines powered by diesel are the work horses of developing countries like India. However, burning fossil fuel causes a lot of air pollution and the depletion of fuel at an alarming rate. Fuels produced from biomass or wastes can partially substitute fossil diesel to decrease its consumption. One such feedstock is waste cooking oil (WCO) which can be easily converted into fuel for diesel engines. The hydrotreating process stands out among the methods available for converting WCO into fuel, since its properties are almost similar to fossil diesel with little or no oxygen content. In this study, the physico-chemical properties of the hydrotreated waste cooking oil (HVO), biodiesel of waste cooking oil, diesel and blends of HVO and diesel are compared. The blends were prepared by mixing 10%, 20%, 30%, 40% and 50% of HVO on volume basis in diesel. The evaporation rate and ignition probability of the fuel samples were found by using a hot-plate test setup. HVO had higher ignition probability than all the test sample. As the percentage of HVO increased in the test samples, the ignition probability increased. The Sauter mean diameter (SMD) of the samples was also found using Malvern Spraytec. The SMD of HVO was larger than diesel but smaller than biodiesel. The study shows that blends of HVO up to 30% are feasible for present use in diesel engines, as the viscosity (2.54, 2.59 and 2.62cSt) and calorific value (42.41, 42.29, 42.08 MJ/kg) of the three blends (10%, 20% and 30%) is close to diesel (2.51cSt and 42.58 MJ/kg). Also, due to high cetane index, neat HVO or blends having higher HVO content (>30%) cannot be used in the existing engines as the engine power output may be affected. Therefore, to use these fuels, the engine needs to be modified which is not feasible for existing engines. The FTIR and GC-MS analysis shows that the HVO has low oxygen content and high amount of paraffins, whereas biodiesel of waste cooking oil has high unsaturation and high oxygen content.

For details refer to https://doi.org/10.1007/s11356-019-07110-w

BIOGRAPHY

MR. ANUJ SHARMA

Department of Mechanical Engineering

Mr. Anuj Sharma is a research scholar at mechanical engineering department in Delhi Technological University. He was admitted into full time PhD in August 2016. He has published 3 papers in SCIE indexed journals, 2 of which are of more than one impact factor.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **Anuj Sharma**, V. Rastogi and A.K. Agrawal, "Estimation and Experimental Validation of Mean-Field Homogenised Effective Properties of Composite", *Experimental Techniques*, vol. 45, pp. 445–456, 2021. Impact Factor: 1.167.

Estimation and Experimental Validation of Mean-Field Homogenised Effective Properties of Composite

Anuj Sharma, V. Rastogi and A.K. Agrawal

Abstract: For composite materials, the system response changes abruptly with a change in the properties of the material. Therefore, attaining significant knowledge about the effect of the material composition on the material properties is crucial. The researchers are looking for new computational methods which can predict these alterations so that the effort in experimental testing can be reduced. In this direction, this paper presents a robust and novel methodology of validating the estimation of the composite's effective through a multi-scale approach by a set of standardized experimentation. These effective properties are estimated through the mean-field homogenization technique whose parameters are driven from the image analysis of Scanning Electron Microscopy (SEM) images. The predicted results are validated with the results obtained by the experimentation as per ASTM E1876 standard. The estimated error between the predicted properties and the experimental values increased with the increase of alumina particle fraction in the matrix. The mean-field homogenization lags behind the experiments for the parameters defined by the image analysis method than the experimental results. The upper bounds of the mean-field homogenization can be used for the composites with higher reinforcement volume fraction.

For details refer to https://doi.org/10.1007/s40799-020-00411-7

BIOGRAPHY

MR. ASEEM DUBEY

Department of Mechanical Engineering

Mr. Aseem Dubey completed his M. Tech. in Thermal Engineering (Department of Mechanical Engineering) from Delhi Technological University in 2020, with First Division (Distinction). He completed his B. Tech in Mechanical Engineering from Dr. APJ Abdul Kalam Technical University, Lucknow, in 2017 with First Division. He has been actively associated with research and publications. He has published four research papers in SCI indexed international journals of repute, out of which two research papers were published under the M. Tech. project. During his masters programme in DTU, he has also presented and published four research papers in various International conferences.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01
Commendable Research Award	01

1. **A. Dubey** and A. Arora, "High-Temperature Distillation Using N-Parallel Evacuated Tube Collector Integrated With Double Slope Solar Still in Force Mode", *Journal of Thermal Science and Engineering Applications*, vol. 1, no. 3, 2021, pp. 031002, 2021, Impact Factor: 1.470.
2. **A. Dubey**, S. Kumar and A. Arora, "Enviro-energy-exergo-economic analysis of ETC augmented double slope solar still with 'N' parallel tubes under forced mode: Environmental and economic feasibility", *Journal of Cleaner Production*, vol. 279, pp. 123859, 2021. Impact Factor: 9.297.

High-Temperature Distillation Using N-Parallel Evacuated Tube Collector Integrated With Double Slope Solar Still in Force Mode

Aseem Dubey and Akhilesh Arora

Abstract: In the present communication, a performance investigation of a double-slope solar still augmented with parallel evacuated tubes under forced mode is carried out for a modified geometry. A comprehensive mathematical model is used for the numerical simulation using the experimental data and incorporating the effect of variable flowrate, water depth, and the number of tubes. An optimum flowrate range ~0.006–0.007 kg/s/tube is found irrespective of the number of tubes and basin water depth to extract optimal energy. The flowrate is validated with other experiments, carried out by various authors. At optimal flowrate with ten tubes and 0.005 m basin water depth, the system yields 6.644 kg, while overall energetic and exergetic efficiencies are observed as ~33.8% and 4.9%, respectively. With an increase in the tubes as 20 and 30, the respective yields are found to be increased by ~2.64% and ~6.62% for nearly the same collector output temperature attainable (≈98.5°C), while the energy and exergy efficiencies decreased significantly by ~24.6% and ~38.6%, compared with ten tubes arrangement. Daily yield and overall exergy efficiency are increased by 13.3% and 19.3%, respectively, using a diffused reflector.

For details refer to https://doi.org/10.1115/1.4047941

Enviro-energy-exergo-economic analysis of ETC augmented double slope solar still with 'N' parallel tubes under forced mode: Environmental and economic feasibility

Aseem Dubey, Shiv Kumar and Akhilesh Arora

Abstract: In this communication, the performance of dual slope solar still augmented with parallel vacuum tubes under forced mode is analyzed, comprising energy and exergy approach at an optimal flow rate. Besides, comprehensive enviro-energy-exergo-economic analyses of the proposed system are also estimated. The respective overall energy and exergy efficiencies are estimated as ~33.8% and ~4.9%, at an optimal flow rate of 0.06 kg/s and 0.005 m water depth. The yearly distillate, energy and exergy productivity are obtained as ~1627 kg, ~1131 kWh and ~152 kWh. Based on energy, the system mitigates ~51.4 tCO_2, 0.37 tSO_2, and 0.15 tNO emissions, while based on exergy, it mitigates ~6.4 tCO_2, 0.04 tSO_2, and 0.02 tNO from the atmosphere during the life span. Accounting environmental cash flow due to CO_2 mitigation, the respective energy and exergy production cost are estimated as Rs 0.46 and Rs 6.6 per kWh. Accounting environmental cash flow based on the net energy and exergy outputs, the distillate production costs are found to be 0.32 R/kg and 0.61 R/kg, respectively. High distillate output, enviro cash flow, emission reduction, and low production cost make the present system compatible and feasible with small collection areas of solar flux.

For details refer to https://doi.org/10.1016/j.jclepro.2020.123859

BIOGRAPHY

MR. ASHOK KUMAR SINGH

Department of Mechanical Engineering

Mr. Ashok Kumar Singh is a research scholar and pursuing his Ph.D. at Mechanical Engineering Department with specialization in Thermal Engineering from Delhi Technological University, Delhi. He has received his B.Tech. degree from Uttar Pradesh Technical University, Lucknow (presently AKTU, Lucknow) in Mechanical Engineering in 2007 and M.Tech from Maharshi Dayanand University, Rohtak, Haryana in Manufacturing Technology and Automation in 2010. Mr. Ashok Kumar Singh has teaching experience about 14 years and published 7 SCI indexed papers in reputed International Journals, and more than 21 Scopus indexed papers in International Conferences and Journals. He has received Commendable Research Award-2020 in 2021 from Delhi Technological University, Delhi. His research areas of interests are solar thermal and solar desaltification systems.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. K. Singh** and Samsher, "A review study of solar desalting units with evacuated tube collectors", *Journal of Cleaner Production*, vol. 279, pp. 123542, 2021. Impact Factor: 9.297.

A review study of solar desalting units with evacuated tube collectors

Ashok Kumar Singh and Samsher

Abstract: To face the problem of freshwater scarcity, many efficient ways were proposed. The potable water among the population especially in solar rich remote areas, evacuated tube collector (ETC) assisted solar desalting units to lead with remarkable performance. Moreover, thermosiphon ETC solar desalting units present a much smarter, self-sustainable, and economic system which does not require any external power to run the system and quite suitable for the remote areas with better self-sustainability rate. This paper covers the review of the performance of ETC assisted solar desalting units with its responsible analytical parameters. An emphasized study on the performance and status of thermosiphon ETC solar desalting units has been reviewed thoroughly. The advancements of ETC integrated solar desalting units (SDU) with the effectiveness of ETC over the other collectors have also been discussed and reported the thermosiphon ETC assisted SDU as an efficient system and better for the self-sustainable working in remote areas.

For details refer to https://doi.org/10.1016/j.jclepro.2020.123542

BIOGRAPHY

MR. CHANDRA SHEKHAR SINGH

Department of Mechanical Engineering

Mr. Chandra Shekhar Singh is pursuing Ph.D. from Department of Mechanical Engineering (CASRAE) at Delhi Technological University, Delhi and presently working as Assistant Professor in Mechanical Engineering Department JIMS College Greater Noida. His research area is Bio-Fuel and Renewable Energy. He has also been "AWSAR" awarded in Ph D Category by DST, Gov. of India.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **C. S. Singh**, N. Kumar and R. Gautam, "Supercritical transesterification route for biodiesel production: Effect of parameters on yield and future perspectives", *Environmental Progress & Sustainable Energy*, vol. 40, no. 6, pp. e13685, 2021. Impact Factor: 2.431.

Supercritical transesterification route for biodiesel production: Effect of parameters on yield and future perspectives

Chandra Shekhar Singh, Naveen Kumar and Raghvenrda Gautam

Abstract: Catalyst-free biodiesel production through supercritical transesterification is faster with the high conversion and a more environment-friendly route than conventional catalyst transesterification. Improving and exploring the new possibilities in this alternative biodiesel production method by including newly available technology will lead us to a more sustainable future. In this paper, supercritical transesterification of biodiesel production has been reviewed in detail. The different parameters of this method, such as temperature, pressure, molar ratio, alcohol types, and residence time which affect the yielding and quality of fuel, have been reviewed. Besides, recycling the energy and suitable feedstock for this method has also been explored to reduce the intensive energy demand and operating cost. Furthermore, light has also thrown on co-solvents effect on this method to reduce the extreme reaction conditions required. At last, the review concludes future recommendations in supercritical transesterification along with the challenges in energy integration and recycling.

For details refer to https://doi.org/10.1002/ep.13685

BIOGRAPHY

MR. FAIZAN KHALID

Department of Mechanical Engineering

Mr. Faizan Khalid is currently employed as Assistant Professor in the Department of Mechanical Engineering, Faculty of Engineering & Technology, Jamia Millia Islamia, New Delhi. He is pursuing his Ph.D. in Mechanical Engineering from Faculty of Engineering & Technology, Delhi Technological University, New Delhi. He has done M. Tech from Indian Institute of Technology Delhi (IITD), New Delhi. He has published around 10 research articles in International Journals and conferences. He possess four years of teaching, research and industrial experience with leading institutions/organizations. His research interest includes Renewable Energy Systems, biofuels and Internal combustion engines.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **F. Khalid**, R.Kumar and F. Khalid, "Feasibility study of a new solar based trigeneration system for fresh water, cooling, and electricity production", *International Journal of Energy Research*, vol. 45, no. 13 pp. 19500-19508, 2021. Impact Factor: 5.164.

Feasibility study of a new solar based trigeneration system for fresh water, cooling, and electricity production

Faizan Khalid, Rajesh Kumar and Farrukh Khalid

Abstract: The utilization of solar energy to generate electricity, cooling, and freshwater in remote areas in a sustainable way still poses lots of challenges to researchers. The aim of the current study is to design a new solar-operated trigeneration system to produce electricity, cooling, and fresh water using parabolic trough collectors in remote areas. Electric power is generated by using Organic Rankine Cycle, and cooling and fresh water (using freezing desalination technique) are obtained by two-stage NH_3–H_2O vapor absorption system run by solar energy. Simulation results show that for PTC arrays of 200 m^2, an electrical output obtained is 3.3 kW, cooling rate is 20.4 kW, and mass flow rate of freshwater produced is 36 kg/h for an average solar irradiation of 0.7 kW/m^2. Furthermore, sensitivity analysis is conducted by varying the parameter like solar irradiation, evaporator temperature, seawater inlet temperature, etc. and their effect on performance characteristics of the overall setup is investigated.

For details refer to https://doi.org/10.1002/er.7054

BIOGRAPHY

MR. FURKAN AHMAD

Department of Mechanical Engineering

Mr. Furkan Ahmad completed M.Tech. in Production Engineering from University of Delhi in year 2018. He has joined Delhi Technological University in year 2019 in Mechanical Engineering Department as a Research Scholar. I have interest in processing and characterisation of Polymeric composite materials and green materials.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **F. Ahmad**, N. Yuvaraj and P. K. Bajpai, "Influence of reinforcement architecture on static and dynamic mechanical properties of flax/epoxy composites for structural applications", *Composite Structures*, vol. 255, pp. 112955, 2021. Impact Factor: 5.407.

Influence of reinforcement architecture on static and dynamic mechanical properties of flax/epoxy composites for structural applications

Furkan Ahmad, N. Yuvaraj and Pramendra Kumar Bajpai

Abstract: Weave architecture of the reinforcement in polymeric composite structures affects macroscopic mechanical properties of the developed composites significantly along with many other factors. In present article, nine different but systematic weave architectures were obtained by changing the number of simultaneous yarns moving in warp and weft direction of flax (*Linum usitatissimum*) woven fabric. Static and dynamic mechanical properties (Tensile, Flexural, Impact, loss modulus, storage modulus and damping factor) of flax fiber reinforced epoxy composites were investigated. The effect of weave configurations on failure mechanism of the developed composites has also been studied morphologically. Scanning electron microscopy (SEM) was performed to investigate the failure mechanism of the developed composites. Tensile strength and modulus was found to be significantly affected by the number of simultaneous load sharing fibers weaved in loading direction and crimp of the fabric respectively. Interlacing points of the fabric seems to control the flexural strength and modulus of the developed composites. Reinforcement architecture was also found to be responsible for the changes in impact strength of developed composites. Consistent with Young's modulus, storage modulus and loss modulus were also affected by weave parameters such as unevenness in the architecture of reinforcement.

For details refer to https://doi.org/10.1016/j.compstruct.2020.112955

BIOGRAPHY

PROF. GIRISH KUMAR

Department of Mechanical Engineering

Dr. Girish Kumar is a faculty member in Mechanical Engineering Department at Delhi Technological University. He holds additional responsibility of Chief Executive Officer of the University Incubator- DTU-IIF. Dr. Kumar is also looking after World Class Skill Centre-DTU as a Nodal Officer. He is associated with Internal Quality Cell (IQAC) of the university. Additionally he is contributing for Desh Ke Mentor program of Delhi Govt. as a member of the Project Monitoring Unit. He has more than 24 years of experience in industry, teaching and research. He served as an Indian Ordnance Factory Services officer for five years before joining to academics. He holds a PhD degree in Reliability Engineering from Indian Institute of Technology Delhi. His teaching and research areas include Optimization, Reliability Engineering, Maintenance Management, Quality engineering, Stochastic Modeling, etc. Dr. Kumar has published more than 50 papers in reputed International Journals and conference proceedings. He completed a visiting faculty assignment at Asian Institute of Technology Bangkok.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. N. Kumar, **G. Kumar** and R. K. Singh, "Big data analytics application for sustainable manufacturing operations: analysis of strategic factors", *Clean Technologies and Environmental Policy*, vol. 23, pp. 965–989, 2021. Impact Factor: 3.636.

Big data analytics application for sustainable manufacturing operations: analysis of strategic factors

Narender Kumar, **Girish Kumar*** and Rajesh Kumar Singh

Abstract: In the present era of Industry 4.0, organizations are transforming from traditional production systems to digital production systems. This transformation is in terms of additional deployment of technologies that lead to digitization and integration of products and services, business processes and customers, etc. A high volume of unstructured data is being created across different processes due to digitization. The digitization captures the data that includes text, images, multimedia, etc., due to multiplicity of platforms, e.g., machine-to-machine communications, sensors networks, cyber-physical systems, and Internet of Things. Managing this huge data generated from different sources has become a challenging task. Big data analytics (BDA) may be helpful in managing this unstructured data for effective decision making and sustainable operations. Many organizations are struggling to integrate BDA with their manufacturing processes for sustainable operations. The application of BDA from a sustainability perspective is not extensively researched in the current literature. Therefore, firstly this study explores the contribution of BDA in sustainable manufacturing operations. It further identifies strategic factors for the successful application of BDA in manufacturing for sustainable operations. For a detailed analysis of strategic factors in manufacturing, a hybrid approach comprising the analytic hierarchy process, fuzzy TOPSIS and DEMATEL is used. Results revealed that development of contract agreement among all stakeholders, engagement of top management, capability to handle big data, availability of quality and reliable data, developing team of knowledgeable, and capable decision-makers have emerged as major strategic factors for the application of BDA in the manufacturing sector for sustainable operations. Major contribution of this study is in analyzing BDA benefits for manufacturing sector, identifying major strategic factors in implementation and categorization of these factors into cause and effect group. These findings may be used by managers as guidelines for successful implementation of BDA across different functions in their respective organization to achieve sustainable operations goal. The results of this study will also motivate industry professionals to integrate BDA with their manufacturing functions for effective decision making and sustainable operations.

For details refer to https://doi.org/10.1007/s10098-020-02008-5

*Corresponding Author

BIOGRAPHY

MR. HUSAIN MEHDI

Department of Mechanical Engineering

Mr. Husain Mehdi is a research scholar in the department of mechanical engineering, Delhi Technological University, Delhi and he received his M.Tech (Machine Design) degree from Aligarh Muslim University, Aligarh in 2013. His teaching and research interests include on Friction stir welding/Processing, Composite material, Machine Design, Computational fluid dynamics (CFD), and advanced materials. He has published more than 30 research papers in reputed journals and conferences. His research publications were cited more than 380 research publications worldwide. He has guided 5 M.Tech scholars. He has successfully organized an international conference on advance research and innovation in Engineering (ICARIE-2017) in 2017 at Meerut Institute of Technology, Meerut, (U.P).

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **H. Mehdi** and R. S. Mishra, "Effect of friction stir processing on mechanical properties and heat transfer of TIG welded joint of AA6061 and AA7075", *Defence Technology*, vol. 17, no. 3, pp. 715-727, 2021. Impact Factor: 3.172.
2. **H. Mehdi** and R. S. Mishra, "Effect of Friction Stir Processing on Mechanical Properties and Wear Resistance of Tungsten Inert Gas Welded Joint of Dissimilar Aluminum Alloys", *Journal of Materials Engineering and Performance*, vol. 30, pp. 1926–1937, 2021. Impact Factor: 1.819.

Effect of friction stir processing on mechanical properties and heat transfer of TIG welded joint of AA6061 and AA7075

Husain Mehdi and R. S. Mishra

Abstract: Tungsten inert gas (TIG) welding is the most commonly used joining process for aluminum alloy for AA6061 and AA7075 which are highly demanded in the aerospace engineering and the automobile sector, but there are some defects occur during TIG welding like micro-crack, coarse grain structure, and porosity. To improve these defects, the TIG welded joint is processed using friction stir processing (FSP).

This paper presents the effect of friction stir processing on TIG welding with filler ER4043 and ER 5356 for dissimilar aluminum alloy AA6061 and AA7075. The mechanical characterization, finite element formulation and mathematical equations of heat transfer of TIG + FSP welded joints are investigated using ANSYS Fluent software by adjusting process parameters of FSP. The results show that the maximum compressive residual stress 73 MPa was obtained at the fusion zone (FZ) of the TIG weldment with filler ER4043, whereas minimum compressive residual stress 37 MPa was obtained at stir zone (SZ) of the TIG + FSP with filler 5356. The maximum heat flux 5.33 × 106 W/m2 and temperature 515 °C have observed at tool rotation 1600 rpm with a feed rate of 63 mm/min. These results give a satisfactory measure of confidence in the fidelity of the simulation.

For details refer to https://doi.org/10.1016/j.dt.2020.04.014

Effect of Friction Stir Processing on Mechanical Properties and Wear Resistance of Tungsten Inert Gas Welded Joint of Dissimilar Aluminum Alloys

Husain Mehdi and R. S. Mishra

Abstract: In this work, we examine TIG welded joints processed with friction stir processing at tool rotational speeds (TRSs) of 700, 800, 900, 1000, and 1100 rpm, with a constant feed rate of 70 mm/min and tilt angle of 1°. The percentage improvement in the tensile strength of TIG + FSP (TF) weldments was observed to be 78.57 and 75.89%, compared with TIG welded joints with ER4043 and ER5356 filler, respectively, at a TRS of 1100 rpm. A maximum tensile strength of 196 MPa was observed in a TF welded joint with ER5356 filler, and a minimum tensile strength of 98 MPa was observed in the TIG weldment with ER4043 filler. Cleavage facets, tear ridges, and large dimples were observed in fractured specimens of TIG welded joints, whereas fine, equiaxed dimples were observed in TF welded joints. A maximum micro-hardness of 137 HV in the stir zone was observed in TF welded joints at a TRS of 1100 rpm. TF welded joints with ER5356 filler had superior wear resistance compared to TIG and TF welded joints with ER4043 filler.

For details refer to https://doi.org/10.1007/s11665-021-05549-y

BIOGRAPHY

DR. KAUSHALENDRA KUMAR SINGH

Department of Mechanical Engineering

Dr. Kaushalendra Kumar Singh is currently a research scholar under the guidance of Professor Rajesh Kumar in the department of Mechanical Engineering, Delhi Technological University, Delhi. He has completed his B.Tech. Mechanical Engineering from B.B.D. National Institute of Technology and Management, Lucknow, Uttar Pradesh and M.Tech. in Machine Design from Al-falah School of Engineering and Technology, Faridabad, Haryana. He has published three research papers in reputed international journals of Elsevier, Springer and Inderscience. He has more than twelve years of teaching experience in Machine Design and Thermal Engineering. He is working as an Assistant Professor in the department of Mechanical Engineering, G. L. Bajaj Institute of Technology and Management, Greater Noida, U.P.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **K. K. Singh**, R. Kumar and A. Gupta, "Multi-objective Optimization of Thermodynamic and Economic Performances of Natural Refrigerants for Cascade Refrigeration", *Arabian Journal for Science and Engineering*, vol. 46, pp. 12235–12252, 2021. Impact Factor: 2.334.

Multi-objective Optimization of Thermodynamic and Economic Performances of Natural Refrigerants for Cascade Refrigeration

Kaushalendra Kumar Singh, Rajesh Kumar and Anjana Gupta

Abstract: In this paper, thermo-economic optimization and comparative analysis of a cascade refrigeration system configured with flash gas removal in its high-temperature cycle (HTC) and flash intercooling with indirect subcooling in lower temperature cycle (LTC) using different natural refrigerant pairs is performed. Thermo-economic optimization is carried out to maximize the exergetic efficiency and minimize the overall cost rate. The optimization model involves six design variables which include subcooling and de-superheating parameters, LTC evaporation and condensation temperatures, HTC condenser temperature and cascade temperature difference. The comparative analysis of twenty-two natural refrigerant pairs based on the results of thermodynamic and economic optimizations reveals that R717-R290 is most efficient pair and R290-R1150 is least efficient refrigerant pair thermodynamically whereas R717-R1270 is the best and R600a-R290 is the worst pair economically. Seven potential refrigerant pairs are chosen via the thermodynamic and economic optimization results and they are further compared based on their performances obtained through multi-objective optimization (maximization of exergetic efficiency and minimization of total cost rate). Multi-objective genetic algorithm is used for optimization which results in seventy non-dominated Pareto optimal solutions where the TOPSIS method is used to select a unique solution for each refrigerant pair. A comparison of refrigerant pairs using these unique solutions shows that R717-R1270 is the best refrigerant pair for the cascade system under consideration. It is also found that R717-R1270 results in 7.77% rise in COP and 5.32% reduction in overall cost when compared with NH_3–CO_2 refrigerant pair working under identical operating conditions.

For details refer to https://doi.org/10.1007/s13369-021-05924-w

BIOGRAPHY

DR. MOHAMMAD ZUNAID

Department of Mechanical Engineering

Dr. Mohammad Zunaid is a Assistant Professor in the Department of Mechanical Engineering, Delhi Technological University (Formerly Delhi College of Engineering) Delhi since 2009. He received his bachelor's and master's Degree in Mechanical Engineering from Aligarh Muslim University, Aligarh, India. He did his Ph.D. in the area of Computational Fluid Dynamics applications in Fluid mechanics and heat & mass transfer from the Department of Mechanical Engineering, Delhi Technological University, Delhi. His teaching and research interest are in the area of heat & mass transfer, and Computational Fluid Dynamics. He guided more than fourteen M.Tech. and he has also published more than forty-five research papers in reputed international/ national journals and conferences proceedings.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. S. Tokas, **M. Zunaid** and M. A. Ansari, "Numerical investigation of the performance of 3D-helical passive micromixer with Newtonian fluid and non-Newtonian fluid blood", *Asia-Pacific Journal of Chemical Engineering*, vol. 16, no. 1, pp. e2570, 2021. Impact Factor: 1.447.

Numerical investigation of the performance of 3D-helical passive micromixer with Newtonian fluid and non-Newtonian fluid blood

Sulekh Tokas, **Mohammad Zunaid*** and Mubashshir Ahmad Ansari

Abstract: Mixing at microscales is purely governed by the diffusion mass transport phenomenon, which is a time-consuming process requiring a prolonged length of the microchannel to obtain desired results. The present study proposes a novel three-dimensional helical micromixer (TDHM) with a rectangular cross-section to achieve splendid mixing performance within a short distance contrary to the simple T-micromixer (STM). A thorough numerical investigation of mixing performance and fluid flow patterns has been conducted using the continuity, species transport, and the Navier–Stokes equations with Newtonian and non-Newtonian fluid at a wide range of Reynolds number (0.2–320) and mass flow rate (0.00005–0.091 kg/h), respectively. Blood is selected as the non-Newtonian fluid, and its rheological characteristics are numerically captured by implementing the Carreau–Yasuda model, whereas water is used to study mixing with the Newtonian fluid. At Re = 2, the mixing index of TDHM is 40. 5% more than that of the STM with water as the working fluid, whereas for blood, it is 34.3%, and thus, it was concluded that the TDHM gives much better performance at much less axial distance than that of the STM at all values of the Reynolds number and flow rates considered in the study. Therefore, TDHM can be utilized for various biomedical, chemical, and biochemical applications.

For details refer to https://doi.org/10.1002/apj.2570

**Corresponding Author*

BIOGRAPHY

MR. MOHD ASJAD SIDDIQUI

Department of Mechanical Engineering

Mr. Mohd Asjad Siddiqui is a research scholar in the area of Thermal Engineering in the Department of Mechanical Engineering at Delhi Technological University (DTU) Delhi. He is a competent and valued researcher in the area of Alternative fuel combustion, Thermal-fluid science, and Renewable energy-based power generation and cooling systems. He has experience in teaching various subjects of Mechanical Engineering which includes; Thermodynamics, Fluid Mechanics, Automotive Components Design, Energy Sources for Automobiles. He has a solid background in thermodynamic concepts and computational skills required to simulate the performance of renewable energy systems and published research papers in reputed international journals.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **M. A. Siddiqui**, A. Khaliq and R. Kumar, "Proposal and analysis of a novel cooling-power cogeneration system driven by the exhaust gas heat of HCCI engine fuelled by wet-ethanol", *Energy*, vol. 232, pp. 120954, 2021. Impact Factor: 7.147.

Proposal and analysis of a novel cooling-power cogeneration system driven by the exhaust gas heat of HCCI engine fuelled by wet-ethanol

Mohd Asjad Siddiqui, Abdul Khaliq and Rajesh Kumar

Abstract: A novel combined power and cooling cycle consisting of the ejector refrigeration cycle (ERC) and organic Rankine cycle (ORC) is proposed to enhance the overall efficiency of wet-ethanol fuelled homogeneous charge compression ignition (HCCI) engine. The proposed combined system of cooling-power cogeneration was simulated by Engineering Equation Solver (EES) software. Combined system responses to altering the operative conditions on the energy and exergy performances are ascertained to obtain guidance for system design. The results are computed for R134a, R290, and R600a working fluids. Increase in turbocharger pressure ratio from 2.5 to 3.5 raises the thermal efficiency of cooling-power cogeneration from 47.87% to 50.09% when R134a is used as working fluid. Cooling capacity and exergy of refrigeration are decreased by greater than 2.0% in case of R134a operated system when the vapor generator pressure is elevated from 1800 kPa to 2200 kPa. Increase in evaporator pressure of ERC from 327.4 kPa to 348.7 kPa is greatly beneficial to thermodynamic performance of cogeneration and its cooling capacity is improved by 11.34% when R134a is utilized as the working. When P_{Evap} rises from 175.7 kPa to 186.9 kPa and R600a is employed as the working fluid, the cooling capacity is increased by 12.58%.

For details refer to https://doi.org/10.1016/j.energy.2021.120954

BIOGRAPHY

MR. MOHIT VISHNOI

Department of Mechanical Engineering

Mr. Mohit Vishnoi pursuing part time Ph.D. under the supervision of Dr. Qasim Murtaza and Dr. Paras Kumar in Mechanical Engineering at Delhi technological University. His current area of research is surface modifications.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **M. Vishnoi**, P. Kumar and Q. Murtaza, "Surface texturing techniques to enhance tribological performance: A review", *Surfaces and Interfaces*, vol. 27, pp. 01463, 2021. Impact Factor: 4.837.

Surface texturing techniques to enhance tribological performance: A review

Mohit Vishnoi, Paras Kumar and Qasim Murtaza

Abstract: Texturing of the surface is a technique to form the surfaces of the desired pattern. It is extensively used to alter the mechanical and tribological properties, such as increased fatigue strength, corrosion, wear resistance, anti-biofouling hydrophobicity and load-carrying capacity. To get these benefits, many researchers have studied the importance of textured parameters on metals and non-metals and revealed that un-optimized parameters might deteriorate the properties of the materials. These texture parameters may be dimple shape, depth, diameter, and density. Even though laser surface texturing widely used method, this review article articulates detailed information about surface texturing methods available to fabricate, surface texture characterization, merits, demerits, and applications of textured surfaces on metals and non-metals to enhance tribological performance.

For details refer to https://doi.org/10.1016/j.surfin.2021.101463

BIOGRAPHY

DR. MUKUL TOMAR

Department of Mechanical Engineering

Dr. Mukul Tomar pursued his Ph.D. at the Centre for Advanced Studies and Research in Automotive Engineering (CASARE), Mechanical Engineering Department, Delhi Technological University, Delhi. He did his B.Tech in Mechanical Engineering from Graphic Era University Dehradun; M.Tech in Thermal Engineering from Gautam Buddha University, Greater Noida (U.P). His research expertise includes alternative fuels with special emphasis on Biofuels and Biomass, Waste Recycling, Micro/Nano-scale Fuel additives (synthesis, characterization and utilization), Combustion, Spray droplet characterization, Exhaust Emissions and Heat transfer and flow characterization. He has authored/co-authored more than 12 quality research/ review papers in renowned International Journals of repute and conferences. Moreover, he has also written collaborative book chapters for well-known publishers such as Springer, Intech Open and CRC Press. He also serves as a reviewer for many journals published by SAE, Taylor & Francis, Wiley, etc. In reward for his exemplary contribution, he had been invited at SAE world congress and ASME World Congress 2018 USA, to present his research work and exchanging experiences with leading experts and researchers.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **M. Tomar**, A. Sonthalia, N. Kumar and H. Dewal, "Waste glycerol derived bio-propanol as a potential extender fuel for compressed ignition engine", *Environmental Progress & Sustainable Energy*, vol. 40, no. 2, pp. e13526, 2021, Impact Factor: 2.431.

Waste glycerol derived bio-propanol as a potential extender fuel for compressed ignition engine

Mukul Tomar, Ankit Sonthalia, Naveen Kumar and Hansham Dewal

Abstract: In recent years there has been a significant rise in crude glycerol generation due to the booming biodiesel industries. Despite having immense benefits, the presence of poisonous methanol and fatty acids, glycerol is treated as a waste by-product of biodiesel. In the present study, investigations have been carried out on utilizing the potential of glycerol derived bio-propanol as an extender fuel with diesel/gasoline blends. Test fuels containing ternary blends of diesel/gasoline/bio-propanol in different volume concentrations were prepared. The crude glycerol was procured from transesterified Kusum (*Schleichera oleosa*) oil. The physicochemical properties, along with stability and homogeneity of the test fuels were evaluated as per ASTM/EN standards and compared with the neat diesel. To study the effect of fuel properties on atomization process, the sauter mean diameter of the test fuels were observed using Malvern spraytec test. The engine performance, combustion and emission characteristics of a single-cylinder diesel engine fuelled with different test fuels were also conducted. Due to the enhancement in mixing rate promoted by low cetane fuels, the ignition delay and heat release rate was higher than diesel. Moreover, the results also reveal upto 5% increase in brake thermal efficiency and a significant reduction in harmful exhaust emission with an increase in the gasoline and bio-propanol share in the blend. The oxide of nitrogen (NO_x) emissions was also lower than diesel for all the fuel blends. In comparison to diesel, the maximum reduction in NO_x, HC, CO and smoke emissions is 7.4%, 33.3%, 55.7%, and 17.2%, respectively, for D40:G30:P30 fuel blend.

For details refer to https://doi.org/10.1002/ep.13526

BIOGRAPHY

DR. N. YUVARAJ

Department of Mechanical Engineering

Dr. N. Yuvaraj has obtained his bachelor's degree in production engineering from Government College of Technology, Coimbatore, India, master's Degree in Mechanical Engineering from Delhi College of Engineering, Delhi University, Delhi, India, and PhD in Mechanical Engineering from DTU. Since 2000, he has been working as an Assistant Professor in the Department of Mechanical Engineering, Delhi Technological University (Formerly Delhi College of Engineering), Delhi, India. He is doing active research in the area of surface composites, friction stir welding, casting welding, and wire arc additive manufacturing. He has published 51 papers in different journals & conferences at national & international level.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. J. G. Roy, **N. Yuvaraj** and Vipin, "Effect of Welding Parameters on Mechanical Properties of Cold Metal Transfer Welded Thin AISI 304 Stainless-Steel Sheets", *Transactions of the Indian Institute of Metals*, vol. 74, pp. 2397–2408, 2021. Impact Factor: 1.499.

Effect of Welding Parameters on Mechanical Properties of Cold Metal Transfer Welded Thin AISI 304 Stainless-Steel Sheets

Jayanta Ghosh Roy, **N. Yuvaraj*** and Vipin

Abstract: Cold metal transfer (CMT) allows thin plates to be joined with minimal distortion and without spattering. In this paper, the CMT process has been used to weld AISI 304 stainless steel. To investigate the weld strength properties, various welding process parameters such as welding current, welding speed, and contact-to-work distance (CTWD) were chosen. The results show that there is no fracture on the weld joint; the tensile residual stress levels of all the samples are in a controlled manner. FESEM images reveal a dimpled morphology and crack-free tensile fracture surfaces in welded joints. Welding speed is the most significant welding process parameter, followed by welding current and CTWD on the tensile strength of the welded joint. The joint welded at a welding current of 95 A, a welding speed of 4 mm/sec and CTWD 7 mm exhibits higher weld strength compared with other welded joints.

For details refer to https://doi.org/10.1007/s12666-021-02326-2

**Corresponding Author*

BIOGRAPHY

DR. PARAS KUMAR

Department of Mechanical Engineering

Dr. Paras Kumar is working as an Assistance Professor in Mechanical Engineering Department, Delhi Technological University Delhi since 2010 and has 21 years of teaching and research experience. He received his PhD degree from DTU Delhi. He has published 40 research papers in reputed journals and conferences. His research interest includes tribology, machine design, wear modelling and simulation, noise monitoring and modelling.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **P. Kumar** and H. Hirani, "Misalignment effect on gearbox failure: An experimental study", *Measurement*, vol. 169, pp.108492, 2021. Impact Factor: 3.927.
2. **P. Kumar**, "Traffic noise prediction and optimization using response surface method (RSM)", *Arabian Journal of Geosciences*, vol. 14, no. 2181, 2021. Impact Factor: 1.827.

Misalignment effect on gearbox failure: An experimental study

Paras Kumar and Harish Hirani

Abstract: Overhang-meshing gears, deflection of pinion/gear shaft, bearing wear, assembly error, poor adjustment of bearings and foundation are the reasons of misalignment in gear drives.

In the present work, the misalignment effect on gearbox failure is investigated experimentally using vibration analysis. Misalignment between motor and gearbox is measured using laser alignment system (LAS). The effect of input shaft speed and load on the gearbox failure is also discussed.

The misalignment effect primarily observes on the gearbox drive end taper roller bearing and distresses gear transmission. Physical and microscopic examinations of the dismantle gearbox confirm similar findings as observe from vibration spectrum. Severe damages in taper roller bearing (32206) and multiple pits on all the rollers and cone. The bearing cage is deformed badly due to overload and misalignment. The effect of bearing failure on gear's damage is also investigated. Non-uniform contact patch is observed on the meshing gears in the plane of action. Misalignment results in scuffing failure on the pinion addendum and gear dedendum regions due to limited lubricant in the overstress region. At the end of the test, all the four seals appears safe, while the coupling spiders damage seriously.

For details refer to https://doi.org/10.1016/j.measurement.2020.108492

Traffic noise prediction and optimization using response surface method (RSM)

Paras Kumar

Abstract: In the present work, a hybrid modeling approach, namely response surface method (RSM) and artificial neural network (ANN), is used to predict and optimize the traffic noise descriptors. In response surface method (RSM), the value of the input parameters, number of experiments, and their sequence are based on central composite design (CCD). Four different models have developed to study the effect of total vehicle volume/hour(LogQ), percentage of heavy vehicles(P%), and average vehicle speed (LogV) on 10 percentile exceeded sound level (L10) and equivalent continuous sound level(Leq).These models include linear, square, interaction, and full quadratic terms of the input variables. Model adequacy is also tested using analysis of variance (ANOVA). The analysis shows that the full quadratic model (4) outperforms the other models in better accuracy and prediction capability. The residual values for model (4) lies in the range of $+0.9/-0.5$ dB (A) for L_{10} and $+0.8/-0.5$ dB (A) for Leq during model development stage. Testing results of the same model (4) also predict least residual values in the range of ± 0.2 dB (A) for L_{10} and $+0.3/-0.6$ dB (A) for *Leq*, respectively. Moreover, it is observed that the linear terms and square and interaction terms of traffic noise parameters have a significant effect on the prediction capability of traffic noise descriptors. As far as the optimization is concerned, the overlaid plot gives better visualization of the feasible region(*LogQ*,*LogV*,*P*%); they are satisfying the criteria of both the responses. Response optimizer is also used to decide the value of the input parameters to get the composite desirability of both the responses equal to one.

For details refer to https://doi.org/10.1007/s12517-021-08547-5

BIOGRAPHY

DR. PRAVIN KUMAR

Department of Mechanical Engineering

Dr. Pravin Kumar is working as an Associate Professor in the Department of Mechanical Engineering, Delhi Technological University, Delhi. He has more than 21 years of Teaching and research experience. His areas of expertise are Industrial Engineering and Management, Supply Chain and Operations Management, Quality Management, and Engineering Economy. He has published many research articles in the International Journals of reputes such as Resources, Conservation, and Recycling; Annals of Operations Research; Cleaner Technologies and Environmental Policy; Environment. Development, and Sustainability; Applied Soft Computing etc. He has also authored few books on Engineering Economy, Industrial Engineering and Management.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	03

1. **P. Kumar**, R. K. Singh, J. Paul and O. Sinha, "Analyzing challenges for sustainable supply chain of electric vehicle batteries using a hybrid approach of Delphi and Best-Worst Method", *Resources, Conservation and Recycling*, vol. 175, pp. 105879, 2021. Impact Factor: 10.204.
2. **P. Kumar**, R. K. Singh and V. Kumar, "Managing supply chains for sustainable operations in the era of industry 4.0 and circular economy: Analysis of barriers", *Resources, Conservation and Recycling*, vol. 164, pp. 105215, 2021. Impact Factor: 10.204.
3. **P. Kumar** and R. K. Singh, "Selection of sustainable solutions for crop residue burning: an environmental issue in northwestern states of India", *Environment, Development and Sustainability*, vol. 23, pp. 3696–3730, 2021. Impact Factor: 3.219.

Analyzing challenges for sustainable supply chain of electric vehicle batteries using a hybrid approach of Delphi and Best-Worst Method

Pravin Kumar, Rajesh Kr Singh, Justin Paul and Oikantik Sinha

Abstract: Due to global warming and fast depletion of fossil fuels, the option of battery-operated electric vehicles (EVs) has emerged as one of the most popular alternatives for sustainable transport. In the present study, India is considered as a case country to explore the challenges in sustainable supply chain of electric vehicle batteries. India, being the second most populated country after China and having limited reserves of fossil fuels, has great potential to excel in electric vehicle supply chains. In addition, growth of electric vehicle markets in India is in the emerging phase. With increasing demand for EVs, the industry is facing many challenges for sustainable supply chain of electric vehicle batteries. The lithium-ion battery is a major component of electric vehicles. Many challenges for sustainability of electric vehicle battery supply chains have been extracted through literature review and discussions with industry experts. These challenges may be categorized as operational, technological, economic, environmental and social. Delphi technique is utilized to finalize major challenges for analysis. For further prioritization of these challenges, Best-Worst Method (BWM) is used. Finally, findings of

the BWM are validated through an empirical study by collecting responses from 87 respondents. It is observed that ineffective recycling and reuse of batteries, disposal of batteries, and insufficient charging infrastructure are the three most important challenges in EV battery supply chain in India. The findings may be equally relevant in many developing countries having similar technological and infrastructure constraints. It will help policymakers in developing strategies for sustainable transport systems in developing countries.

For details refer to https://doi.org/10.1016/j.resconrec.2021.105879

Managing supply chains for sustainable operations in the era of industry 4.0 and circular economy: Analysis of barriers

Pravin Kumar, Rajesh Kr Singh and Vikas Kumar

Abstract: Organizations are struggling to leverage emerging opportunities for maintaining sustainability in the global markets due to many barriers in the era of Industry 4.0 and circular economy. The main aim of this study is to analyze these barriers to improve the sustainability of a supply chain. Our study identifies the major criteria for sustainable operations and barriers that need to be overcome to achieve the objectives of sustainability through literature review and experts' opinions. An integrated approach comprising Analytic Hierarchy Process (AHP) and Elimination and Choice Expressing Reality (ELECTRE) is used to analyze these barriers and ensure the sustainable supply chain operations. Resource circularity, increasing profits from green products, and designing processes for resource and energy efficiency have been found to be as major sustainability criteria.

There are many barriers to the implementation of Industry 4.0. These barriers include but are not limited to, a lack of a skilled workforce that understands Industry 4.0, ineffective legislation and controls, ineffective performance framework, and short-term corporate goals. The study finds that ineffective strategies for the integration of industry 4.0 with sustainability measures, combined with a lack of funds for industry 4.0 initiatives, are just two of the major barriers. The findings of the study will help organizations to develop an effective and integrated strategic approach that will foster sustainable operations through the utilization of improved knowledge of Industry 4.0 and the circular economy.

For details refer to https://doi.org/10.1016/j.resconrec.2020.105215

Selection of sustainable solutions for crop residue burning: an environmental issue in northwestern states of India

Pravin Kumar and Rajesh Kr Singh

Abstract: The main purpose of the paper is to find the sustainable solutions for crop residues burning in the northwestern states of India. Pre- and post-monsoon burning of the crop residues in Punjab, Haryana, Rajasthan, and western Uttar Pradesh increases the particulate matter significantly in the environment. During this period, the wind remains stagnant in Delhi NCR (National Capital Region) which creates an airlock situation in this region. The air quality during this period becomes very poor. It is a major health issue in the northern part of the country, especially in NCR Delhi which is densely populated and industrialized. It has become a major concern for the state as well as central government. Therefore, the purpose of this study is to review the factors forcing the farmers to burn the crop residues in the field and analyze the solutions considering the social and economic sustainability of the farmers. A focus group discussion composed of farmers, academicians, and industry experts has been used to get the opinion regarding the solutions for crop residues burning in the field. For an analysis of the information collected, a hybrid approach of analytic hierarchy process and elimination and choice expressing reality have been used. Based on the analysis, it is observed that use of crop residues for the preparation of biogas, biochar, and bioethanol is the most preferred substitute, whereas use as fuel for the thermal power plant is the second preferred substitute for use of crop residues.

For details refer to https://doi.org/10.1007/s10668-020-00741-x

BIOGRAPHY

PROF. RAJESH KUMAR

Department of Mechanical Engineering

Prof. Rajesh Kumar is currently employed as Professor in the Department of Mechanical Engineering, Delhi Technological University, Delhi. He has completed his B. Tech. in Mechanical Engineering from HBTI Kanpur, and M.E. in Thermal Engineering from IIT Roorkee. He received his Ph.D. from Jamia Millia Islamia, New Delhi in the area of refrigeration and air-conditioning. He has more than 21 years' experience of teaching & Research in the fields of Thermodynamics, Refrigeration & Air conditioning, Renewable energy and Fluid Mechanics. He has guided and guiding more than 22 M. Tech and 17 Ph. D. thesis. He has published more than 34 research papers in reputed international journals of Elsevier, ASME Transactions, ASHRAE Transaction, Wiley, Inderscience, Springer etc. He is also a reviewer of ASME, Elseveir, Inderscience, Springer, Wiley. He is a life member of Solar Energy Society of India and fellow of Institution of Engineers.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01
Commendable Research Award	01

1. A. Khaliq, B. A. Almohammadi, M. A. Alharthi, M. A. Siddiqui and **R. Kumar**, "Investigation of a Combined Refrigeration and Air Conditioning System Based on Two-Phase Ejector Driven by Exhaust Gases of Natural Gas Fueled Homogeneous Charge Compression Ignition Engine", *Journal of Energy Resources Technology*, vol. 143, no. 12, pp. 120911, 2021. Impact Factor: 2.903.

2. K. K. Singh, **R. Kumar** and A. Gupta, "Multi-objective Optimization of Thermodynamic and Economic Performances of Natural Refrigerants for Cascade Refrigeration", *Arabian Journal for Science and Engineering*, vol. 46, pp. 12235–12252, 2021. Impact Factor: 2.334.

Investigation of a Combined Refrigeration and Air Conditioning System Based on Two-Phase Ejector Driven by Exhaust Gases of Natural Gas Fueled Homogeneous Charge Compression Ignition Engine

Abdul Khaliq, Bandar A. Almohammadi, Mathkar A. Alharthi, Mohd Asjad Siddiqui and **Rajesh Kumar***

Abstract: A natural gas-fueled homogeneous charge compression ignition (HCCI) engine is coupled to an exhaust gas operated turbine driven two-phase ejector cycle to generate power and cooling energy, simultaneously. By establishing a thermodynamic model, the simulation of the proposed system and its parametric analyses are conducted. Energetic and exergetic investigations are carried out to study the role of equivalence ratio, engine speed, condenser temperature, refrigeration evaporator temperature, air-conditioning evaporator temperature, and ejector nozzle efficiency on the thermodynamic performance parameters of the combined cycle. The analysis of two-phase ejector cooling cycle using three working fluids including R717, R290, and R600a is conducted. Results reveal that the thermal efficiency of HCCI engine is increased from 47.44% to 49.94%, and for the R600a operated combined cycle it is increased from 60.05% to 63.26% when the equivalence ratio is promoted from 0.3 to 0.6. Distribution of fuel exergy results show that out of 100% exergy input, in case of R717 operated combined cycle, 139.79 kW (38.72%) is the total exergy output, and 164.21 kW (45.49%) and 57 kW (15.79%) are the values for exergy destruction and exergy losses. It is further shown that change in refrigerant minorly influence the percentages of exergy distribution.

For details refer to https://doi.org/10.1115/1.4052248

Multi-objective Optimization of Thermodynamic and Economic Performances of Natural Refrigerants for Cascade Refrigeration

Kaushalendra Kumar Singh, **Rajesh Kumar*** and Anjana Gupta

Abstract: In this paper, thermo-economic optimization and comparative analysis of a cascade refrigeration system configured with flash gas removal in its high-temperature cycle (HTC) and flash intercooling with indirect subcooling in lower temperature cycle (LTC) using different natural refrigerant pairs is performed. Thermo-economic optimization is carried out to maximize the exergetic efficiency and minimize the overall cost rate. The optimization model involves six design variables which include subcooling and de-superheating parameters, LTC evaporation and condensation temperatures, HTC condenser temperature and cascade temperature difference. The comparative analysis of twenty-two natural refrigerant pairs based on the results of thermodynamic and economic optimizations reveals that R717-R290 is most efficient pair and R290-R1150 is least efficient refrigerant pair thermodynamically whereas R717-R1270 is the best and R600a-R290 is the worst pair economically. Seven potential refrigerant pairs are chosen via the thermodynamic and economic optimization results and they are further compared based on their performances obtained through multi-objective optimization (maximization of exergetic efficiency and minimization of total cost rate). Multi-objective genetic algorithm is used for optimization which results in seventy non-dominated Pareto optimal solutions where the TOPSIS method is used to select a unique solution for each refrigerant pair. A comparison of refrigerant pairs using these unique solutions shows that R717-R1270 is the best refrigerant pair for the cascade system under consideration. It is also found that R717-R1270 results in 7.77% rise in COP and 5.32% reduction in overall cost when compared with NH_3–CO_2 refrigerant pair working under identical operating conditions.

For details refer to https://doi.org/10.1007/s13369-021-05924-w

**Corresponding Author*

BIOGRAPHY

DR. RAVI BUTOLA

Department of Mechanical Engineering

Dr. Ravi Butola is currently working as an Assistant Professor in the Department of Mechanical Engineering at Delhi Technological University, Delhi. He has completed his Ph.D. from Delhi Technological University, Delhi. He received the B.Tech degree from G.B.Pant University of Agriculture and Technology, Pantnagar, Uttarakhand and M.Tech from Delhi Technological University, Delhi. He has 9 year of teaching experience. He has published more than 35 research papers in International Journal/Conferences Proceeding, and 5 Book chapters. He is working in the area of advance manufacturing, composite material and surface modification. He is also a reviewer of Journal of Material Research (JMR), Journal of Adhesion Science and Technology (T&F), Journal of Mechanical Engineering Science (SAGE), Surface Topography: Metrology and Properties (IOP) etc.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Butola**, P. Chandra, K. Bector and R. M. Singari, "Fabrication and multi-objective optimization of friction stir processed aluminium based surface composites using Taguchi approach", *Surface Topography: Metrology and Properties*, vol. 9, no. 2, pp. 025044, 2021. Impact Factor: 2.038.

Fabrication and multi-objective optimization of friction stir processed aluminium based surface composites using Taguchi approach

Ravi Butola, Prakash Chandra, Kartikeya Bector and Ranganath M Singari

Abstract: Friction stir processing is a technique for the modification and fabrication of surface composites. Surface composites of aluminium have a diverse application in industries like aerospace and automobile. Here, B_4C nano-particles (< 30 nm) have been employed as the reinforcement on AA7075 based substrate alloy and surface composites have been constructed at varying Tool rotation and Tool traverse speeds. The influence of these varying factors on the ultimate tensile strength (UTS), microhardness (Hv) and residual stress (RS) have been studied. Taguchi L9 orthogonal array was used for the DOE and the changes in the mechanical properties of these nine samples with regards to the tool rotation speeds of 800 rpm, 1000 rpm and 1200 rpm and the tool traverse speeds of 40 mm min^{-1}, 50 mm min^{-1} and 60 mm min^{-1} were investigated. It was found that between the two processing variables, Tool traverse speed was the more significant variable. 800 rpm and 60 mm min^{-1} were determined to be the optimum parameters for Friction stir processing and the predicted values of microhardness (Hv) through Taguchi analysis were the most accurate.

For details refer to https://doi.org/10.1088/2051-672X/ac0ba3

BIOGRAPHY

DR. SACHIN DHULL

Department of Mechanical Engineering

Dr. Sachin Dhull has completed Ph.D. from Delhi Technological University, M.Tech. from YMCAUST Faridabad and B.Tech from Kurukshetra University. Currently he is working as an assistant professor in Maharaja Surajmal Institute of Technology, GGSIPU Delhi. His field of specialization includes manufacturing process and applied mechanics. He has more than 7 years of research and teaching experience. He has published more than 8 research papers in various journals including SCIE, ESCI, scopus and other reputed journals and presented more than 7 research papers in national and international conferences. In addition, he has got one patent and one book published. He has guided one M.Tech. student. He has qualified GATE ME exam 7 times.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Dhull**, R. S. Walia, Q. Murtaza and M. S. Niranjan, "Experimental, Computational and Mathematical Analysis of Hybrid Abrasive Flow Machining Process", *International Journal of Precision Engineering and Manufacturing*, vol. 22, pp. 1657–1680, 2021. Impact Factor: 2.106.

Experimental, Computational and Mathematical Analysis of Hybrid Abrasive Flow Machining Process

Sachin Dhull, R. S. Walia, Qasim Murtaza and M. S. Niranjan

Abstract: The current scenario of industrialization requires need for higher productivity which is met by advanced material removal process, i.e., abrasive flow machining (AFM) in which the internal surfaces of the workpiece is machined to higher accuracy level with the help of abrasive laden media. In this paper, the conventional AFM setup has been made hybrid using electrolytic and magnetic force arrangement alongwith rotational effect in order to achieve better results in terms of material removal and surface roughness. The newly developed in-house polymer media were utilized in the process and the input parameters taken during experimentation were magnetic flux, electrolytic rod size and shape, rotational speed, polymer media, abrasive particles and extrusion pressure. It was found that the material removal and surface roughness improvement were more in electrochemo magneto rotational AFM process compared to conventional AFM process. The experimental values were in confirmation with those obtained in the optimization techniques applied, i.e., Taguchi L9 OA, Matlab fuzzy logic and GRA-PCA. In addition, the hybrid mathematical model was developed and effect of different forces occurring in the process and computational flow analysis of media have been explained.

For details refer to https://doi.org/10.1007/s12541-021-00565-3

BIOGRAPHY

MR. SHRIKANT VIDYA

Department of Mechanical Engineering

Mr. Shrikant Vidya is a research scholar in the Department of Mechanical Engineering, Delhi Technological University, New Delhi. He holds a master's degree from Indian Institute of Technology (Indian School of Mines), Dhanbad. As recognition of his academic achievements, he has received an appreciation certificate from working institute for his research activities. He is presently working as an Assistant Professor in the Department of Mechanical Engineering at Galgotias University, Greater Noida. Mr. Shrikant has been involved in research on non-conventional machining, micro machining, micro measurement and additive manufacturing. He has authored many research papers in International Journals and Conferences of repute.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **S. Vidya**, R. Wattal and P. V. Rao, "Investigation of machining performance in die-sinking electrical discharge machining of pentagonal micro-cavities using cylindrical electrode", *Journal of the Brazilian Society of Mechanical Sciences and Engineering*, vol. 43, no. 288, 2021. Impact Factor: 2.220.

Investigation of machining performance in die-sinking electrical discharge machining of pentagonal micro-cavities using cylindrical electrode

Shrikant Vidya, Reeta Wattal and P. Venkateswara Rao

Abstract: The aim of the present article is to fabricate pentagonal micro-cavities and describe the influence of current on the machining performances. Machining of EN-24 alloy steel samples was performed in die-sinking electrical discharge machining (EDM) machine with varying values of current using polygon cycle approach. The machined pentagonal cavities were examined under optical microscope and scanning electron microscope (SEM) to evaluate machining performances in terms of corner error, white layer formation, surface crack distribution, and globule formation. It is found that as the value of current increases, there is more formation of white layer with non-uniform distribution of cracks and the thickness of white layer increased from 6.21 to 8.20 µm with increase in current. On the other hands, surface finish deteriorates when the current value rises. In addition to this, there is an enhancement in tool wear rate with increasing current. At the higher values of current, the spark energy increases which leads to greater melting and evaporation and production of smoke and bubbles on the dielectric surface. This study revealed that die-sinking EDM coupled with short electronic pulses and precise electrode movement is capable of producing microstructures under appropriate operating conditions.

For details refer to https://doi.org/10.1007/s40430-021-03012-6

BIOGRAPHY

PROF. VIJAY GAUTAM

Department of Mechanical Engineering

Dr. Vijay Gautam is Professor in Department of Mechanical Engineering, DTU, Delhi since 27th December 2016. He graduated from Delhi College of Engineering, Delhi University (presently Delhi Technological University) in 1995 and did his post graduation in Manufacturing Engineering from National Institute of Foundry and Forge Technology (NIFFT), Ranchi University in 1998. He completed his Ph.D. on the topic "Investigations on Springback in V-Bending of Tailor Welded Blanks" under the expert guidance of Prof. D. Ravi Kumar, from Department of Mechanical Engineering, IIT Delhi in Dec 2016. He has more than 21 years of teaching experience in the field of Manufacturing Processes, Mechanics of Solids, Machine Design, Design of Machine Elements, Design of Automobile Components, Metallurgy, Foundry Technology and Plasticity and Metal Forming. He has been teaching these subjects at both Undergraduate and Postgraduate levels. His research areas are focussed in the field of Metal Forming, Machine Design and Design of Automotive Components and Composite laminates and material characterization. He has guided many under-graduate and graduate students for various projects. He has published his research work in 23 international journals and 40 International and National conferences. He has also been serving to DTU as a member secretary to Department Research Committee (DRC) and an active Director to the centre for competitive examinations (CCE) since Nov. 2018 which is a centralised facility in DTU for various examinations of UPSC, IES, IAS, allied services, GATE for Public Sector Undertaking (PSU) etc. He was Faculty Advisor to SAE-Delhi DTU Chapter and a member of SAE (Society for Automotive Engineers). He had been faculty advisor to team MINI BAJA for five consecutive years and the team participated in many events in India and abroad and won many awards and laurels till 2018.

Award Summary and Publications Details

Category Title	Number of Publications
Premier Research Award	01

1. P. K. Sharma, **V. Gautam** and A. K. Agrawal, "Analytical and Numerical Prediction of Springback of SS/Al-Alloy Cladded Sheet in V-Bending", *Journal of Manufacturing Science and Engineering*, vol. 143, no. 3, pp. 031011, 2021. Impact Factor: 3.033.

Analytical and Numerical Prediction of Springback of SS/Al-Alloy Cladded Sheet in V-Bending

Pankaj Kumar Sharma, **Vijay Gautam*** and Atul Kumar Agrawal

Abstract: The present work deals with the development of an analytical model incorporating the effects of anisotropy and strain hardening to predict the springback in V-bending of two-ply sheet metal using a punch profile radius of 15 mm and included a bend angle of 90 deg. In the analytical model, the total bending moment is determined from resulting bending stresses for two different layers arranged in parallel planes one above the other and a new radius of curvature after springback is determined by applying a negative bending moment. The two-ply sheet composed of layers of AA1050 and SS430 is characterized for its tensile properties to be used in analytical and numerical models for prediction of springback. To study the effect of each layer during bending operation, two possible cases of sheet placements during bending and springback are studied; i.e., in the first case, the inner layer is of AA1050 while the SS430 layer is the outer layer whereas in the second case it is opposite. In all the cases of springback experiments when the outer layer is of SS430, the springback values are higher than the values obtained with the specimens when the inner layer is of SS430. This could be attributed to the higher tensile strength of the stainless steel layer and the higher bending radius experienced by it. The springback behaviors are also analyzed by simulations using Hill's anisotropic yield criterion in abaqus software. The springback results obtained by simulations and analytical models are in good agreement in general; however, in some cases, discrepancy of more than 15% is observed in the analytical results when compared with the experimental results.

For details refer to https://doi.org/10.1115/1.4048953

**Corresponding Author*

BIOGRAPHY

DR. YASHWANT KOLI

Department of Mechanical Engineering

Dr. Yashwant Koli completed Ph.D. from the Department of Mechanical Engineering, Delhi Technological University under the guidance of Dr. N. Yuvaraj (DTU), Prof. Vipin (DTU) and Prof. S. Aravindan (IIT-D) on 14/05/2021. His Ph.D topic was Mechanical and Microstructural characterization of dissimilar joint obtained by GMAW using Cold Metal Transfer (CMT) and has published 6 SCI/SCIE, 3 Scopus and 12 Conference papers till now. His main area of research includes gas metal arc welding (GMAW), cold metal transfer welding (CMT), wire-arc additive manufacturing (WAAM), composites and optimization techniques.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	02

1. **Y. Koli**, N. Yuvaraj, S. Aravindan and Vipin, "CMT Joining of AA6061-T6 and AA6082-T6 and Examining Mechanical Properties and Microstructural Characterization", *Transactions of the Indian Institute of Metals*, vol. 74, pp. 313–329, 2021. Impact Factor: 1.499.
2. **Y. Koli**, N. Yuvaraj, S. Aravindan and Vipin, "Enhancement of Mechanical Properties of 6061/6082 Dissimilar Aluminium Alloys Through Ultrasonic-Assisted Cold Metal Transfer Welding", *Arabian Journal for Science and Engineering*, vol. 46, pp. 12089–12104, 2021. Impact Factor: 2.334.

CMT Joining of AA6061-T6 and AA6082-T6 and Examining Mechanical Properties and Microstructural Characterization

Yashwant Koli, N. Yuvaraj, S. Aravindan and Vipin

Abstract: Nowadays, CMT is used for joining dissimilar thickness of dissimilar metals for achieving higher mechanical strength by using properties of both the metals. Joining of dissimilar aluminium alloys with dissimilar thickness by using gas metal arc welding with cold metal transfer (GMAW-CMT) process, is the primary objective of this work. CMT butt joining of 6061-T6 (3.18 mm) and 6082-T6 (2 mm) aluminium alloys was carried out by using ER4043 (Al–5%Si) wire. Mechanical properties and microstructural characterization were carried out for the weld bead. Microstructural examination at different weld zones is studied using optical microscope and field emission scanning electron microscope (FESEM). Macro-structural images were captured to study the weld bead geometry in relation to heat input. Mechanical properties were examined by Vicker's microhardness and tensile test (with reinforcement, that is, the actual profile of the bead and without reinforcement, that is, the profile of bead are flattened to the surface of the plate). The residual stresses were measured using high-resolution X-ray diffraction (HR-XRD) method. Results showed significant changes in mechanical properties when heat input was in the range of 120–130 J/mm. Removal of reinforcement height improved almost 7–11% of tensile strength. Compressive residual stresses were experienced in the weldment. Comparatively cold metal transfer (CMT) showed better residual stress results than metal inert gas (MIG) welding at the same heat input.

For details refer to https://doi.org/10.1007/s12666-020-02134-0

Enhancement of Mechanical Properties of 6061/6082 Dissimilar Aluminium Alloys Through Ultrasonic-Assisted Cold Metal Transfer Welding

Yashwant Koli, N. Yuvaraj, S. Aravindan and Vipin

Abstract: Nowadays, to enhance structural efficiency, ultrasonic vibrations are combined with other manufacturing processes such as welding. It gives considerable advantages in terms of improved mechanical properties, adequate surface strength, improved material flow and uniform grain growth, etc. Welding of 6061-T6 alloy with 6082-T6 aluminium alloys is carried out with dissimilar thickness. Ultrasonic-assisted cold metal transfer (U-CMT) welding is performed to fabricate the joints and improvements in mechanical properties and microstructural modifications are studied. The microstructural analysis is done with the assistance of an optical microscope (OM) and field emission scanning electron microscope (FESEM). The non-destructive technique (NDT) such as the radiography technique (RT) is used to test weld consistency. Results revealed that the weld bead dimensions are increased with the aid of ultrasonic vibrations for the same welding parameters. The tensile strength and microhardness are enhanced. Samples with ultrasonic vibration experience grain refining as compared to those without vibration samples. As compared with CMT, U-CMT is rich in Al-Si eutectic structure which is in globular form, reduces the porosity level.

For details refer to https://doi.org/10.1007/s13369-021-05844-9

BIOGRAPHY

DR. ABHILASHA SHARMA

Department of Software Engineering

Dr. Abhilasha Sharma is currently working as an Assistant Professor in Department of Software Engineering at Delhi Technological University, Delhi, India. She has more than 14 years of work experience in industry, research and academics. She has received her M.Tech (Master of Technology) and B.Tech (Bachelor of Technology) degrees in Information Technology and completed her PhD in Information Technology from Delhi Technological University. She has many publications to her credit in various journals and international conferences. Her research area includes Web Applications, Web Engineering, Opinion Mining, Social Web, Big Data Analytics, Social Web based Predictive Modelling.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **A. Sharma** and H. Shekhar, "A predictive analytics framework for Sustainable Water Governance", *Sustainable Computing: Informatics and Systems*, vol. 32, pp. 100604, 2021. Impact Factor: 4.028.

A predictive analytics framework for Sustainable Water Governance

Abhilasha Sharma and Himanshu Shekhar

Abstract: Natural resources exist independent of human intervention. Although these interventions can and do affect the balance between ecological and biological diversity conditions these resources support, and their use to promote economic development. Currently, the unsustainable use of these resources threatens this balance, calling for more sustainable patterns of natural resource use and conservation. The primary responsibility for ensuring the proper balance lies with governments, leading to various policies and programs to preserve natural resources. The ultimate goal is to make the masses aware of natural assets' importance and encourage their sustainable use. To successfully implement, however, these government practices require public communication and participation, and the full consideration of public opinion at various levels of governance. A predictive analytics framework is proposed for understanding public opinion on government policies to improve sustainable water governance. An integrated policy initiative to balance water resources use and conservation launched by the Indian government served as a test case for applying the framework in an attempt to accurately classify the opinion polarity related to the policy. The conventional feature extraction is applied to pre-processed datasets to extract the relevant features. Subsequently, swarm-based feature selection is applied to filter out optimal features. Lastly, opinion mining and textual analysis are performed to determine the most relevant water management factors that need immediate attention. The proposed framework serves as a policy evaluation strategy in the water management domain. The paper closes with a discussion of the general applicability of the proposed framework.

For details refer to https://doi.org/10.1016/j.suscom.2021.100604

BIOGRAPHY

PROF. RUCHIKA MALHOTRA

Department of Software Engineering

Prof. Ruchika Malhotra is Head of Department and Professor in the Department of Software Engineering, Delhi Technological University, Delhi, India. She is Associate Dean in Industrial Research and Development, Delhi Technological University. She was awarded with prestigious Raman Fellowship for pursuing Post-doctoral research in Indiana University Purdue University Indianapolis USA. She received her master's and doctorate degree in software engineering from the University School of Information Technology, Guru Gobind Singh Indraprastha University, Delhi, India. She has received IBM Faculty Award 2013. She has been ranked amongst the World's top 2% scientist by Stanford University report, USA, for her research in the field of "Artificial Intelligence & Image Processing" (Ploss Biology, 2020). She is recipient of Commendable Research Award (in 2018, 2019, 2020 and 2021) by Delhi Technological University. Her h-index is 32 as reported by Google Scholar. She is author of book titled "Empirical Research in Software Engineering" published by CRC press and co-author of a book on Object Oriented Software Engineering published by PHI Learning. She has published more than 200 research papers in international journals and conferences. Her research interests are in software testing, improving software quality, statistical and adaptive prediction models, software metrics and the definition and validation of software metrics.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **R. Malhotra** and K. Lata, "An empirical study to investigate the impact of data resampling techniques on the performance of class maintainability prediction models", *Neurocomputing*, vol. 459, pp. 432-453, 2021. Impact Factor: 5.719.

An empirical study to investigate the impact of data resampling techniques on the performance of class maintainability prediction models

Ruchika Malhotra and Kusum Lata

Abstract: With the increasing complexity of the software systems nowadays, the trend has been shifted to object-oriented (OO) development. The classes are the central construct in an OO software that are expected to be of utmost quality and high maintainability. The maintainability of a class is the probability that a class can be effortlessly modifiable in the maintenance phase. Unfortunately, it is very tough to determine the maintainability of a class with confidence before the release of the software. However, maintainability can be predicted with the help of internal quality attributes (viz. complexity, cohesion coupling, inheritance, etc.). The researchers in the literature have studied the relation amongst the internal quality attributes and class maintainability. Many class maintainability prediction models have been developed in the past with the help of internal quality attributes. Effective prediction models are vital to forecast class maintainability accurately. However, various datasets used to build prediction models for class maintainability suffer from imbalanced data problem. In that scenario, a model trained with imbalanced data gives erroneous predictions of class maintainability, which results in the inaccurate allocation of testing and maintenance resources to the misclassified classes. Therefore towards this direction, this study assesses the applicability of techniques to take care of imbalanced data. In this study the imbalanced data is treated with nine oversampling and three undersampling methods. A comprehensive comparison of fourteen machine learning (ML) techniques and fourteen search based (SB) techniques is conducted for class maintainability prediction. The results of the study support the applicability Safe-Level Synthetic Minority Oversampling Technique (Safe-SMOTE) to handle the imbalanced data for class maintainability prediction.

For details refer to https://doi.org/10.1016/j.neucom.2020.01.120

BIOGRAPHY

MR. SANJAY PATIDAR

Department of Software Engineering

Mr. Sanjay Patidar is Assistant Professor at Software Engineering Department of Delhi Technological University, Delhi. He is working in the area of IoT and Data mining. His research area is Machine learning , IoT, cloud computing, data mining. He is working in - IoT stream data Handling, Analysis and Optimization, IoT Data Security, IoT in smart application like samrt city, smart agriculture, Smart Grids, Data mining and analysis using Machine Learning and IoT network.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. A. Srivastava, A. Gupta and **S. Patidar**, "Review of biomarker systems as an alternative for early diagnosis of ovarian carcinoma", *Clinical and Translational Oncology*, vol. 23, pp. 1967–1978, 2021. Impact Factor: 3.405.

Review of biomarker systems as an alternative for early diagnosis of ovarian carcinoma

A. Srivastava, A. Gupta and **S. Patidar***

Abstract: Early diagnosis of ovarian carcinoma is bound to boost the long-term endurance rate of the patients. Most ovarian tumors happen post menopause when the ovaries have no vital operation and therefore irregular ovarian role causes no signs. According to Muinao T. et al. (Heliyon. 5(12):e02826, 2019), if we consider the frequency of ovarian carcinoma to be moderate, a screening technique must accomplish a base specificity of 99.6% and sensitivity of over 75%. The classification and approval of early diagnostic biomarkers explicit to ovarian carcinoma are essentially required. Prevailing methods for early diagnosis of ovarian carcinoma incorporate TVS, biological marker examination, or a blend of the two or other. In recent years, it has been revealed that a combination of at least two biomarkers has beaten single biomarkers in measures for early diagnosis of the illness. In the present document, we survey the ongoing exploration of innovative characteristic methodologies and possible panels of carcinoma biological markers for the early diagnosis of ovarian carcinoma and discuss biomarkers as the plausible apparatus for model improvement and other progressed approaches as an effective alternative to the prevailing methods for early diagnosis of this dreadful disease to evade bogus analysis and inordinate expense.

For details refer to https://doi.org/10.1007/s12094-021-02604-x

**Corresponding Author*

BIOGRAPHY

DR. NAVAL GARG

University School of Management and Entrepreneurship

Dr. Naval Garg is an Assistant Professor (HR & OB) at the University School of Management and Entrepreneurship, Delhi Technological University, New Delhi. His areas of interest are workplace spirituality, gratitude, business ethics, and human-computer interactions. He has published more than forty papers in various national and international journals.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	01

1. **N. Garg**, N. Katiyar and Mehak, "Gratitude Questionnaire (GQ-6)—Exploring Psychometric Properties in India", *Journal of Religion and Health*, vol. 60, pp. 3716–3731, 2021. Impact Factor: 1.898.

Gratitude Questionnaire (GQ-6)—Exploring Psychometric Properties in India

Naval Garg, Nancy Katiyar and Mehak

Abstract: Due to culture-based differences in conceptualization, expression, and gratitude experience, the GQ-6 scale has been validated in different countries. The present study examines the adaptability of the Gratitude Questionnaire (GQ-6) scale in India. Two studies are conducted to evaluate the psychometric properties of GQ-6 for Indian college students. The first study explores factorial validity, reliability, and measurement invariance of the scale. Appropriate factor loading in exploratory factor analysis and model fit indices in confirmatory factor analysis (CFA) provides empirical evidence of the scale's factorial validity. The second study investigates the convergent and criterion validity of the scale. A positive correlation with positive affect (PANAS scale) and life satisfaction (Wheel of Life Scale) and a negative association with negative affect (PANAS scale) establish criterion validity of GQ-6. The results conclude adequate suitability of the GQ-6 scale for Indian college students.

For details refer to https://doi.org/10.1007/s10943-021-01419-y

BIOGRAPHY

DR. RAJESH SHARMA

University School of Management and Entrepreneurship

Dr. Rajesh Sharma is currently an Assistant Professor in the discipline of Economics at Delhi Technological University, East Delhi Campus. He has completed Ph.D. Economics from the Indian Institute of Technology Ropar, Punjab. He has contributed several research papers in reputed journals including such as Breast Cancer, EPMA Journal and Plos One. His areas of research include health economics, epidemiology of cancer and economic cost of cancer management and control. He has received commendable research awards (given by Delhi Technological University) for four single-authored research papers in 2020 and 2021. He has also featured among top 2% scientists in the list released by Stanford for 2020 and 2021. Currently, he is also associate editor in the journal BMC Public Health and also guest-associate editor for Frontiers in Public Health.

Award Summary and Publications Details

Category Title	Number of Publications
Commendable Research Award	04

1. **R. Sharma**, "A Systematic Examination of Burden of Childhood Cancers in 183 Countries: Estimates from GLOBOCAN 2018", *European Journal of Cancer Care*, vol. 30, no. 5, pp. e13438, 2021. Impact Factor: 2.520.
2. **R. Sharma**, "Breast cancer burden in Africa: evidence from GLOBOCAN 2018", *Journal of Public Health*, vol. 43, no. 4, pp. 763–771, 2021. Impact Factor: 2.341.
3. **R. Sharma**, "Examination of incidence, mortality and disability-adjusted life years and risk factors of breast cancer in 49 Asian countries, 1990-2019: estimates from Global Burden of Disease Study 2019", *Japanese Journal of Clinical Oncology*, vol. 51, n. 5, pp. 826-835, 2021. Impact Factor: 3.019.
4. **R. Sharma**, "Global, regional, national burden of breast cancer in 185 countries: evidence from GLOBOCAN 2018", *Breast Cancer Research and Treatment*, vol. 187, no. 2, pp. 557-567, 2021. Impact Factor: 4.872.

A Systematic Examination of Burden of Childhood Cancers in 183 Countries: Estimates from GLOBOCAN 2018

Rajesh Sharma

Abstract:

Objective - Childhood cancers are a significant cause of child deaths worldwide. This study examines the burden of 33 childhood cancers in 183 countries.

Methods - The estimates of age-, sex- and country-wise incidence and deaths due to 33 childhood cancers (below the age 15) for 183 countries were retrieved from GLOBOCAN 2018. The socioeconomic status of a country was measured by human development index (HDI).

Results - Globally, an estimated 200 166 cases and 74 956 deaths were attributed to childhood cancers in 2018. The age-standardised incidence rate (ASIR) was 103 per million, whereas the age-standardised mortality rate (ASMR) stood at 38 per million. ASIR was highest in high-income regions (e.g. North America: 182 per million); ASMR, however, was elevated in low- and medium-income countries (e.g. south-east Asia: 62 per million; North Africa: 51 per million). Leukaemia and brain cancers were dominant cancer groups accounting for 45% of cases and 57% of deaths. The ASIRs exhibited a positive gradient with HDI ($R^2 = 0.46$)..

Conclusion - The high burden of childhood cancers (>80% of total incidence) in low- and middle-income countries (LMICs) calls for increased cancer awareness, improvement in oncologic infrastructure, international collaborations and twinning programmes, equitable access to multi-modal treatment and financial coverage of treatment expenses.

For details refer to https://doi.org/10.1111/ecc.13438

Breast cancer burden in Africa: evidence from GLOBOCAN 2018

Rajesh Sharma

Abstract:

Background - Breast cancer is the leading malignancy in African females. This study aims to examine the breast cancer burden in Africa using recently released GLOBOCAN 2018 estimates.

Methods - The incidence and mortality estimates of age- and country-wise burden of breast cancer in 54 African countries were obtained from GLOBOCAN 2018.

Results - In Africa, breast cancer caused 74 072 deaths, and 168 690 cases were estimated to have occurred in 2018. The age-standardized incidence rate stood at 37.9/100 000 in Africa, varying from 6.9/100 000 in the Gambia to 69.6/100 000 in Mauritius. The age-standardized mortality rate stood at 17.2/100 000 in 2018, ranging from 4/100 000 in the Gambia to 29.1/100 000 in Somalia in 2018. Nigeria was the leading country in terms of absolute burden with 26 310 cases and 11 564 deaths, followed by Egypt with 23 081 new cases and 9254 deaths. The mortality-to-incidence ratio for Africa stood at 0.44, varying from 0.24 in Libya to 0.68 in the Central African Republic.

Conclusion - To tackle breast cancer burden in Africa, the main challenges are late-stage disease presentation, lack of screening and therapeutic infrastructure, lack of awareness and limited resources.

For details refer to https://doi.org/10.1093/pubmed/fdaa099

Examination of incidence, mortality and disability-adjusted life years and risk factors of breast cancer in 49 Asian countries, 1990–2019: estimates from Global Burden of Disease Study 2019

Rajesh Sharma

Abstract:

Background - This study presents an up-to-date, comprehensive and comparative examination of breast cancer's temporal patterns in females in Asia in last three decades.

Methods - The estimates of incidence, mortality, disability-adjusted-life-years and risk factors of breast cancer in females in 49 Asian countries were retrieved from Global Burden of Disease 2019 study.

Results - In Asia, female breast cancer incidence grew from 245 045[226 259–265 260] in 1990 to 914 878[815 789–1025 502] in 2019 with age-standardized incidence rate rising from 21.2/100 000[19.6–22.9] to 35.9/100 000[32.0–40.2] between 1990 and 2019. The death counts more than doubled from 136 665[126 094–148 380] to 337 822[301 454–375 251]. The age-standardized mortality rate rose marginally between 1990 and 2019 (1990: 12.1[11.0–13.1]; 2019: 13.4[12.0–14.9]). In 2019, age-standardized incidence rate varied from 17.2/100 000[13.95–21.4] in Mongolia to 122.5[92.1–160.7] in Lebanon and the age-standardized mortality rate varied 4-fold from 8.0/100 000 [7.2–8.8] in South Korea to 51.9[39.0–69.8] in Pakistan. High body mass index (5.6%), high fasting plasma glucose (5.6%) and secondhand smoke (3.5%) were the main contributory risk factors to all-age disability-adjusted-life-years due to breast cancer in Asia.

Conclusion - With growing incidence, escalating dietary and behavioural risk factors and lower survival rates due to late-disease presentation in low- and medium-income countries of Asia, breast cancer has become a significant public health threat. Its rising burden calls for increasing breast cancer awareness, preventive measures, early-stage detection and cost-effective therapeutics in Asia.

For details refer to https://doi.org/10.1093/jjco/hyab004

Global, regional, national burden of breast cancer in 185 countries: evidence from GLOBOCAN 2018+

Rajesh Sharma

Abstract:

Purpose - This study aims to examine the burden of breast cancer in 185 countries in 2018.

Methods - The estimates of incidence, mortality, and prevalence of breast cancer were drawn from GLOBOCAN 2018. The overall burden of breast cancer was gauged using breast cancer burden index (BRCBI)—a novel index comprising age-standardized incidence rate (ASIR), age-standardized mortality rate (ASMR), mortality-to-incidence ratio (MIR), prevalence-to-incidence ratio (PIR), and prevalence-to-mortality ratio (PMR). The socioeconomic status of countries was measured using human development index (HDI)

Results - Globally, breast cancer was responsible for an estimated 626,679 deaths at age-standardized rate of 13/100,000; there were 2.1 million cases diagnosed in 2018 at age-standardized rate of 46.3/100,000. The ASIR varied 22-fold from 5/100,000 (Bhutan) to 113.2/100,000 (Belgium). The ASMR varied 13-fold from 2.7/100,000 (Bhutan) to 36.9/100,000 (Fiji). The HDI exhibited a positive gradient with ASIR ($r=0.73$), PIR ($r=0.98$), and PMR ($r=0.85$); with MIR, however, it exhibited a negative association ($r=-0.83$). The BRCBI spanned from 0.70 in Somalia to 78.92 in South Korea and exhibited a positive association with HDI ($r=0.76$). An additional 46,823 female lives in 2018 and a cumulative total of 333,304 lives could have been saved over 2013–2018, had countries performed as per their HDI.

Conclusions - The substantial burden of breast cancer in developing and low-resource economies calls for a holistic approach to cancer management and control that includes oncologic infrastructure to provide cost-effective screening, diagnostic, therapeutic, and palliative services, greater breast cancer awareness, and mitigation of risk factors.

For details refer to https://doi.org/10.1007/s10549-020-06083-6

+Eligible for Certificate only

DR. KAPIL SHARMA

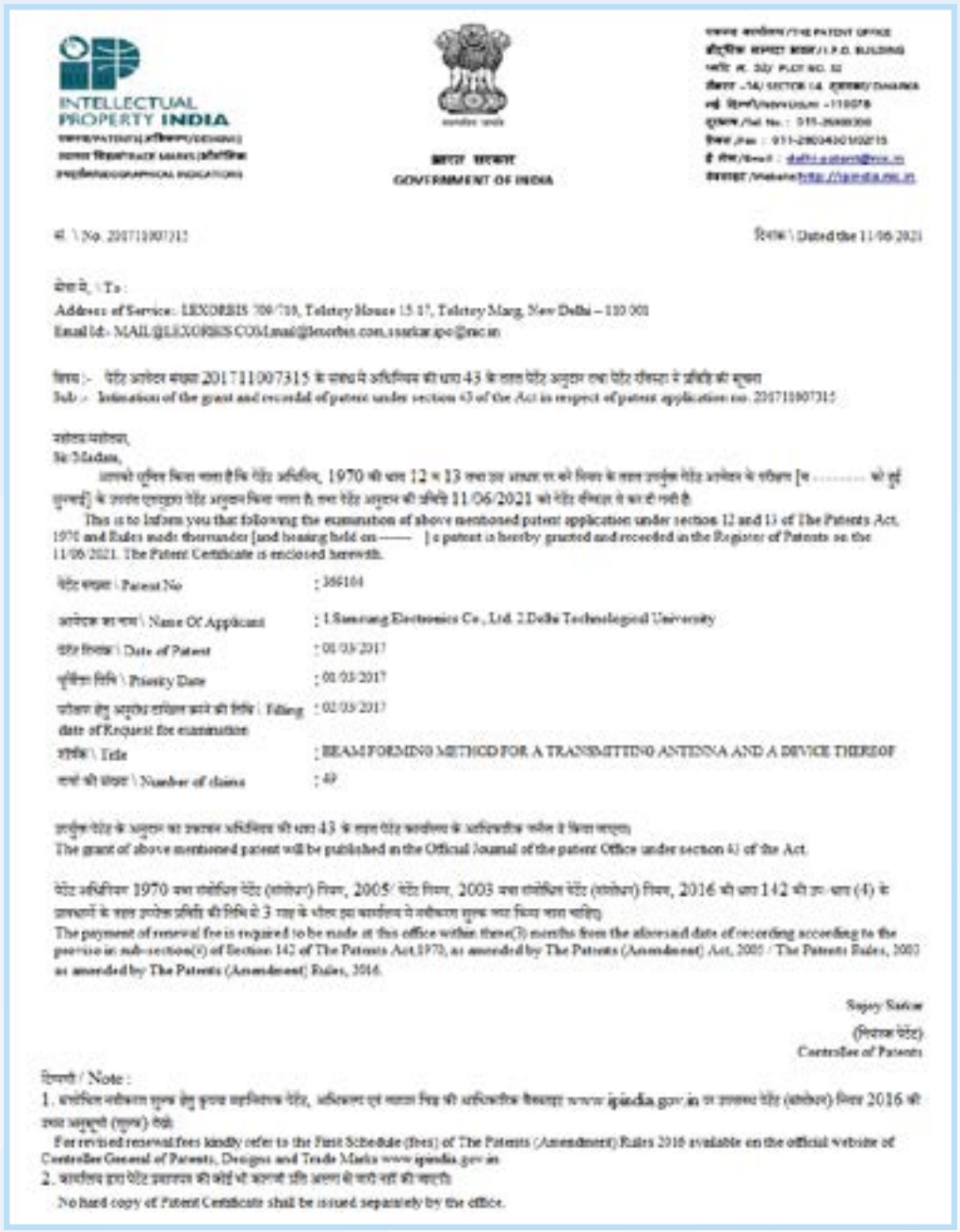
Dr. Kapil Sharma is IEEE senior member and head of Information Technology Department, Delhi Technological University, Delhi, India. He was born in Haryana, India. In 2011, he has completed Doctors Degree in Computer Science and Engineering under the Faculty of Engineering and Technology at the M. D. University, Rohtak (Haryana), India. He has obtained his Bachelor of Engineering and Master of Technology Degrees in Computer Science & Engineering and Information Technology. He has published various research papers in international conferences and journals in the domain of mobile communications, cyber security and machine learning along with several national and international patents.

US10454553B2 : Beam forming method for a transmitting antenna and a device thereof

Sachin Kumar Agrawal and **Kapil Sharma**

Abstract: The disclosure relates to method and device for beam forming in cellular communication systems. In accordance with one embodiment, the device selects at least one obstruction free zone and at least one obstruction free beam window, the at least one obstruction free beam window being selected within the at least one obstruction free zone. The device forms at least one beam based on said at least one obstruction free beam window thus selected.

For details refer to https://patents.google.com/patent/US10454553B2/en



INTELLECTUAL PROPERTY INDIA

भारत सरकार
GOVERNMENT OF INDIA

सं. \ No. 201711007315 दिनांक \ Dated the 11/06/2021

सेवा में, \ To :
Address of Service: LEXORBIS 709/710, Tolstoy House 15 17, Tolstoy Marg, New Delhi – 110 001
Email Id:- MAIL@LEXORBIS.COM,mail@lexorbis.com,ssarkar.ipo@rnc.in

विषय :- पेटेंट आवेदन संख्या 201711007315 के संबंध में अधिनियम की धारा 43 के तहत पेटेंट अनुदान तथा पेटेंट रजिस्टर में प्रविष्टि की सूचना
Sub :- Intimation of the grant and recordal of patent under section 43 of the Act in respect of patent application no. 201711007315

महोदय/महोदया,
Sir/Madam,
आपको सूचित किया जाता है कि पेटेंट अधिनियम, 1970 की धारा 12 व 13 तथा इस संबंध में बने नियम के तहत उपर्युक्त पेटेंट आवेदन के परीक्षण [व ..... को हुई सुनवाई] के उपरांत उपर्युक्त पेटेंट अनुदान किया जाता है तथा पेटेंट अनुदान की तारीख 11/06/2021 को पेटेंट रजिस्टर में कर दी गयी है
This is to inform you that following the examination of above mentioned patent application under section 12 and 13 of The Patents Act, 1970 and Rules made thereunder [and hearing held on ———] a patent is hereby granted and recorded in the Register of Patents on the 11/06/2021. The Patent Certificate is enclosed herewith.

पेटेंट संख्या \ Patent No	: 366104
आवेदक का नाम \ Name Of Applicant	: 1.Samsung Electronics Co., Ltd. 2.Delhi Technological University
पेटेंट दिनांक \ Date of Patent	: 01/03/2017
पूर्वाधिकार तिथि \ Priority Date	: 01/03/2017
परीक्षण हेतु अनुरोध दाखिल करने की तिथि \ Filing date of Request for examination	: 02/03/2017
शीर्षक \ Title	: BEAM FORMING METHOD FOR A TRANSMITTING ANTENNA AND A DEVICE THEREOF
दावों की संख्या \ Number of claims	: 49

उपर्युक्त पेटेंट के अनुदान का प्रकाशन अधिनियम की धारा 43 के तहत पेटेंट कार्यालय के आधिकारिक जर्नल में किया जाएगा
The grant of above mentioned patent will be published in the Official Journal of the patent Office under section 43 of the Act.

पेटेंट अधिनियम 1970 तथा संशोधित पेटेंट (संशोधन) नियम, 2005/ पेटेंट नियम, 2003 तथा संशोधित पेटेंट (संशोधन) नियम, 2016 की धारा 142 की उप-धारा (4) के प्रावधानों के तहत उपरोक्त तारीख की तिथि से 3 माह के भीतर इस कार्यालय में नवीकरण शुल्क जमा किया जाना चाहिए।
The payment of renewal fee is required to be made at this office within three(3) months from the aforesaid date of recording according to the proviso in sub-section(4) of Section 142 of The Patents Act,1970, as amended by The Patents (Amendment) Act, 2005 / The Patents Rules, 2003 as amended by The Patents (Amendment) Rules, 2016.

Sujoy Sarkar
(सुजय सरकार)
Controller of Patents

टिप्पणी / Note :
1. आवश्यक नवीकरण शुल्क हेतु कृपया नवीनतम पेटेंट, अभिकल्प एवं व्यापार चिह्न की अधिकारिक वेबसाइट www.ipindia.gov.in पर उपलब्ध पेटेंट (संशोधन) नियम 2016 की प्रथम अनुसूची (शुल्क) देखें।
For revised renewal fees kindly refer to the First Schedule (fees) of The Patents (Amendment) Rules 2016 available on the official website of Controller General of Patents, Designs and Trade Marks www.ipindia.gov.in
2. कार्यालय द्वारा पेटेंट प्रमाणपत्र की कोई भी कठोर प्रति अलग से जारी नहीं की जाएगी
No hard copy of Patent Certificate shall be issued separately by the office.

EDITORS

Prof. A. Trivedi
Dean
Industrial Research and Development

Prof. Ruchika Malhotra
Associate Dean
Industrial Research and Development

ASSOCIATE EDITOR

Ms. Shweta Meena
Assistant Professor
Department of Software Engineering

This Compendium of Abstracts of published Papers for Research Excellence Awards is compiled and edited on behalf of Delhi Technological University, as per submissions made by the first/corresponding authors. This publication is meant for the internal circulation only and has no commercial purpose.

Printed by Arti Printers, New Delhi.