



A
COMPENDIUM OF
ABSTRACTS OF
PUBLISHED PAPERS

4th
RESEARCH
EXCELLENCE
AWARDS

1st January, 2020 to
31st December, 2020

DELHI TECHNOLOGICAL UNIVERSITY

(Formerly Delhi College of Engineering)





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This Compendium of Abstracts of published Papers for Research Excellence Awards is compiled and edited by Prof. Ashutosh Trivedi and Dr. Ruchika Malhotra, 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.

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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.



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FROM THE DESK OF THE VICE CHANCELLOR

Delhi Technological University (formerly Delhi College of Engineering) has an illustrious history spanning over 79 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.

Based on this idea to recognize the achievements of faculty and students at DTU, we 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 awards are open to all the researchers of DTU. The eligible researcher is encouraged to apply for the publication that is written either under single authorship or jointly with university faculty, research scholar or undergraduate/postgraduate student. The award will be granted to all the researchers who qualify the

selection criteria in each category of the award. In 2020, 155 researchers with 116 SCIE/SSCI Indexed publications have been awarded for their publications in the year 2019. This initiative will create an enabling research environment in the university and will enhance the focus on outcome-based research.

With the view of inculcating research and innovation culture at the undergraduate level of DTU, I am happy to announce that recently the university has introduced three new tracks in the undergraduate curriculum: Research Track, Product Track and Entrepreneurship Track. The idea of the tracks is to develop analytical skills and critical thinking among the students that will enable the students apply knowledge to address the real-world situation/problem and find the solutions for them. These research track will enable the student learn appropriate research methodologies and to use them. The course will enable the student to develop a new idea. To summarize, the research experience at the undergraduate level will not only allow the student to learn content, but they will also learn how knowledge is constructed in a particular discipline.

Let us march forward on the path of research excellence and reach new heights of education & research in the years to come. I invite the students and faculty members of DTU to commit themselves for creating research and innovation culture in engineering excellence by their fullest dedication and unconditional commitment to the research and innovation activities and I call them to involve themselves in the service of institution, society, country at large.

I heartily congratulate all the 2021 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: 09.02.2021

Prof. Yogesh Singh
Vice Chancellor

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 2019 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.

This 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. Yogesh Singh
VICE CHANCELLOR



Prof. Ashutosh Trivedi
DEAN
Industrial Research and
Development (IRD)



Dr. 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:

2

Approved in 37th Meeting of the Board of Management held on 29.05.2020

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 \geq 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.



Approved in 37th Meeting of the Board of Management held on 29.05.2020

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. Samsheer)

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 wide circulation among the faculty and students of their department
6. Head Computer Centre with a request to upload on website
7. Guard File

Approved in 37th Meeting of the Board of Management held on 29.05.2020

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.

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,

$$A \cdot Z / N$$

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

$$(A - Y \cdot (A/N)) \cdot Z / (N - Y)$$

Where Y number of authors are external to the university

Calculations sheets are enclosed.

DETAILS FOR PUBLISHED PAPERS FOR PREMIER RESEARCH AWARDS

1ST JANUARY, 2020 – 31ST DECEMBER, 2020

S. No	Authors	Paper Title	Journal with Publication Details
DEPARTMENT OF APPLIED MATHEMATICS			
1	Anshul Arora, Sateesh K. Peddoju and Mauro Conti	PermPair: Android malware detection using permission pairs	<i>IEEE Transactions on Information Forensics and Security (IEEE)</i> , vol. 15, pp. 1968-1982, 2020, Impact Factor: 6.013.
2	C. P. Singh and Ajay Kumar	Holographic dark energy, matter creation, and cosmic acceleration	<i>Physical Review D (American Physical Society)</i> , vol. 102, no. 12, pp.123537, 2020, Impact Factor: 4.833.
DEPARTMENT OF BIOTECHNOLOGY			
3	Rajkumar Chakraborty and Yasha Hasija	Predicting MicroRNA sequence using CNN and LSTM stacked in Seq2Seq architecture	<i>IEEE/ACM Transactions on Computational Biology and Bioinformatics (IEEE Computer Soc)</i> , vol. 17, no. 6, pp. 2183- 2188, 2020, Impact Factor: 3.015.
DEPARTMENT OF ELECTRICAL ENGINEERING			
4	Amrish Devanshu, Madhusudan Singh and Narendra Kumar	An improved nonlinear flux observer based sensorless FOC IM drive with adaptive predictive current control	<i>IEEE Transactions on Power Electronics (IEEE Transactions)</i> , vol. 35, no. 1, pp. 652-666, 2020, Impact Factor: 6.373.

S. No	Authors	Paper Title	Journal with Publication Details
5	Rupam Singh and Bharat Bhushan	Data-driven technique-based fault-tolerant control for pitch and yaw motion in unmanned helicopters	<i>IEEE Transactions on Instrumentation and Measurement (IEEE Transactions)</i> , vol. 70, pp. 1-11, 2021, Impact Factor: 3.658.
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING			
6	Chhavi Dhiman and Dinesh Kumar Vishwakarma	View-invariant deep architecture for human action recognition using two-stream motion and shape temporal dynamics	<i>IEEE Transactions on Image Processing (IEEE Transactions)</i> , vol. 29, pp. 3835-3844, 2020, Impact Factor: 9.369.
DEPARTMENT OF INFORMATION TECHNOLOGY			
7	Gurjit Singh Walia, Himanshu Ahuja, Ashish Kumar, Nipun Bansal and Kapil Sharma	Unified graph-based multicue feature fusion for robust visual tracking	<i>IEEE Transactions on Cybernetics (IEEE Transactions)</i> , vol. 50, no. 6, pp. 2357-2368, 2020, Impact Factor: 11.709.
DEPARTMENT OF MECHANICAL ENGINEERING			
8	Naveen Kumar , Ankit Sonthalia and Rashi Koul	Optimization of the process parameters for hydrotreating used cooking oil by the taguchi method and fuzzy logic	<i>Journal of Energy Resources Technology (The American Society of Mechanical Engineers)</i> , vol. 142, no. 12, pp. 123006, 2020, Impact Factor: 2.650.
9	Abdul Khaliq, Mathkar A. Alharthi, Saeed Alqaed, Esmail M. A. Mokheimer and Rajesh Kumar	Analysis and assessment of tower solar collector driven trigeneration system	<i>Journal of Solar Energy Engineering (The American Society of Mechanical Engineers)</i> , vol. 142, no. 5, pp. 051003, 2020, Impact Factor: 1.641.



DETAILS FOR PUBLISHED PAPERS FOR COMMENDABLE RESEARCH AWARDS

1ST JANUARY, 2020 – 31ST DECEMBER, 2020

S. No	Authors	Paper Title	Journal with Publication Details
DEPARTMENT OF APPLIED CHEMISTRY			
1	Deepali Ahluwalia, Anil Kumar , Sudhir G. Warkar and Milind M. Deshmukh	Effect of substitutions on the geometry and intramolecular hydrogen bond strength in <i>meta</i> -benzporphodimethenes: A new porphyrin analogue	<i>Journal of Molecular Structure (Elsevier)</i> , vol.1220, pp. 128773, 2020, Impact Factor: 2.463.
2	Meenakshi Gautam, Deenan Santhiya and Namit Dey	Zein coated calcium carbonate nanoparticles for the targeted controlled release of model antibiotic and nutrient across the intestine	<i>Materials Today Communications (Elsevier)</i> , vol. 25, pp. 101394, 2020, Impact Factor: 2.678.
3	Neha Tiwari, Deenan Santhiya and Jai Gopal Sharma	Microbial remediation of micro-nano plastics: Current knowledge and future trends	<i>Environmental Pollution (Elsevier)</i> , vol. 265, Part A, pp. 115044, 2020, Impact Factor: 6.793.
4	Owais Jalil, Chandra Mouli Pandey and Devendra Kumar	Electrochemical biosensor for the epithelial cancer biomarker EpCAM based on reduced graphene oxide modified with nanostructured titanium dioxide	<i>Microchimica Acta (Springer)</i> , vol. 187, no. 275, 2020, Impact Factor: 6.232.
5	Purujit Tandon and Manish Jain	Modeling and simulation of non-isothermal packed-bed membrane reactor for decomposition of hydrogen iodide	<i>Environmental Technology and Innovation (Elsevier)</i> , vol. 20, pp. 101162, 2020, Impact Factor: 3.356.

S. No	Authors	Paper Title	Journal with Publication Details
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12	Khushbu and Sudhir G.Warkar	Potential applications and various aspects of polyfunctional macromolecule- carboxymethyl tamarind kernel gum	<i>European Polymer Journal (Elsevier)</i> , vol. 140, 2020, Impact Factor: 3.862.
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13	Abhishek Kumar , Manoj Kumar and Nilam	A study on the stability behavior of an epidemic model with ratio-dependent incidence and saturated treatment	<i>Theory in Biosciences (Springer)</i> , vol. 139, pp. 225–234, 2020, Impact Factor: 1.303.

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15	Anjali Singh, Anjana Gupta and Aparna Mehra	Matrix games with 2-tuple linguistic information	<i>Annals of Operations Research (Springer)</i> , vol. 287, pp. 895–910, 2020, Impact Factor: 2.583.
16	Ajay Kumar and C. P. Singh	Observational constraints on holographic dark energy model with matter creation	<i>Astrophysics and Space Science (Springer)</i> , vol. 365, no. 1, 2020, Impact Factor: 1.430.
17	C. P. Singh and Simran Kaur	Probing bulk viscous matter-dominated model in Brans-Dicke theory	<i>Astrophysics and Space Science (Springer)</i> , vol. 365, no. 1, 2020, Impact Factor: 1.430.
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19	Dhirendra Kumar , R. K. Agrawal and Hanuman Verma	Kernel intuitionistic fuzzy entropy clustering for MRI image segmentation	<i>Soft Computing (Springer)</i> , vol. 24, no. 6, pp. 4003–4026, 2020, Impact Factor: 3.050.
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21	Kanica Goel , Abhishek Kumar and Nilam	A deterministic time-delayed SVIRS epidemic model with incidences and saturated treatment	<i>Journal of Engineering Mathematics (Springer)</i> , vol. 121, pp. 19–38, 2020, Impact Factor: 1.434.
22	Luckshay Batra and H.C.Taneja	Evaluating volatile stock markets using information theoretic measures	<i>Physica A: Statistical Mechanics and its Applications (Elsevier)</i> , vol. 537, pp. 122711, 2020, Impact Factor: 2.924.
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25	Mohit Kumar and A. S. Rao	Concentration-dependent reddish-orange photoluminescence studies of Sm^{3+} ions in borosilicate glasses	<i>Optical Materials (Elsevier)</i> , vol. 109, pp. 110356, 2020, Impact Factor: 2.779.
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31	Praveen Tanwar, Amrish K. Panwar , Sukhvir Singh and A.K. Srivatava	Microstructural and optical properties investigation of variable thickness of tin telluride thin films	<i>Thin Solid Films (Elsevier)</i> , vol. 693, pp. 137708, 2020, Impact Factor: 2.030.
32	Aditya Jain and Amrish K. Panwar	Synergetic effect of rare-earths doping on the microstructural and electrical properties of Sr and Ca co-doped BaTiO_3 nanoparticles	<i>Ceramics International (Elsevier)</i> , vol. 46, no. 8, pp. 10270-10278, 2020, Impact Factor: 3.830.

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33	Deshraj Meena , Bharti Singh, Abhishek Anand, Mukhtiyar Singh and M. C. Bhatnagar	Phase dependent selectivity shifting behavior of Cd ₂ SnO ₄ nanoparticles based gas sensor towards volatile organic compounds (VOC) at low operating temperature	<i>Journal of Alloys and Compounds (Elsevier)</i> , vol. 820, pp. 153117, 2020, Impact Factor: 4.650.
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35	Harpreet Kaur , M. Jayasimhadri, Mukesh K.Sahu, P. Koteswar Rao and N.S.Reddy	Synthesis of orange emitting Sm ³⁺ doped sodium calcium silicate phosphor by sol-gel method for photonic device applications	<i>Ceramics International (Elsevier)</i> , vol. 46, no. 16, Part B, pp. 26434-26439, 2020, Impact Factor: 3.830.
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39	Prateek Sharma and Mohan Singh Mehata	Colloidal MoS ₂ quantum dots based optical sensor for detection of 2,4,6-TNP explosive in an aqueous medium	<i>Optical Materials (Elsevier)</i> , vol. 100, pp. 109646, 2020, Impact Factor: 2.779.
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41	Nisha Fatma, Mohan Singh Mehata , Nupur Pandey and Sanjay Pant	Flavones fluorescence-based dual response chemosensor for metal ions in aqueous media and fluorescence recovery	<i>Journal of Fluorescence (Springer)</i> , vol. 30, pp. 759–772, 2020, Impact Factor: 2.093.

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42	Nupur Pandey, Mohan Singh Mehata , Nisha Fatma and Sanjay Panta	Modulation of fluorescence properties of 5-aminoquinoline by Ag ⁺ in aqueous media via charge transfer	<i>Journal of Photochemistry and Photobiology A: Chemistry (Elsevier)</i> , vol. 396, pp. 112549, 2020, Impact Factor: 3.306.
43	Prateek Sharma and Mohan Singh Mehata	Rapid sensing of lead metal ions in an aqueous medium by MoS ₂ quantum dots fluorescence turn-off	<i>Materials Research Bulletin (Elsevier)</i> , vol. 131, pp. 110978, 2020, Impact Factor: 4.019.
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46	Mukesh K.Sahu , Harpreet Kaur, B.V.Ratnam, J. Suresh Kumar and M. Jayasimhadri	Structural and spectroscopic characteristics of thermally stable Eu ³⁺ activated barium zinc orthophosphate phosphor for white LEDs	<i>Ceramics International (Elsevier)</i> , vol. 46, no. 16, Part B, pp. 26410-26415, 2020, Impact Factor: 3.830.
47	Kamal Arora and Nitin K.Puri	Chemiresistive sensing platform based on PdO-PANI/ITO heterostructure for room temperature hydrogen detection	<i>Materials Chemistry and Physics (Elsevier)</i> , vol. 247, pp. 122850, 2020, Impact Factor: 3.408.
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54	Shaveta, H. M. Maali Ahmed and Rishu Chaujar	Rapid detection of biomolecules in a dielectric modulated GaN MOSHEMT	<i>Journal of Materials Science: Materials in Electronics (Springer)</i> , vol. 31, pp. 16609–16615, 2020, Impact Factor: 2.220.
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57	Suman Dahiya , Siddhartha Lahon and Rinku Sharma	Effects of temperature and hydrostatic pressure on the optical rectification associated with the excitonic system in a semi-parabolic quantum dot	<i>Physica E: Low-dimensional Systems and Nanostructures (Elsevier)</i> , vol. 118, pp. 113918, 2020, Impact Factor: 3.570.
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59	Ajay Gahlot, Suresh C. Sharma and Jyotsna Sharma	The effect of dust grains on the Weibel instability in presence of large amplitude electrostatic waves	<i>Physics of Plasmas (American Institute of Physics)</i> , vol. 27, no. 4, pp. 043702, 2020, Impact Factor: 1.830.

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61	Ravi Gupta and Suresh C. Sharma	Parametric study of plasma characteristics and carbon nanofibers growth in PECVD System: Numerical modeling	<i>Plasma Chemistry and Plasma Processing (Springer)</i> , vol. 40, pp. 1331–1350, 2020, Impact Factor: 2.178.
62	Ritika Ranga, Yogita Kalra and Kamal Kishor	Petal shaped nanoantenna for solar energy harvesting	<i>Journal of Optics (IOP Publishing)</i> , vol. 22, no. 3, pp. 035001, 2020, Impact Factor: 2.379.
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69	Dia Advani , Rohan Gupta, Rahul Tripathi, Sudhanshu Sharma, Rashmi K. Ambasta and Pravir Kumar	Protective role of anticancer drugs in neurodegenerative disorders: A drug repurposing approach	<i>Neurochemistry International (Elsevier)</i> , vol. 140, pp. 104841, 2020, Impact Factor: 3.881.
70	Neeraj Kumari , Asmita Das and Anant Narayan Bhatt	Interleukin-6 confers radio-resistance by inducing Akt-mediated glycolysis and reducing mitochondrial damage in cells	<i>The Journal of Biochemistry (Oxford University Press)</i> , vol. 167, no. 3, pp. 303–314, 2020, Impact Factor: 2.476.
71	Indu Bisht, Rashmi K. Ambasta and Pravir Kumar	An integrated approach to unravel a putative crosstalk network in alzheimer's disease and parkinson's disease	<i>Neuropeptides (Elsevier)</i> , vol. 83, pp. 102078, 2020, Impact Factor: 2.411.
72	Dhiraj Kumar, Rashmi K. Ambasta and Pravir Kumar	Ubiquitin biology in neurodegenerative disorders: From impairment to therapeutic strategies	<i>Ageing Research Reviews (Elsevier)</i> , vol. 61, pp. 101078, 2020, Impact Factor: 10.616.
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74	Rohan Gupta , Rashmi K. Ambasta and Pravir Kumar	Identification of novel class I and class IIb histone deacetylase inhibitor for alzheimer's disease therapeutics	<i>Life Sciences (Elsevier)</i> , vol. 256, pp. 117912, 2020, Impact Factor: 3.647.
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78	Shilpa Pal , M.Shariq, H.Abbas, A.K.Pandit and A.Masood	Strength characteristics and microstructure of hooked-end steel fiber reinforced concrete containing fly ash, bottom ash and their combination	<i>Construction and Building Materials (Elsevier)</i> , vol. 247, pp. 118530, 2020, Impact Factor: 4.419.
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79	Akshi Kumar and Abhilasha Sharma	Socio-sentic framework for sustainable agricultural governance	<i>Sustainable Computing: Informatics and Systems (Elsevier)</i> , vol. 28, pp. 100274, 2020, Impact Factor: 2.798.
80	Akshi Kumar and Anshika Arora	An ANFIS-based compatibility scorecard for IoT integration in websites	<i>The Journal of Supercomputing (Springer)</i> , vol. 76, pp. 2568–2596, 2020, Impact Factor: 2.469.
81	Akshi Kumar , Kathiravan Srinivasan, ChengWen-Huang and Albert Y.Zomaya	Hybrid context enriched deep learning model for fine-grained sentiment analysis in textual and visual semiotic modality social data	<i>Information Processing and Management (Elsevier)</i> , vol. 57, no. 1, pp. 102141, 2020, Impact Factor: 4.787.
82	Akshi Kumar	Using cognition to resolve duplicacy issues in socially connected healthcare for smart cities	<i>Computer Communications (Elsevier)</i> , vol. 152, pp. 272-281, 2020, Impact Factor: 2.816.
83	Deepak Jain, Akshi Kumar and Geetanjali Garg	Sarcasm detection in mash-up language using soft-attention based bi-directional LSTM and feature-rich CNN	<i>Applied Soft Computing (Elsevier)</i> , vol. 91, pp. 106198, 2020, Impact Factor: 5.472.
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87	Ashish Kumar , Gurjit Singh Walia and Kapil Sharma	Real-time visual tracking via multi-cue based adaptive particle filter framework	<i>Multimedia Tools and Applications (Springer)</i> , vol. 79, pp. 20639–20663, 2020, Impact Factor: 2.313.
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92	Manisha Saini and Seba Susan	Deep transfer with minority data augmentation for imbalanced breast cancer dataset	<i>Applied Soft Computing (Elsevier)</i> , vol. 97, Part A, pp. 106759, 2020, Impact Factor: 5.472.
93	Manpreet Kaur and Rajesh Kumar Yadav	Performance analysis of beaulieu-xie fading channel with MRC diversity reception	<i>Transactions on Emerging Telecommunications Technologies (Wiley)</i> , vol. 31, no. 7, pp. e3949, 2020, Impact Factor: 1.594.

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95	Pratima Sharma , Rajni Jindal, and Malaya Dutta Borah	Blockchain technology for cloud storage: A systematic literature review	<i>ACM Comput. Surv. (ACM)</i> , vol. 53, no. 4, pp. 1-32, 2020, Impact Factor: 7.990.
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97	Lokesh Jain, Rahul Katarya and Shelly Sachdeva	Recognition of opinion leaders coalitions in online social network using game theory	<i>Knowledge-Based Systems (Elsevier)</i> , vol. 203, pp. 106158, 2020, Impact Factor: 5.921.
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DEPARTMENT OF ELECTRICAL ENGINEERING			
104	Aakash Kumar Seth and Mukhtiar Singh	Resonant controller of single-stage off-board EV charger in G2V and V2G modes	<i>IET Power Electronics (IET)</i> , vol. 13, no. 5, pp. 1086-1092, 2020, Impact Factor: 2.672.
105	Ajishkek Raj , D. R. Bhaskar and Pragati Kumar	Two quadrant analog voltage divider and square-root circuits using OTA and MOSFETs	<i>Circuits, Systems, and Signal Processing (Springer)</i> , vol. 39, pp. 6358–6385, 2020, Impact Factor: 1.681.
106	Alka Singh , Manoj Badoni, Bhim Singh and Hemant Saxena	Real-time implementation of active shunt compensator with adaptive SRLMMN control technique for power quality improvement in the distribution system	<i>IET Generation, Transmission and Distribution (IET)</i> , vol. 14, no. 8, pp. 1598-1606, 2020, Impact Factor: 2.862.
107	Astitva Kumar , M. Rizwan and Uma Nangia	A hybrid intelligent approach for Solar photovoltaic power forecasting: impact of aerosol data	<i>Arabian Journal for Science and Engineering (Springer)</i> , vol. 45, pp. 1715–1732, 2020, Impact Factor: 1.711.
108	Dinesh Kumar Atal and Mukhtiar Singh	A dictionary matrix generation based compression and bitwise embedding mechanisms for ECG signal classification	<i>Multimedia Tools and Applications (Springer)</i> , vol. 79, pp. 13139–13159, 2020, Impact Factor: 2.313.
109	Dinesh Kumar Atal and Mukhtiar Singh	A hybrid feature extraction and machine learning approaches for epileptic seizure detection	<i>Multidimensional Systems and Signal Processing (Springer)</i> , vol. 31, pp. 503–525, 2020, Impact Factor: 1.810.
110	Dinesh Kumar Atal and Mukhtiar Singh	Arrhythmia classification with ECG signals based on the optimization-enabled deep convolutional neural network	<i>Computer Methods and Programs in Biomedicine (Elsevier)</i> , vol. 196, pp. 105607, 2020, Impact Factor: 3.632.
111	Hemant Saxena , Alka Singh and Jitendra Nath Rai	Adaptive spline-based PLL for synchronisation and power quality improvement in distribution system	<i>IET Generation, Transmission and Distribution (IET)</i> , vol. 14, no. 7, pp. 1311-1319, 2020, Impact Factor: 2.862.
112	Hemant Saxena , Alka Singh and Jitendra Nath Rai	Design and performance analysis of improved adaline technique for synchronization and load compensation of grid-tied photovoltaic system	<i>International Transactions on Electrical Energy Systems (Wiley)</i> , vol. 30, no. 6, pp. e12388, 2020, Impact Factor: 1.692.

S. No	Authors	Paper Title	Journal with Publication Details
113	Imran Ahmad Quadri and S. Bhowmick	A hybrid technique for simultaneous network reconfiguration and optimal placement of distributed generation resources	<i>Soft Computing (Springer)</i> , vol. 24, pp. 11315–11336, 2020, Impact Factor: 3.050.
114	Mayank Kumar	Enhanced solar PV power generation under PSCs using shade dispersion	<i>IEEE Transactions on Electron Devices (IEEE Transactions)</i> , vol. 67, no. 10, pp. 4313–4320, 2020, Impact Factor: 2.913.
115	Indu Singh, Narendra Kumar , Srinivasa K.G., Tript Sharma, Vaibhav Kumar and Siddharth Singhal	Database intrusion detection using role and user behavior based risk assessment	<i>Journal of Information Security and Applications (Elsevier)</i> , vol. 55, pp. 102654, 2020, Impact Factor: 2.327.
116	Pallavi Verma , Rachana Garg and Priya Mahajan	Asymmetrical interval type-2 fuzzy logic control based MPPT tuning for PV system under partial shading condition	<i>ISA Transactions (Elsevier)</i> , vol. 100, pp. 251–263, 2020, Impact Factor: 4.305.
117	Pallavi Verma , Rachana Garg and Priya Mahajan	Smooth LMS-based adaptive control of SPV system tied to grid for enhanced power quality	<i>IET Power Electronics (IET)</i> , vol. 13, no. 15, p. 3456 – 3466, 2020, Impact Factor: 2.672.
118	Poras Khetarpal and Madan Mohan Tripathi	A critical and comprehensive review on power quality disturbance detection and classification	<i>Sustainable Computing: Informatics and Systems (Elsevier)</i> , vol. 28, pp. 100417, 2020, Impact Factor: 2.798.
119	Rupam Singh and Bharat Bhushan	A novel fault classification-based fault-tolerant control for two degree of freedom helicopter systems	<i>International Journal of Adaptive Control and Signal Processing (Wiley)</i> , vol. 34, no. 8, pp. 1080–1104, 2020, Impact Factor: 2.116.
120	Rupam Singh and Bharat Bhushan	Real-time control of ball balancer using neural integrated fuzzy controller	<i>Artificial Intelligence Review (Springer)</i> , vol. 53, pp. 351–368, 2020, Impact Factor: 5.747.
121	Santosh Ghosh, Vinod K. Yadav and Vivekananda Mukherjee	A novel hot spot mitigation circuit for improved reliability of pv module	<i>IEEE Transactions on Device and Materials Reliability (IEEE Transactions)</i> , vol. 20, no. 1, pp. 191–198, 2020, Impact Factor: 1.407.

S. No	Authors	Paper Title	Journal with Publication Details
122	Kapil Deo Bodha, Vinod Kumar Yadav and Vivekananda Mukherjee	Formulation and application of quantum-inspired tidal firefly technique for multiple-objective mixed cost-effective emission dispatch	<i>Neural Computing and Applications (Springer)</i> , vol. 32, pp. 9217–9232, 2020, Impact Factor: 4.774.
123	Vishal Verma , Ramesh Singh and Ritika Gour	ADSIG as Gen-Former providing three port network for soft coupling of distribution feeders in addition to wind energy harvesting	<i>International Journal of Electrical Power and Energy Systems (Elsevier)</i> , vol. 117, pp. 105573, 2020, Impact Factor: 3.588.
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING			
124	Akanksha Srivastava , Mani Shekhar Gupta and Gurjit Kaur	Energy efficient transmission trends towards future green cognitive radio networks (5G): Progress, taxonomy and open challenges	<i>Journal of Network and Computer Applications (Elsevier)</i> , vol. 168, pp. 102760, 2020, Impact Factor: 5.570.
125	Avinash Ratre	Stochastic gradient descent–whale optimization algorithm-based deep convolutional neural network to crowd emotion understanding	<i>The Computer Journal (Oxford University Press)</i> , vol. 63, no. 2, pp.267-282, 2020, Impact Factor: 1.077.
126	Dwijendra Pandey and K.C.Tiwari	Extraction of urban built-up surfaces and its subclasses using existing built-up indices with separability analysis of spectrally mixed classes in AVIRIS-NG imagery	<i>Advances in Space Research (Elsevier)</i> , vol. 66, no. 8, pp. 1829-1845, 2020, Impact Factor: 2.178.
127	Gaurav Saxena , Priyanka Jain and Yogendra Kumar Awasthi	High diversity gain MIMO-antenna for UWB application with WLAN notch band characteristic including human interface devices	<i>Wireless Personal Communications (Springer)</i> , vol. 112, pp. 105–121, 2020, Impact Factor:10.61.
128	Gaurav Saxena , Y.K.Awasthi and Priyanka Jain	High isolation and high gain super-wideband (0.33-10 THz) MIMO antenna for THz applications	<i>Optik (Elsevier)</i> , vol. 223, pp. 165335, 2020, Impact Factor: 2.187.
129	Karteeek Viswanadha and Nallanthighal Srinivasa Raghava	Design and analysis of a multi-band flower shaped patch antenna for WLAN/WiMAX/ISM band applications	<i>Wireless Personal Communications (Springer)</i> , vol. 112, pp. 863–887, 2020, Impact Factor: 1.061.

S. No	Authors	Paper Title	Journal with Publication Details
130	Lalit Goswami , Neha Aggarwal, Rajni Verma, Swati Bishnoi, Sudhir Husale, Rajeshwari Pandey, and Govind Gupta	Graphene quantum dot-sensitized ZnO-nanorod/GaN-nanotower heterostructure-based high-performance UV photodetectors	<i>ACS applied materials and interfaces (American Chemical Society)</i> , vol. 12, no. 41, pp. 47038-47047, 2020, Impact Factor: 8.758.
131	Lalit Goswami , Rajeshwari Pandey and Govind Gupta	Ultra-thin GaN nanostructures based self-powered ultraviolet photodetector via non-homogeneous Au-GaN interfaces	<i>Optical Materials (Elsevier)</i> , vol. 102, pp. 109820, 2020, Impact Factor: 2.779.
132	N. Jayanthi , Vishal Rajput and S. Indu	Underwater haze removal using contrast boosted grayscale image	<i>Multimedia Tools and Applications (Springer)</i> , vol. 79, pp. 31007–31026, 2020, Impact Factor: 2.313.
133	Ranjana Sivaram, Kirti Gupta and Neeta Pandey	A new realization scheme for dynamic PFSCl style	<i>Integration (Elsevier)</i> , vol. 75, pp. 169-177, 2020, Impact Factor: 1.214.
134	Neha Sharma and Jeebananda Panda	Statistical watermarking approach for 3D mesh using local curvature estimation.	<i>IET Information Security (IET)</i> , vol. 14, no. 6, pp.745-753, 2020, Impact Factor: 1.068.
135	Om Prakash Verma , Nitin Jain and S. K. Pal	A hybrid-based verifiable secret sharing scheme using chinese remainder theorem	<i>Arabian Journal for Science and Engineering (Springer)</i> , vol. 45, pp. 2395–2406, 2020, Impact Factor: 1.711.
136	Paritosh Chamola and Poornima Mittal	Impact of ZnTe, SbZnTe and SnZnTe absorber materials for multi-layered solar cell: Parametric extraction and layer wise internal analysis	<i>Optik (Elsevier)</i> , vol. 224, pp. 165626, 2020, Impact Factor: 2.187.
137	Shubham Negi, Poornima Mittal and Brijesh Kumar	In-depth analysis of structures, materials, models, parameters, and applications of organic light-emitting diodes	<i>Journal of Electronic Materials (Springer)</i> , vol. 49, pp. 4610–4636, 2020, Impact Factor: 1.774.
138	Shubham Negi, Poornima Mittal and Brijesh Kumar	Numerical modeling and parameters extraction of novel triple hole block layer-based organic light-emitting diode for display	<i>Journal of the Society for Information Display (Wiley)</i> , vol. 28, no. 12, pp.956-964, 2020, Impact Factor: 1.645.

S. No	Authors	Paper Title	Journal with Publication Details
139	Priyanka Garg and Priyanka Jain	Novel ultrathin penta-band metamaterial absorber	<i>AEU - International Journal of Electronics and Communications (Elsevier)</i> , vol. 116, pp. 153063, 2020, Impact Factor: 2.924.
140	Pragati Dahiya and Priyanka Jain	Efficient MDCT recursive structure for VLSI implementation	<i>Circuits, Systems, and Signal Processing (Springer)</i> , vol. 39, pp. 1372–1386, 2020, Impact Factor: 1.681.
141	Gaurav Saxena, Priyanka Jain and Yogendra Kumar Awasthi	High diversity gain super -wideband single notch circularly polarized MIMO antenna for multiple wireless applications	<i>IET Microwaves, Antennas and Propagation (IET)</i> , vol. 14, no. 1, pp. 109-119, 2020, Impact Factor: 1.972.
142	Priyanka Garg and Priyanka Jain	Isolation improvement of MIMO antenna using a novel flower shaped metamaterial absorber at 5.5 GHz WiMAX Band	<i>IEEE Transactions on Circuits and Systems II: Express Briefs (IEEE Transactions)</i> , vol. 67, no. 4, pp. 675-679, 2020, Impact Factor: 2.814.
143	Rahul Thakur and Rajesh Rohilla	Recent advances in digital image manipulation detection techniques: A brief review	<i>Forensic Science International (Elsevier)</i> , vol. 312, pp. 110311, 2020, Impact Factor: 2.108.
144	Ajay Kaushik, Mononito Goswami, Minkush Manuja, S. Indu and Daya Gupta	A binary PSO approach for improving the performance of wireless sensor networks	<i>Wireless Personal Communications (Springer)</i> , vol. 113, pp. 263–297, 2020, Impact Factor: 1.061.
145	A. Dutta, S. Kour and S. Taran	Automatic drowsiness detection using electroencephalogram signal	<i>Electronics Letters (IET)</i> , vol. 56, Issue 25, pp. 1383 – 1386, 2020, Impact Factor: 1.316.
146	Kuldeep Singh, Shantanu Rajora, Dinesh Kumar Vishwakarma, Gaurav Tripathi, Sandeep Kumar and Gurjit Singh Walia	Crowd anomaly detection using aggregation of ensembles of fine-tuned ConvNets	<i>Neurocomputing (Elsevier)</i> , vol. 371, pp. 188-198, 2020, Impact Factor: 4.438.

S. No	Authors	Paper Title	Journal with Publication Details
DEPARTMENT OF ENVIRONMENTAL ENGINEERING			
147	Sakshi and A. K. Haritash	A comprehensive review of metabolic and genomic aspects of PAH-degradation	<i>Archives of Microbiology (Springer)</i> , vol. 202, pp. 2033–2058, 2020, Impact Factor: 1.884.
148	Manisha Verma and A.K.Haritash	Photocatalytic degradation of amoxicillin in pharmaceutical wastewater: A potential tool to manage residual antibiotics	<i>Environmental Technology and Innovation (Elsevier)</i> , vol. 20, pp. 101072, 2020, Impact Factor: 3.356.
149	Aviral Agarwal, Aman Kaushik, Sankalp Kumar and Rajeev Kumar Mishra	Comparative study on air quality status in Indian and Chinese cities before and during the COVID-19 lockdown period	<i>Air Quality, Atmosphere and Health (Springer)</i> , vol. 13, no. 10, pp. 1167-1178, 2020, Impact Factor: 2.870.
150	Amrit Kumar, Rajeev Kumar Mishra and Kiranmay Sarma	Mapping spatial distribution of traffic induced criteria pollutants and associated health risks using kriging interpolation tool in Delhi	<i>Journal of Transport and Health (Elsevier)</i> , vol. 18, pp. 100879, 2020, Impact Factor: 2.418.
DEPARTMENT OF INFORMATION TECHNOLOGY			
151	Ashima Yadav and Dinesh Kumar Vishwakarma	A unified framework of deep networks for genre classification using movie trailer	<i>Applied Soft Computing (Elsevier)</i> , vol. 96, pp. 106624, 2020, Impact Factor: 5.472.
152	Ashima Yadav and Dinesh Kumar Vishwakarma	Sentiment analysis using deep learning architectures: A review	<i>Artificial Intelligence Review (Springer)</i> , vol. 53, pp. 4335–4385, 2020, Impact Factor: 5.747.
153	Ashima Yadav and Dinesh Kumar Vishwakarma	A comparative study on bio-inspired algorithms for sentiment analysis	<i>Cluster Computing (Springer)</i> , vol. 23, pp. 2969–2989, 2020, Impact Factor: 3.458.
154	Ashima Yadav and Dinesh Kumar Vishwakarma	A deep learning architecture of RA-DLNet for visual sentiment analysis	<i>Multimedia Systems (Springer)</i> , vol. 26, pp. 431–451, 2020, Impact Factor: 1.563.
155	Dinesh Kumar Vishwakarma	A two-fold transformation model for human action recognition using decisive pose	<i>Cognitive Systems Research (Elsevier)</i> , vol. 61, pp. 1-13, 2020, Impact Factor: 1.902.
156	Om Prakash Verma and Heena Hooda	A novel intuitionistic fuzzy co-clustering algorithm for brain images	<i>Multimedia Tools and Applications (Springer)</i> , vol. 79, pp. 31517–31540, 2020, Impact Factor: 2.313.

S. No	Authors	Paper Title	Journal with Publication Details
157	Gurjit Singh Walia, Ashish Kumar, Astitwa Saxena, Kapil Sharma and Kuldeep Singh	Robust object tracking with crow search optimized multi-cue particle filter	<i>Pattern Analysis and Applications (Springer)</i> , vol. 23, pp. 1439–1455, 2020, Impact Factor: 1.512.
158	Om Prakash Verma, Nitin Jain and Saibal Kumar Pal	Design and analysis of an optimal ECC algorithm with effective access control mechanism for big data	<i>Multimedia Tools and Applications (Springer)</i> , vol. 79, pp. 9757–9783, 2020, Impact Factor: 2.313.
159	Priyanka Meel and Dinesh Kumar Vishwakarma	Fake news, rumor, information pollution in social media and web: A contemporary survey of state-of-the-art, challenges and opportunities	<i>Expert Systems with Applications (Elsevier)</i> , vol. 153, pp. 112986, 2020, Impact Factor: 5.452.
160	Ritu Agarwal and Om Prakash Verma	An efficient copy move forgery detection using deep learning feature extraction and matching algorithm	<i>Multimedia Tools and Applications (Springer)</i> , vol. 79, pp. 7355–7376, 2020, Impact Factor: 2.313.
161	Seba Susan , Rohit Ranjan, Udyant Taluja, Shivang Rai and Pranav Agarwal	Global-best optimization of ANN trained by PSO using the non-extensive cross-entropy with Gaussian gain	<i>Soft Computing (Springer)</i> , vol. 24, pp. 18219–18231, 2020, Impact Factor: 3.050.
162	Seba Susan and K. M. Rachna Devi	Text area segmentation from document images by novel adaptive thresholding and template matching using texture cues	<i>Pattern Analysis and Applications (Springer)</i> , vol. 23, pp. 869–881, 2020, Impact Factor: 1.512.
163	Srishti Vashishtha and Seba Susan	Sentiment cognition from words shortlisted by fuzzy entropy	<i>IEEE Transactions on Cognitive and Developmental Systems (IEEE Transactions)</i> , vol. 12, no. 3, pp. 541-550, 2020, Impact Factor: 2.667.
DEPARTMENT OF MECHANICAL ENGINEERING			
164	Shyam Agarwal, Akhilesh Arora and B.B.Arora	Energy and exergy analysis of vapor compression–triple effect absorption cascade refrigeration system	<i>Engineering Science and Technology, an International Journal (Elsevier)</i> , vol. 23, no. 3, pp. 625-641, 2020, Impact Factor: 3.219.
165	Anuj Sharma , Vikas Rastogi and Atul Kumar Agrawal	Microstructural, dynamic and residual stress analysis of metal matrix composite shafts	<i>Transactions of the Indian Institute of Metals (Springer)</i> , vol. 73, pp. 2995–3005, 2020, Impact Factor: 1.205.

S. No	Authors	Paper Title	Journal with Publication Details
166	Ashok Kumar Singh and Samsher	Analytical study of evacuated annulus tube collector assisted solar desalting	<i>Solar Energy (Elsevier)</i> , vol. 207, pp. 1404-1426, 2020, Impact Factor: 4.608.
167	Vijay Chaudhary and Furkan Ahmad	A review on plant fiber reinforced thermoset polymers for structural and frictional composites	<i>Polymer Testing (Elsevier)</i> , vol. 91, pp. 106792, 2020, Impact Factor: 3.275.
168	Furkan Ahmad , N Yuvaraj and Pramendra K. Bajpai	Effect of reinforcement architecture on the macroscopic mechanical properties of fibrous polymer composites: A review	<i>Polymer Composites (Wiley)</i> , vol. 41, no. 6, pp. 2518-2534, 2020, Impact Factor: 2.265.
169	Husain Mehdi and R. S. Mishra	Influence of friction stir processing on weld temperature distribution and mechanical properties of TIG-welded joint of AA6061 and AA7075	<i>Transactions of the Indian Institute of Metals (Springer)</i> , vol. 73, pp. 1773-1788, 2020, Impact Factor: 1.205.
170	Kaushalendra Kumar Singh , Rajesh Kumar and Anjana Gupta	Comparative energy, exergy and economic analysis of a cascade refrigeration system incorporated with flash tank (HTC) and a flash intercooler with indirect subcooler (LTC) using natural refrigerant couples	<i>Sustainable Energy Technologies and Assessments (Elsevier)</i> , vol. 42, pp. 100833, 2020, Impact Factor: 3.427.
171	Mukul Tomar and Naveen Kumar	Effect of multi-walled carbon nanotubes and alumina nano-additives in a light duty diesel engine fuelled with schleicher oleosa biodiesel blends	<i>Sustainable Energy Technologies and Assessments (Elsevier)</i> , vol. 42, pp. 100833, 2020, Impact Factor: 3.427.
172	Mukul Tomar , Amit Jain, Prashant Chandra Pujari, Hansham Dewal and Naveen Kumar	Potentials of waste plastic pyrolysis oil as an extender fuel for diesel engine	<i>Arabian Journal of Geosciences (Springer)</i> , vol. 13, 2020, Impact Factor: 1.327.
173	Nagendra Kumar Maurya , Vikas Rastogi and Pushpendra Singh	An overview of mechanical properties and form error for rapid prototyping	<i>CIRP Journal of Manufacturing Science and Technology (Elsevier)</i> , vol. 29, Part A, pp. 53-70, 2020, Impact Factor: 2.991.
174	Parvesh Ali , S.M.Pandey, M.S.Ranganath, R.S.Walia and Qasim Murtaza	Experimentation and modelling of CNT additive abrasive media for micro finishing	<i>Measurement (Elsevier)</i> , vol. 151, pp. 107133, 2020, Impact Factor: 3.364.

S. No	Authors	Paper Title	Journal with Publication Details
175	Parvesh Ali, R. S. Walia, Qasim Murtaza and Ranganath Muttanna Singari	Material removal analysis of hybrid EDM-assisted centrifugal abrasive flow machining process for performance enhancement	<i>Journal of the Brazilian Society of Mechanical Sciences and Engineering (Springer)</i> , vol. 42, 2020, Impact Factor: 1.755.
176	Ravi Butola , Qasim Murtaza and Ranganath M Singari	Formation of self-assembled monolayer and characterization of AA7075-T6/B ₄ C nano-ceramic surface composite using friction stir processing	<i>Surface Topography: Metrology and Properties (IOP Publishing)</i> , vol. 8, 2020, Impact Factor: 1.613.
177	Ravi Butola , Ranganath M Singari and Qasim Murtaza	Mechanical and wear behaviour of Friction stir processed surface composite through self-assembled monolayer technique	<i>Surface Topography: Metrology and Properties (IOP Publishing)</i> , vol. 8,, 2020, Impact Factor: 1.613.
178	Sanjay Sundriyal , Jitender Yadav, R. S. Walia, Vipin and Rajesh Kumar	Thermophysical-based modeling of material removal in powder mixed near-dry electric discharge machining	<i>Journal of Materials Engineering and Performance (Springer)</i> , vol. 29, pp. 6550–6569, 2020, Impact Factor: 1.652.
179	Sumit Joshi , N. Yuvaraj, Ramesh Chandra Singh and Rajiv Chaudhary	Microstructural and wear investigations of the Mg/B ₄ C surface composite prepared through friction stir processing	<i>Transactions of the Indian Institute of Metals (Springer)</i> , vol. 73, pp. 3007–3018, 2020, Impact Factor: 1.205.
180	Yashwant Koli , N. Yuvaraj, S. Aravindan and Vipin	Multi-response mathematical modeling for prediction of weld bead geometry of AA6061-T6 using response surface methodology	<i>Transactions of the Indian Institute of Metals (Springer)</i> , vol. 73, pp. 645–666, 2020, Impact Factor: 1.205.
UNIVERSITY SCHOOL OF MANAGEMENT AND ENTREPRENEURSHIP			
181	Rajesh Sharma	An examination of colorectal cancer burden by socioeconomic status: evidence from GLOBOCAN 2018	<i>EPMA Journal (Springer)</i> , vol. 11, pp. 95–117, 2020, Impact Factor: 4.901.
182	Rajesh Sharma	Descriptive epidemiology of incidence and mortality of primary liver cancer in 185 countries: evidence from GLOBOCAN 2018	<i>Japanese Journal of Clinical Oncology (Oxford University Press)</i> , vol. 50, no. 12, pp. 1370-1379, 2020, Impact Factor: 1.914.



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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. D. Ahluwalia, **A. Kumar***, S. G. Warkar and M. Deshmukh, "Effect of substitutions on the geometry and intramolecular hydrogen bond strength in meta-benziporphodimethenes: A new porphyrin analogue", *Journal of Molecular Structure*, vol. 1220, pp. 128773, 2020, Impact Factor: 2.463.

Effect of Substitutions on the Geometry and Intramolecular Hydrogen Bond Strength in meta-benziporphodimethes: A New Porphyrin Analogue

Deepali Ahluwalia, **Anil Kumar***, Sudhir G. Warkar and M. Deshmukh

Abstract: A new class of compound meta-benziporphodimethene, that has low synthetic yield yet extensive applications in metal ion sensing and cell-imaging, has been explored here. The present work is aimed to investigate the effect of substituents at sp² and sp³ meso carbons, on the geometry and energy of these molecules. The substitution at these positions affects the inner geometry (cavity size) and the classical hydrogen bond strengths. The hydrogen bond strength has been estimated using molecular tailoring-based approach using density functional theory. Theoretical studies showed that on increasing the bulkiness of sp³ meso positions, the puckered structure undergoes better conventional hydrogen bonding. It is also concluded that electron-withdrawing groups at sp² meso phenyl stabilize the molecule more than electron-donating ones. This study is useful for perceiving the factors regulating the cavity size in meta-benziporphodimethene analogues that can further enhance the ease in metalation of these moieties.

For details refer to: <https://doi.org/10.1016/j.molstruc.2020.128773>

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Dr. Deenan Santhiya is 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 Master's 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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. M. Gautam, **D. Santhiya** and N. Dey, “Zein coated calcium carbonate nanoparticles for the targeted controlled release of model antibiotic and nutrient across the intestine”, *Materials Today Communications*, vol. 25, pp.101394, 2020. Impact Factor: 2.678.
2. N Tiwari, **D. Santhiya** and J.G. Sharma, “Microbial remediation of micro-nano plastics: Current knowledge and future trends”, *Environmental Pollution*, vol. 265, Part A, pp. 115044, 2020. Impact Factor: 6.793.
3. N. Gupta, H. Goel, **D. Santhiya**, C.M. Srivastava, S. Mishra and P. Rai, “Aqueous-phased electrospun bioactive glass mineralized gelatin-pectin hybrid composite fiber matrix for 7-Dehydrocholesterol delivery”, *ChemistrySelect*, vol. 5, no. 14, pp. 4364-4370, 2020. Impact Factor: 1.811.

Zein coated calcium carbonate nanoparticles for the targeted controlled release of model antibiotic and nutrient across the intestine

Meenakshi Gautam, **Deenan Santhiya*** and Namit Dey

Abstract: In this study, a novel bio-inspired method was used to synthesize calcium carbonate nanoparticles (CaCO_3 NPs) using gelatin as a template for the co-delivery of vitamin D and amoxicillin. The synthesized CaCO_3 NPs were characterized using Transmission electron microscopy (TEM), X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), Thermogravimetric analysis (TGA) and Brunauer-Emmett-Teller (BET). XRD and TEM confirmed nanocrystalline nature of CaCO_3 in size range of 10–15 nm. Further, CaCO_3 NPs encapsulated with vitamin D, coated with zein and finally loaded with amoxicillin as a model drug. The release study of vitamin D and amoxicillin was performed in the simulated gastric fluid (SGF) (pH 1.2) and simulated intestinal fluid (SIF) (pH 6.8) and (pH 7.4) at 37 °C temperature. The encapsulation of hydrophobic vitamin D in CaCO_3 NPs with an external zein coating approach enhances their controlled and sustained release property at the target site. The role of gelatin molecule in the synthesis of nano-sized CaCO_3 was demonstrated using CD spectroscopy. MTT assay was performed on zein coated CaCO_3 NPs at varying concentrations on kidney (HEK) and liver (Hep G₂) cell lines after 24 h exposure to ensure its biocompatibility.

For details refer to <https://doi.org/10.1016/j.mtcomm.2020.101394>

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Microbial remediation of micro-nano plastics: Current knowledge and future trends

Neha Tiwari, **Deenan Santhiya*** and Jai Gopal Sharma

Abstract: An alarming rise of micro-nano plastics (MNPs) in environment is currently causing the biggest threat to biotic and abiotic components around the globe. These pollutants, apart from being formed through fragmentation of larger plastic pieces and are also manufactured for commercial usage. MNPs enter agro-ecosystem, wildlife, and human body through the food chain, ingestion or through inhalation, causing blockage in the blood-brain barrier, lower fertility, and behavioural abnormalities among other problems. Hence, it becomes essential to develop novel procedures for remediation of MNPs. Among the numerous existing methods, microbial remediation promises to degrade/recover MNPs via a green route. Since microbial remediation processes mostly depend upon biotic and abiotic factors such as (temperature, pH, oxidative stress, etc.), it becomes easy to influence changes in the plastic pollutants. Hence, with the help of recent technologies, a complete degradation/removal of MNPs can be expected by utilizing the respective carbon content as energy sources for growth of microorganisms. In this review, considering the urgent environmental need, the impact of micro-nano plastics on ecosystem along with its corresponding degradation mechanisms has been brought out. Also, importance of the various recent research approaches in MNPs remediation is highlighted. Finally, the role of enzyme and membrane technology, nanoparticle technology, and metagenomics in remediation of MNPs are discussed for the first time in detail to bring out a novel remedy for the environment.

For details refer to <https://doi.org/10.1016/j.envpol.2020.115044>

Aqueous-phased electrospun bioactive glass mineralized gelatin-pectin hybrid composite fiber matrix for 7-dehydrocholesterol delivery

Nidhi Gupta, Himansh Goel, **Deenan Santhiya***, Chandra Mohan Srivastava, Sarita Mishra and Pragya Rai

Abstract: Ultrafine fibers and a bioactive glass mineralized fibrous mat of gelatin-pectin blends were produced by electrospinning in an aqueous phase. Herein, the gelatin-pectin blend was used as a template for the in situ mineralization of bioactive glass particles during the electrospinning of gelatin-pectin based hybrid composite fiber matrix. Further, in situ mineralized bioactive glass along with the fibrous mat functioned as a site for 7-dehydrocholesterol, i. e., vitamin-D precursor. This engineered fibrous mat resulted in the sustained release of the drug, which is necessary for the strengthening of the neo regenerated bones. The fibrous mat also exhibited excellent bioactivity in simulated body fluid. Additionally, the hybrid composite fiber mat was observed to possess remarkable cytocompatibility with osteoblast cells and showed cell proliferation on the surface of the fibrous mat.

For details refer to <https://doi.org/10.1002/slct.202000264>

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PROF. D. KUMAR

Department of Applied Chemistry

Dr. D. Kumar is working as Professor in the Department of Applied Chemistry, Delhi Technological University, Delhi w.e.f. 05/03/2010. He has worked as **Head of the Department of Biotechnology, and Department of Applied Chemistry at Delhi Technological University, Delhi**. 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, India–Japan Collaborative Research Project twice under DST-JSPS bilateral programme. He has guided 13 Ph.Ds., 84 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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

- O. Jalil, C.M. Pandey and **D. Kumar**, “Electrochemical biosensor for the epithelial cancer biomarker EpCAM based on reduced grapheme oxide modified with nanostructured titanium dioxide”, *Microchimica Acta*, vol. 187, no. 275, 2020. Impact Factor: 6.232.

Electrochemical biosensor for the epithelial cancer biomarker EpCAM based on reduced graphene oxide modified with nanostructured titanium dioxide

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

Abstract: An electrochemical immunosensor has been fabricated for the early determination of epithelial cell adhesion molecules (EpCAM, tumor biomarker) antigen using reduced graphene oxide (rGO) modified with nanostructured titanium dioxide (TiO₂). The hydrothermally synthesized rGO@TiO₂ nanocomposite has been electrophoretically deposited on indium tin oxide (ITO) coated glass substrate, and the deposition was confirmed using various spectroscopic, microscopic, and electrochemical techniques. The fabricated rGO@TiO₂/ITO electrode shows improved electron transfer kinetics with an electron transfer rate constant of $1.93 \times 10^{-7} \text{ cm} \cdot \text{s}^{-1}$. Furthermore, the rGO@TiO₂/ITO electrodes were used for the covalent immobilization of monoclonal EpCAM antibodies. Electrochemical determination of the EpCAM cancer biomarker is achieved using differential pulse voltammetry by scanning the potential from -0.4 to 0.8 V with an amplitude of 50 mV. The rGO@TiO₂-based biosensor shows high sensitivity ($3.24 \mu\text{A} \cdot \text{mL} \cdot \text{ng}^{-1} \cdot \text{cm}^{-2}$), wide detection range ($0.01 \text{ ng} \cdot \text{mL}^{-1}$ to $60 \text{ ng} \cdot \text{mL}^{-1}$), and low detection limit ($0.0065 \text{ ng} \cdot \text{mL}^{-1}$, S/N=3). The fabricated biosensor is highly stable and regenerable and has been successfully applied to the determination of EpCAM in spiked human serum samples.

For details refer to <https://doi.org/10.1007/s00604-020-04233-7>

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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 10 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 11 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 four 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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. P. Tondan and **M. Jain**, "Modeling and simulation of non-isothermal packed-bed membrane reactor for decomposition of hydrogen iodide", *Environmental Technology and Innovation*, vol. 20, pp. 101162, 2020. Impact Factor: 3.356.
2. R. Sharma and **M. Jain**, "Removal of benzothiophenes from model diesel/jet oil fuel by using pervaporation process: Estimation of mass transfer properties of the different membranes and dynamic modeling of a scale-up batch process", *Journal of Membrane Science*, vol. 595, pp. 117500, 2020. Impact Factor: 7.183.
3. R. Sharma and **M. Jain**, "Variance based sensitivity analysis and statistical optimization of design and operating parameters of spiral wound pervaporation modules for thiophene removal from FCC gasoline", *Computers and Chemical Engineering*, vol. 141, pp. 106987, 2020. Impact Factor: 4.0.

Modeling and simulation of non-isothermal packed-bed membrane reactor for decomposition of hydrogen iodide

Purujit Tondan and **Manish Jain***

Abstract: HI decomposition using a membrane reactor is one of the important steps in hydrogen production by the thermal splitting of water using the Sulfur–Iodine cycle. Though, this reaction is endothermic. The mathematical model available to study the performance of such a reactor is an isothermal model. In this study, a non-isothermal mathematical model is developed by microscopic material and energy balance across the length of the membrane reactor. Experimental results from the literature are used for validation of the developed model. Comparing the simulations from the developed model and already reported isothermal model showed significant differences, which endorses the importance of the developed model.

Later, the effects of different operating and design parameters were analyzed. Higher feed temperature (950–1000 K), lower feed pressure (100,000–150,000 Pa), lower feed flow rate (<200 ml/min), lower permeate pressure (<2500 Pa) and low to moderate N₂/HI ratio (0.3–0.4) were found to be the optimum operating conditions. Similarly, the conversion also increased with increasing reactor length, membrane area, and membrane permeance but eventually became constant. Reactor length around 0.4 m, membrane area around 0.008 m² and membrane permeance around 2×10^{-7} mol m² Pa⁻¹ s⁻¹ were estimated to be the optimum design conditions for the maximum HI decomposition.

For details refer to <https://doi.org/10.1016/j.eti.2020.101162>

**Corresponding Author*

Removal of benzothiophenes from model diesel/jet oil fuel by using pervaporation process: Estimation of mass transfer properties of the different membranes and dynamic modeling of a scale-up batch process

Rohan Sharma and **Manish Jain***

Abstract: Removal of benzothiophenes is a crucial step in order to reduce sulfur content in transportation fuels up to the desired levels. In this study, pervaporation process is investigated for the removal of benzothiophenes from model diesel/jet fuels (benzothiophene/n dodecane mixtures). Values of different mass transfer parameters were estimated for different sulfur selective membranes by using reported experimental results. These parameters were then used to compare the membrane selectivity for benzothiophene. Polyimide membrane prepared from 2,3,5,6-tetramethyl-1,4-phenylenediamine showed the highest selectivity (1.99) towards benzothiophene at 393 K feed temperature. Membrane selectivity towards benzothiophene increased with increasing feed temperature for all membranes.

Later, a mathematical model was developed for a scale-up batch pervaporation unit. The model was simulated to reduce the sulfur concentration from 303 PPM mole to 30.3 PPM mole in 100 liters of model diesel/jet fuel by using a 5 m² spiral wound module. Simulations showed that all membranes are able to reduce the sulfur content up to the desired limit (303 PPM mole to 30.3 PPM mole). Polyimide/POSS hybrid membrane took 11.17 h to reduce sulfur concentration; however, the product recovery was low (7.05%). Moreover, polyimide membranes synthesized from 2,3,5,6-tetramethyl-1,4-phenylenediamine gave the highest product recovery 35.81% and took 21.33 h to reduce the sulfur concentration.

For details refers to <https://doi.org/10.1016/j.memsci.2019.117500>

**Corresponding Author*

Variance based sensitivity analysis and statistical optimization of design and operating parameters of spiral wound pervaporation modules for thiophene removal from FCC gasoline

Rohan Sharma and **Manish Jain** *

Abstract: Global sensitivity analysis and optimization is an essential step to understand the overall influence of input parameters. In this study, the influence of different operating and design parameters of the spiral wound pervaporation module is examined for the desulfurization of model gasoline. Feed temperature is found most influential parameter among all parameters for flux and enrichment factor. The sensitivity of other parameters is found relatively lesser. For temperature drop in the feed section and pressure drop in the permeate section, influences of design parameters become significant. The influence of interactions among input parameters on the decision variables is also found substantial except for total flux.

Later, different operating and design parameters were also optimized. Lower permeate pressure, higher feed temperature, and Reynolds number are found better-operating conditions, and lower L/W (length to width ratio of a membrane leaf), smaller membrane area and the higher number of leaves are found better design conditions.

For details refer to <https://doi.org/10.1016/j.compchemeng.2020.106987>

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DR. NIDHI GUPTA

Department of Applied Chemistry

Dr. Nidhi Gupta received her master's degree in Nanotechnology from Amity University with masters dissertation on the vaccine adjuvant nanoformulation development under Prof. Anton Middleberg at AIBN, University of Queensland, Australia. She earned her PhD in chemistry from Delhi Technological University under the supervision of Dr. Deenan Santhiya. Her thesis focused on the bio-inspired synthesis of nanobioactive glass materials, exploring its bioactivity, mechanical properties and cell-interaction studies as well as applications beyond bone regeneration towards gene and co-antibiotics delivery. During PhD tenure, she has also gained experience on skin penetrating peptides under Dr. Munia Ganguli, CSIR-IGIB, Delhi. She worked as a postdoctoral SERB research associate in the laboratory of Prof. H. B. Bohidar, School of Physical Science, JNU, gaining understanding towards the biophysical characterization and rheological properties of biopolymers. Presently pursuing her postdoctoral studies under Dr. Asish Pal at INST, Mohali, where she is focusing her research efforts on developing supramolecular biomimetic peptide hydrogels for various biomedical applications primarily bone regeneration and cartilage tissue engineering.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

- N. Gupta**, H. Goel, D. Santhiya, C.M. Srivastava, S. Mishra and P. Rai, "Aqueous-phased electrospun bioactive glass mineralized gelatin-pectin hybrid composite fiber matrix for 7-dehydrocholesterol delivery", *ChemistrySelect*, vol. 5, no. 14, pp. 4364-4370, 2020. Impact Factor: 1.811.

Aqueous-phased electrospun bioactive glass mineralized gelatin-pectin hybrid composite fiber matrix for 7-dehydrocholesterol delivery

Nidhi Gupta, Himansh Goel, Deenan Santhiya, Chandra Mohan Srivastava, Sarita Mishra and Pragya Rai

Abstract: Ultrafine fibers and a bioactive glass mineralized fibrous mat of gelatin-pectin blends were produced by electrospinning in an aqueous phase. Herein, the gelatin-pectin blend was used as a template for the in situ mineralization of bioactive glass particles during the electrospinning of gelatin-pectin based hybrid composite fiber matrix. Further, in situ mineralized bioactive glass along with the fibrous mat functioned as a site for 7- dehydrocholesterol, i. e., vitamin-D precursor. This engineered fibrous mat resulted in the sustained release of the drug, which is necessary for the strengthening of the neo regenerated bones. The fibrous mat also exhibited excellent bioactivity in simulated body fluid. Additionally, the hybrid composite fiber mat was observed to possess remarkable cytocompatibility with osteoblast cells and showed cell proliferation on the surface of the fibrous mat.

For details refer to <https://doi.org/10.1002/slct.202000264>



PROF. R. C. SHARMA

Department of Applied Chemistry

Prof. R. C. Sharma earned Gold Medal in M.Sc. (Chemistry) in 1972. He obtained his Doctorate Degree from University of Delhi in 1977. He further enriched his knowledge by attending specialized courses at IIT Bombay, IIT Kharagpur, Roorkee Univeristy, CECRI Karaikudi, NIESBUD Delhi and NISIET Hyderabad. He has been accredited Professional Trainer for Entrepreneurship Motivation and Small Business Development Training by NIESBUD Delhi and NISIET Hyderabad.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. P. Goel, D. Dobhal and **R. C. Sharma**, "Aluminum–air batteries: A viability review", *Journal of Energy Storage*, vol. 28, pp. 101287, 2020. Impact Factor: 3.762.

Aluminum–air batteries: A viability review

P. Goel, D. Dobhal and **R.C. Sharma***

Abstract: Aluminum–air (Al–air) batteries, both primary and secondary, are promising candidates for their use as electric batteries to power electric and electronic devices, utility and commercial vehicles and other usages at a relatively lower cost. This paper provides an analysis of the performance of these batteries with a component by component comparison with other technologies. It also aims to identify the major impediments that must be overcome for the battery. Al alloys are inexpensive and provide better electrochemical performances as compared to pure Al. The oxygen reduction reaction (ORR) at the cathode is traditionally controlled by platinum and other noble catalysts, but several carbonaceous materials, transitional metal oxides, and polymer-based systems may be satisfactory alternatives. The aqueous alkali electrolytes, though widely used at present, may be suitably replaced by non-aqueous electrolytes, aprotic and ionic liquids for both primary and secondary batteries. The different types of design and assembly for greater performance and economic viability are also described. This review may serve as a scientific tool for the progression of research on Al–air battery system.

For details refer to <https://doi.org/10.1016/j.est.2020.101287>

**Corresponding Author*



DR. ROLI PURWAR

Department of Applied Chemistry

Dr. Roli Purwar is currently working as Associate Professor in the discipline of Polymer Science and Chemical Technology, Department of Applied Chemistry, DTU. In addition to academics she is holding position of “Associate Dean” of Office of International affairs at DTU. She has Joined DTU as Assistant Professor in the year 2010. Dr. Purwar has been awarded “Young scientist fast Track Project” as Principal Investigator by SERB-DST, Govt. of India during 2012-2015. She has developed two technologies namely “Acrylic based formulations for floor” & “Formulation for improving the impact properties of recycled polypropylene” and transferred to industries. Three patents (2 Indian and 1 US) are in her credit. She has been received grant of Rs.26 lakh under EMR-SERB project as Principal Investigator by DST, Govt. of India for three years 2018-2021. She has published more than 60 papers in Journal of International repute and in proceeding of national/ International Conference. She has supervised 02 PhD and 10 M.Tech Thesis.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. P. Gupta and **R. Purwar**, “Electrospun pH responsive poly (acrylic acid-co- acrylamide) hydrogel nanofibrous mats for drug delivery”, *Journal of Polymer Research*, vol. 27, no. 296, 2020. Impact Factor: 2.426.
2. R. Yadav and **R. Purwar**, “Tailoring of electrical and optical properties of regenerated silk fibroin films with metal oxides”, *Journal of Materials Science: Materials in Electronics*, vol. 31, no. 20, pp. 17784–17797, 2020. Impact Factor: 2.220.

Electrospun pH responsive poly (acrylic acid-co-acrylamide) hydrogel nanofibrous mats for drug delivery

Preeti Gupta and Roli Purwar*

Abstract: In the present study hydrogel nanofibrous mats are prepared through electrospinning of poly (acrylamide-co-acrylic acid) dope solution having polyethylene glycol as cross-linker. The electrospun mats are heat treated at 150 °C to induce esterification crosslinking reaction. The mats are characterized for their structural, morphological and thermal behaviour. The average diameter of hydrogel nanofibers is found to be 275 ± 94.5 nm. The swelling behaviour of nanofibrous mats is evaluated in the phosphate buffer solutions of different pHs in the range of 2 to 8.5 and is found to be highest at neutral pH. The nanofibrous mats are loaded with amoxicillin drug for antimicrobial activity and drug release behaviour. The drug loaded mats form a clear inhibition zone with both Gram-positive bacteria *S. aureus* and Gram-negative bacteria *E. coli* in disc diffusion test. Drug is released at all the pHs (2 to 8.5) and maximum release is observed at neutral pH. The kinetics of drug release follows Fickian diffusion ($n < 0.5$) at tested pH.

For details refer to <https://doi.org/10.1007/s10965-020-02236-9>

Tailoring of electrical and optical properties of regenerated silk fibroin films with metal oxides

Reetu Yadav and Roli Purwar*

Abstract: In this study, silk fibroin was used as a matrix to incorporate the metal oxide nanoparticles i.e. zinc oxide (ZnO) and copper oxide (CuO) to form transparent nanocomposite films by solvent casting method. The effect of metal oxide nanoparticles and their concentrations on the conductivity of silk fibroin film were detected by a four-point probe instrument. As the thickness of the films was reduced, the conductivity increased. Hall Effect experiment was carried out to determine the carrier (electron or holes) concentration and identification of the semiconducting behaviour of nanocomposite films. Pure silk fibroin (SF) film showed p-type semiconducting behaviour. Incorporation of zinc oxide and copper oxide nanoparticles in the silk fibroin matrix makes it n-type and p-type semiconductor, respectively. Uniform dispersion of metal oxide nanoparticles in the silk fibroin matrix was observed through field emission scanning electron microscopy. The UV-Vis spectra of nanocomposite films showed 82–84% transmittance and reduction in refractive index. Addition of metal oxide nanoparticles reduced the β sheet content and percentage crystallinity of silk fibroin as observed by FTIR and XRD, respectively. The structural alterations at the molecular level reveal their relationship with electrical and optical properties.

For details refer to <https://doi.org/10.1007/s10854-020-04332-4>

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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 benzoporphyrins. 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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. Khushbu and **S. G. Warkar**, "Potential applications and various aspects of polyfunctional macromolecule- carboxymethyl tamarind kernel gum", *European Polymer Journal*, vol. 140, 2020. Impact Factor: 3.862.

Potential applications and various aspects of polyfunctional macromolecule- carboxymethyl tamarind kernel gum

Khushbu and **Sudhir G. Warkar***

Abstract: The future of good research lies in the search for innocuous and versatile material development, based primarily on natural resources. Natural polymers have a unique combination of environment-friendly features and functional properties which make them different from synthetic polymers. Carboxymethyl Tamarind kernel gum (CMTKG) is one such fine example of the derivatives of the natural polymers because of its simple technique utilized for isolation and derivatization. CMTKG is the carboxymethyl derivative of Tamarind Kernel Powder (TKG) wherein TKG is extracted from the seeds of Tamarindus Indica L. and has diverse forms and applications. The chemical modification of TKG into CMTKG results in enhancing swelling ability, high drug holding capacity, broad pH tolerance, mucoadhesivity, in situ gelations, hydrophilicity, stability, and release kinetics. CMTKG also plays a notable role in the field of drug delivery along with agriculture, wastewater treatment, tissue engineering and in developing hydrogels, films, composites, pellets, nanoparticles. This review is intended to work as a useful tool for researchers, who are diligently engaged in the sphere of green polymeric materials, and in providing almost every aspect of CMTKG published till date.

For details refer to <https://doi.org/10.1016/j.eurpolymj.2020.110042>

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DR. ABHISHEK KUMAR

Department of Applied Mathematics

Dr. Abhishek Kumar has received Ph.D. degree in the Department of Applied Mathematics, Delhi Technological University, Delhi, India in 2019. After completing his Ph.D., he joined as an Assistant Professor in the Sharda University, Greater Noida. His research area is mathematical epidemiology. He gained his master's degree in applied mathematics from Indian Institute of Technology (IIT) Roorkee. He has published several research papers in reputed international journals.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. Kumar**, M. Kumar and Nilam, "A study on the stability behavior of an epidemic model with ratio-dependent incidence and saturated treatment", *Theory in Biosciences*, vol. 139, no. 2, pp. 225-234, 2020. Impact Factor: 1.303.

A study on the stability behavior of an epidemic model with ratio-dependent incidence and saturated treatment

Abhishek Kumar, M. Kumar and Nilam

Abstract: In the present article, the dynamics of a novel combination of ratio-dependent incidence rate and saturated treatment rate in susceptible-infected-recovered disease compartmental model has been presented. The ratio-dependent incidence rate has been incorporated into the model to monitor the situation when ratio of the number of infectives to that of the susceptibles is getting higher. The saturated treatment rate of the infected population has been considered as Holling type II functional, which explains the limitation in treatment availability. From the mathematical analysis of the model, two types of equilibria of the model have been obtained, which are named as disease-free equilibrium (DFE) and endemic equilibrium (EE). The local stability behavior of equilibria has been investigated by the basic reproduction number R_0 , center manifold theory and Routh–Hurwitz criterion. It has been investigated that the DFE is locally asymptotically stable when $R_0 < 1$, and when $R_0 > 1$, the DFE exhibits either a forward bifurcation or a backward bifurcation under some conditions. The local stability behavior of the EE has also been analyzed, and some conditions are obtained for the same. Finally, some numerical computations have been performed in support of our theoretical results.

For details refer to <https://doi.org/10.1007/s12064-020-00314-6>



DR. ADITYA KAUSHIK

Department of Applied Mathematics

Dr. Aditya Kaushik has been working as an Associate Professor in the Department of Applied Mathematics, Delhi Technological University, Delhi, India. His research interest includes “Numerical Analysis” and “Differential Equations”. He obtained his Ph.D. degree from Kurukshetra University, Kurukshetra. Moreover, he had postdoctoral experience working at INRIA, France and Center for Techno-mathematics, Germany.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. Kaushik**, V. Kumar, M. Sharma and A. K. Vashishth, “A higher order finite element method with modified graded mesh for singularly perturbed two-parameter problems,” *Mathematical Methods in the Applied Sciences*, vol. 43, no. 15, pp. 8644-8656, 2020. Impact Factor: 1.626.

A higher order finite element method with modified graded mesh for singularly perturbed two-parameter problems

Aditya Kaushik, Vijayant Kumar, Manju Sharma and Anil K. Vashishth

Abstract: This paper presents a modified graded mesh for singularly perturbed two-parameter problems. The mesh is generated recursively using Newton’s algorithm and some implicitly defined function. The problem is solved numerically using the finite element method based on higher order polynomials of degree $p \geq 1$. We prove parameter uniform convergence of optimal order in ε -weighted energy norm. A test example is taken to compare the proposed graded mesh with others found in the literature.

For details refer to <https://doi.org/10.1002/mma.6523>



PROF. ANJANA GUPTA

Department of Applied Mathematics

Dr. Anjana Gupta is working as Professor in the Department of Applied Mathematics, DTU. She has completed her M.Phil. and Ph.D. from the University of Delhi. Her interest areas are optimization techniques, fuzzy logic, multi-Criteria decision-making, and computing with words. She has a teaching experience of more than 20 years and research experience of 19 years with publications in very reputed journals like Soft Computing, IEEE transactions on fuzzy systems, Expert systems with applications and many more. She has organized and participated in numerous workshops and many national and international conferences. She has also delivered invited talks in the training programs. Furthermore, four Ph.D. thesis has been completed under her supervision. She is a life time member of Indian Science Congress Association.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. A. Singh, **A. Gupta**, A. Mehra, "Matrix games with 2-tuple linguistic information," *Annals of Operations Research*, vol. 287, no. 2, pp. 895–910, 2020. Impact Factor: 2.583.

Matrix games with 2-tuple linguistic information

Anjali Singh, **Anjana Gupta*** and Aparna Mehra

Abstract: In this contribution, a two-player constant-sum 2-tuple linguistic matrix game is described, and a linguistic linear programming (LLP) approach is proposed to solve this class of games. The proposed approach can be perceived as a unified mechanism in the sense that it can be adopted to solve linguistic matrix game problems, LLP problems, and linguistic multi-attribute decision-making (MADM) problems. The latter is exhibited by presenting examples of linguistic MADM problems modelled as two-player constant-sum linguistic matrix games with Nature as the second player.

For details refer to <https://doi.org/10.1007/s10479-018-2810-6>

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Department of Applied Mathematics

Anshul Arora is working as an Assistant Professor in the Department of Applied Mathematics, Delhi Technological University Delhi, India. Moreover, He is also pursuing the Ph.D. degree from the Department of Computer Science and Engineering, IIT Roorkee, India. His research interests include mobile security, mobile malware detection, and network traffic analysis.

Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01

1. **A. Arora**, S. K. Peddoju and M. Conti, "PermPair: Android malware detection using permission pairs", *IEEE Transactions on Information Forensics and Security*, vol. 15, pp. 1968-1982, 2020. Impact Factor: 6.013.

PermPair: Android malware detection using permission pairs

Anshul Arora, Sateesh K. Peddoju and Mauro Conti

Abstract: The Android smartphones are highly prone to spreading the malware due to intrinsic feebleness that permits an application to access the internal resources when the user grants the permissions knowingly or unknowingly. Hence, the researchers have focused on identifying the conspicuous permissions that lead to malware detection. Most of these permissions, common to malware and normal applications present themselves in different patterns and contribute to attacks. Therefore, it is essential to find the significant combinations of the permissions that can be dangerous. Hence, this paper aims to identify the pairs of permissions that can be dangerous. To the best of our knowledge, none of the existing works have used the permission pairs to detect malware. In this paper, we proposed an innovative detection model, named PermPair, that constructs and compares the graphs for malware and normal samples by extracting the permission pairs from the manifest file of an application. The evaluation results indicate that the proposed scheme is successful in detecting malicious samples with an accuracy of 95.44% when compared to other similar approaches and favorite mobile anti-malware apps. Further, we also proposed an efficient edge elimination algorithm that removed 7% of the unnecessary edges from the malware graph and 41% from the normal graph. This lead to minimum space utility and also 28% decrease in the detection time.

For details refer to <https://doi.org/10.1109/TIFS.2019.2950134>



BIOGRAPHY

PROF. CHANDRA PRAKASH SINGH Department of Applied Mathematics

Prof. Chandra Prakash Singh is a regular faculty at 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 **82** research papers in refereed international (66) and national (16) journals of repute like Physical Review D, EPJC, EPJ Plus, Astrophysics and Space Science, IJMPD, IJMPA, MPLA IJTP CQG, GRG, Pramana, INJP, etc. He has attended and presented 25 research papers in national and international conferences. He has also delivered many invited talk in the national and international conferences. He has supervised 04 PhD students. He is the reviewer of many journals like, EPJC, Astrophysics and Space Science, Indian Journal of Physics, Gravitation & Cosmology, Canadian Journal of Physics, etc. He has a rich experience of teaching of 22 years in the subject of Pure and Applied Mathematics. He has received Commendable Research award in 2018 and Premier Research award in 2019.

Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01
Commendable Research Award	03

1. **C. P. Singh** and A. Kumar, “Holographic dark energy, matter creation, and cosmic acceleration”, *Physical Review D*, vol. 102, no. 12, pp.123537, 2020. Impact Factor: 4.833.
2. A. Kumar and **C. P. Singh**, “Observational constraints on holographic dark energy model with matter creation”, *Astrophysics and Space Science*, vol. 365, no. 1, 2020. Impact Factor: 1.430.
3. **C. P. Singh** and S. Kaur, “Probing bulk viscous matter-dominated model in brans-dicke theory”, *Astrophysics and Space Science*, vol. 365, no. 1, 2020. Impact Factor: 1.430.
4. **C. P. Singh** and A. Kumar, “Quintessence behavior via matter creation cosmology”, *The European Physical Journal C*, vol. 80, no. 2, 2020. Impact Factor: 4.389.

Holographic dark energy, matter creation and cosmic acceleration

C. P. Singh and Ajay Kumar

Abstract: In this paper, we study the adiabatic matter creation process in holographic dark energy (HDE) with the motivation of considering it as an alternative choice to explain the recent accelerating phase of the Universe. In the background, we consider a homogeneous and isotropic flat Friedmann-Robertson-Walker geometry. It has been observed that the HDE with Hubble horizon as an IR cutoff does not show an accelerating Universe. Instead of assuming other IR cutoffs in order to have a transition at low redshifts, we consider the HDE model with the gravitationally induced matter creation processes. The matter creation rate is phenomenologically parametrized by a linear combination in terms of Hubble parameter, that is, $\Gamma=3\alpha H_0+3\beta H$, where α and β are positive constants. Some particular cases like HDE with $\Gamma=0$ and $\Gamma\propto H$ are also studied. The evolution of such models are tested by the latest observational data of a type Ia supernova, observational Hubble data, and latest local H_0 by SH0ES. We discuss the evolution of the Universe by plotting the trajectory of cosmological parameters using best-fit values. We find that the HDE model $\Gamma=3\alpha H_0+3\beta H$ corresponds to early deceleration and then a smooth transition into an accelerated epoch. We discuss the cosmographic parameters and Ω_m to distinguish models with other standard dark energy models. By using the Akaike information criterion and the Bayesian information criterion, we also assess the viability of models corresponding to the Λ CDM model. Finally, we discuss the thermodynamics of HDE model with matter creation and find that the model satisfies the generalized second law of thermodynamic under certain conditions.

For details refer to <https://doi.org/10.1103/PhysRevD.102.123537>

Observational constraints on holographic dark energy model with matter creation

Ajay Kumar and C. P. Singh*

Abstract: In this paper, we consider a holographic dark energy model driven by the gravitationally induced adiabatic matter creation with constant creation rate. It is assumed that the present accelerating stage is a consequence of the negative pressure describing the irreversible process of gravitational matter creation. Exact solutions are obtained to discuss the evolution of the universe. We obtain the best-fit values of the model parameters through MCMC method by the use of EMCEE python package on latest observational data. With the best-fit values, it is found that the universe shows transition from decelerated phase to accelerated phase. We carry out the diagnostic analysis to distinguish our model with other standard dark energy models. We also discuss the cosmography analysis of our model. We analyse the model by applying Akaike information criterion (AIC) and Bayesian information criterion (BIC) based on the penalization associated to the number of parameters. The results show that the model behaves quintessence like and approaches to Λ CDM model in late time.

For details refer to <https://doi.org/10.1007/s10509-020-03799-1>

Probing bulk viscous matter-dominated model in brans-dicke theory

C. P. Singh and Simran Kuar

Abstract: We explore a matter-dominated model with bulk viscosity in Brans-Dicke theory to interpret the observed cosmic accelerating expansion phenomena. We obtain the exact solution of the field equations by taking constant bulk viscous coefficient (which potentially could explain the present accelerated expansion of the Universe) and Brans-Dicke scalar field proportional to some power of the scale factor. The model is studied statistically using the available astronomical data and then compare using the tools taken from information criterion. Using the best-fit values of model parameters we find that the model shows transition from decelerated phase to accelerated phase. The effective equation of state parameter is within the quintessence region ($-1 \leq \omega < 0$). Thus, the model shows quintessence behavior and approaches to Λ CDM model in late time. It does not cross the phantom divide line and hence it is free from big-rip singularity. The viscous model also alleviates the age problem. We discuss two diagnostic parameters, namely statefinder and $Om(z)$ and compare the model with the existing models by plotting the trajectories. We also apply Akaike information criterion (AIC) and Bayesian information criterion (BIC) to discriminate the viscous model based on the penalization associated to the number of parameters. The analyses based on the AIC indicates that there is less support for the viscous model when compared to the Λ CDM model, while those based on the BIC indicates that there is strong evidence against it in favor of the Λ CDM model.

For details refer to: <https://doi.org/10.1007/s10509-019-3713-y>

*Corresponding Author

Quintessence behaviour via matter creation cosmology

C. P. Singh and Ajay Kumar

Abstract: We study the matter creation cosmology as an alternative theory to explain the dark energy phenomena. We discuss the matter-dominated Universe in a flat Friedmann-Robertson-Walker line element by adopting the thermodynamics of open systems, in which the matter creation irreversible processes may take place at a cosmological scale. We propose a new form of the matter creation rate, $\Gamma=3\alpha H_0+3\beta H+3\gamma$, which generalizes some of the previous models in the literature. Exact solutions of the field equations are found and discussed the evolution of the Universe. Constraints on the model parameters are obtained from Markov Chain Monte Carlo (MCMC) analysis using the Supernova distance modulus data, observational measurements of Hubble parameter, Baryon acoustic oscillation data. The trajectories of the evolution of the scale factor, deceleration parameter and equation of state parameter are plotted by using best-fit values of the parameters. It is observed that the model shows accelerating behavior and behaves quintessence like ($\omega > -1$). The age of the Universe is obtained which is in good agreement with Λ CDM model. We examine the model using two independent diagnostic parameters, namely statefinder and Om . We apply Akaike information criterion (AIC) and Bayesian information criterion (BIC) to discriminate the model based on the penalization associated to the number of parameters. The analysis shows that the model has close resemblance to the Λ CDM cosmology. We also discuss the thermodynamics of the model and find that the model satisfies the generalized second law of thermodynamics with certain constraints.

For details refer to <https://doi.org/10.1140/epjc/s10052-020-7679-2>



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Mr. Dharendra Kumar is working as an Assistant Professor in the Department of Applied Mathematics, Delhi Technological University, Delhi, India. He received his B.Sc. degree from Banaras Hindu University, Varanasi, in the year 2011. He had completed M.Sc. in computer science from the same university in the year 2013. He has done M. Tech. in Computer Science and Technology from Jawaharlal Nehru University in year 2015. He is pursuing Ph.D. degree from Jawaharlal Nehru University, New Delhi. His research interest includes medical image segmentation, pattern recognition, and image classification.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **D. Kumar**, R. K. Agrawal and H. Verma, “Kernel intuitionistic fuzzy entropy clustering for MRI image segmentation”, *Soft Computing*, vol. 24, no. 6, pp. 4003–4026, 2020. Impact Factor: 3.050.

Kernel intuitionistic fuzzy entropy clustering for MRI image segmentation

Dhirendra Kumar, R. K. Agrawal and Hanuman Verma

Abstract: Fuzzy entropy clustering (FEC) is a variant of hard c-means clustering which utilizes the concept of entropy. However, the performance of the FEC method is sensitive to the noise and the fuzzy entropy parameter as it gives incorrect clustering and coincident cluster sometimes. In this work, a variant of the FEC method is proposed which incorporates advantage of intuitionistic fuzzy set and kernel distance measure termed as kernel intuitionistic fuzzy entropy c-means (KIFECM). While intuitionistic fuzzy set allows to handle uncertainty and vagueness associated with data, kernel distance measure helps to reveal the inherent nonlinear structures present in data without increasing the computational complexity. In this work, two popular intuitionistic fuzzy sets generators, Sugeno and Yager's negation function, have been utilized for generating intuitionistic fuzzy sets corresponding to data. The performance of the proposed method has been evaluated over two synthetic datasets, Iris dataset, publicly available simulated human brain MRI dataset and IBSR real human brain MRI dataset. The experimental results show the superior performance of the proposed KIFECM over FEC, FCM, IFCM, UPCA, PTFECM and KFEC in terms of several performance measures such as partition coefficient, partition entropy, average segmentation accuracy, dice score, Jaccard score, false positive ratio and false negative ratio.

For details refer to <https://doi.org/10.1007/s00500-019-04169-y>



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Dr. Goonjan Jain joined the Department of Applied Mathematics of Delhi Technological University (DTU) in 2017 as Assistant Professor. She has four years of teaching and administrative experience. Before joining academia, she worked in Infosys as a Systems Engineer from 2009 – 2012. She received Ph.D. degree in Natural Language Processing (2015-2020) and M. Tech degree in Computer Science and Technology (2013-2015) from Jawaharlal Nehru University (JNU), Delhi. She was awarded Junior Research Fellowship by UGC (2015) and CSIR (2013). She completed her B.E. from Vaish College of Engineering, Rohtak, Haryana (2004-2008). Her research interests include Natural Language Processing, Artificial Intelligence, Graph Theory, and Game Theory. She has published many research papers in reputed international journals like Natural Language Engineering and proceedings of international conferences like COLING (2020). She is a lifetime member of the Computer Society of India (CSI).

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **G. Jain** and D. K. Lobiyal, “Word sense disambiguation using implicit information,” *Natural Language Engineering*, vol. 26, no. 4, pp. 413-432. Impact Factor: 1.465.

Word sense disambiguation using implicit information

Goonjan Jain, and D. K. Lobiyal

Abstract: Humans proficiently interpret the true sense of an ambiguous word by establishing association among words in a sentence. The complete sense of text is also based on implicit information, which is not explicitly mentioned. The absence of this implicit information is a significant problem for a computer program that attempts to determine the correct sense of ambiguous words. In this paper, we propose a novel method to uncover the implicit information that links the words of a sentence. We reveal this implicit information using a graph, which is then used to disambiguate the ambiguous word. The experiments show that the proposed algorithm interprets the correct sense for both homonyms and polysemous words. Our proposed algorithm has performed better than the approaches presented in the SemEval-2013 task for word sense disambiguation and has shown an accuracy of 79.6 percent, which is 2.5 percent better than the best unsupervised approach in SemEval-2007.

For details refer to <https://doi.org/10.1017/S1351324919000421>



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Kanica Goel is a research scholar in the Department of Applied Mathematics, Delhi Technological University. Her research area is Mathematical Epidemiology. She gained her Master's degree in Mathematics from the University of Delhi. She has published several research papers in reputed international journals.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **K. Goel**, A. Kumar and Nilam, "A deterministic time-delayed SVIRS epidemic model with incidences and saturated treatment", *Journal of Engineering Mathematics*, vol. 121, no. 1, pp. 19–38, 2020. Impact Factor: 1.434.
2. **K. Goel**, A. Kumar and Nilam, "Nonlinear dynamics of a time-delayed epidemic model with two explicit aware classes, saturated incidences, and treatment", *Nonlinear Dynamics*, vol. 101, no. 3, pp. 1693–1715, 2020. Impact Factor: 4.867.

A deterministic time-delayed SVIRS epidemic model with incidences and saturated treatment

Kanica Goel, Abishek Kumar and Nilam

Abstract: A novel nonlinear delayed susceptible–vaccinated–infected–recovered–susceptible (SVIRS) epidemic model with a Holling type II incidence rate for fully susceptible and vaccinated classes, a saturated treatment rate, and an imperfect vaccine given to susceptibles is proposed herein. Analysis of the model shows that it exhibits two equilibria, namely disease-free and endemic. The basic reproduction number is derived, and it is demonstrated that the disease-free equilibrium is locally asymptotically stable when and linearly neutrally stable when . Furthermore, bifurcation analysis is performed for the undelayed model, revealing that it exhibits backward and forward bifurcation when the basic reproduction number varies from unity. The stability behavior of the endemic equilibrium is also discussed, revealing that oscillatory and periodic solutions may appear via Hopf bifurcation when regarding delay as the bifurcation parameter. Moreover, numerical simulations are carried out to illustrate the theoretical findings.

For details refer to <https://doi.org/10.1007/s10665-020-10037-8>

Nonlinear dynamics of a time-delayed epidemic model with two explicit aware classes, saturated incidences, and treatment

Kanica Goel, Abhishek Kumar, Nilam

Abstract: Whenever a disease emerges, awareness in susceptibles prompts them to take preventive measures, which influence individuals' behaviors. Therefore, we present and analyze a time-delayed epidemic model in which class of susceptible individuals is divided into three subclasses: unaware susceptibles, fully aware susceptibles, and partially aware susceptibles to the disease, respectively, which emphasizes to consider three explicit incidences. The saturated type of incidence rates and treatment rate of infectives are deliberated herein. The mathematical analysis shows that the model has two equilibria: disease-free and endemic. We derive the basic reproduction number R_0 of the model and study the stability behavior of the model at both disease-free and endemic equilibria. Through analysis, it is demonstrated that the disease-free equilibrium is locally asymptotically stable when $R_0 < 1$, unstable when $R_0 > 1$, and linearly neutrally stable when $R_0 = 1$ for the time delay > 0 . Further, an undelayed epidemic model is studied when $R_0 = 1$, which reveals that the model exhibits forward and backward bifurcations under specific conditions, which also has important implications in the study of disease transmission dynamics. Moreover, we investigate the stability behavior of the endemic equilibrium and show that Hopf bifurcation occurs near endemic equilibrium when we choose time delay as a bifurcation parameter. Lastly, numerical simulations are performed in support of our analytical results.

For details refer to <https://doi.org/10.1007/s11071-020-05762-9>



BIOGRAPHY

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Luckshay Batra joined his PhD program in July 2017 in Department of Applied Mathematics of Delhi Technological University, Delhi. He is working in the area of applications of Information Theoretic Measures for Assessing Financial Markets. He has already published/got accepted four research papers in the joint authorship with his research supervisor Prof. Taneja. Also he has presented his research work at national/international conferences.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **L. Batra** and H. C. Taneja, “Evaluating volatile stock markets using information theoretic measures”, *Physica A: Statistical Mechanics and its Applications*, vol. 537, pp. 122711, 2020. Impact Factor: 2.924.

Evaluating volatile stock markets using information theoretic measures

Luckshay Batra and H. C. Taneja

Abstract: In this paper, we broaden the entropy concept for Indian financial markets to make a collation between markets which are highly volatile. We have considered seven different estimators of Shannon entropy; Tsallis entropy and Renyi entropy for various values of their parameters; and also Approximate entropy and Sample entropy. For all these entropies, we provide computational results for minute-wise and day-wise data in terms of NIFTY stock and NIFTY sector indices. We conclude that in context of sector wise indices and stock wise indices, NIFTY Pharma and NIFTY50 are the most volatile among other indices respectively.

For details refer to <https://doi.org/10.1016/j.physa.2019.122711>



DR. NILAM

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Dr. Nilam is faculty in the Department of Applied Mathematics of Delhi Technological University since Feb 2011. She has a doctorate from IIT Roorkee. Her research interests are in Mathematical modeling and simulation, Differential Equations, Dynamics of Infectious diseases, Control theory in Diabetes. She has vast experience of more than 15 years in teaching and research.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. K. Goel, A. Kumar and **Nilam**, “Nonlinear dynamics of a time-delayed epidemic model with two explicit aware classes, saturated incidences, and treatment”, *Nonlinear Dynamics*, vol. 101, no. 3, pp. 1693–1715, 2020. Impact Factor: 4.867.
2. K. Goel, A. Kumar and **Nilam**, “A deterministic time-delayed SVIRS epidemic model with incidences and saturated treatment”, *Journal of Engineering Mathematics*, vol. 121, no. 1, pp. 19–38, 2020. Impact Factor: 1.434.

Nonlinear dynamics of a time-delayed epidemic model with two explicit aware classes, saturated incidences, and treatment

Kanica Goel, Abhishek Kumar, **Nilam***

Abstract: Whenever a disease emerges, awareness in susceptibles prompts them to take preventive measures, which influence individuals' behaviors. Therefore, we present and analyze a time-delayed epidemic model in which class of susceptible individuals is divided into three subclasses: unaware susceptibles, fully aware susceptibles, and partially aware susceptibles to the disease, respectively, which emphasizes to consider three explicit incidences. The saturated type of incidence rates and treatment rate of infectives are deliberated herein. The mathematical analysis shows that the model has two equilibria: disease-free and endemic. We derive the basic reproduction number R_0 of the model and study the stability behavior of the model at both disease-free and endemic equilibria. Through analysis, it is demonstrated that the disease-free equilibrium is locally asymptotically stable when $R_0 < 1$, unstable when $R_0 > 1$, and linearly neutrally stable when $R_0 = 1$ for the time delay > 0 . Further, an undelayed epidemic model is studied when $R_0 = 1$, which reveals that the model exhibits forward and backward bifurcations under specific conditions, which also has important implications in the study of disease transmission dynamics. Moreover, we investigate the stability behavior of the endemic equilibrium and show that Hopf bifurcation occurs near endemic equilibrium when we choose time delay as a bifurcation parameter. Lastly, numerical simulations are performed in support of our analytical results.

For details refer to <https://doi.org/10.1007/s11071-020-05762-9>

A deterministic time-delayed SVIRS epidemic model with incidences and saturated treatment

Kanica Goel, Abhishek Kumar and **Nilam***

Abstract: A novel nonlinear delayed susceptible–vaccinated–infected–recovered–susceptible (SVIRS) epidemic model with a Holling type II incidence rate for fully susceptible and vaccinated classes, a saturated treatment rate, and an imperfect vaccine given to susceptibles is proposed herein. Analysis of the model shows that it exhibits two equilibria, namely disease-free and endemic. The basic reproduction number is derived, and it is demonstrated that the disease-free equilibrium is locally asymptotically stable when and linearly neutrally stable when . Furthermore, bifurcation analysis is performed for the undelayed model, revealing that it exhibits backward and forward bifurcation when the basic reproduction number varies from unity. The stability behavior of the endemic equilibrium is also discussed, revealing that oscillatory and periodic solutions may appear via Hopf bifurcation when regarding delay as the bifurcation parameter. Moreover, numerical simulations are carried out to illustrate the theoretical findings.

For details refer to <https://doi.org/10.1007/s10665-020-10037-8>

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Ms. Priyanka Goel, a senior research fellow currently pursuing for Ph. D degree in the area of geometric function theory in Department of Applied Mathematics, Delhi Technological University, Delhi, India. She did her graduation as well as her post-graduation in mathematics from Miranda House, University of Delhi. She qualified JRF and joined DTU under CSIR fellowship in the year 2017. So far she published two research papers in reputed international journals, communicated two papers for publication. Her first paper was published in 2020, attracted more than 20 citations as on today. The second paper has been published in the journal RACSAM (Impact factor-1.406) in the year 2020.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. S. S. Kumar and **P. Goel**, “Starlike functions and higher order differential subordinations”, *Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas*, vol. 114, no. 192, 2020. Impact Factor: 1.406.

Starlike functions and higher order differential subordinations

S. Sivaprasad Kumar and **Priyanka Goel**

Abstract: In the present investigation, a third order differential subordination result of Antonino and Miller (Complex Var Ellipt Equ 56(5):439–454, 2011) has been modified to accommodate Ma–Minda functions so that new avenues could be explored related to them. Further as an application, many alluring results pertaining to $S^*SG = \{f \in A : zf'(z)/f(z) < 2/(1+e^{-z})\}$, the class of Sigmoid starlike functions, involving higher order differential subordinations are also obtained.

For details refer to <https://doi.org/10.1007/s13398-020-00925-0>

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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, Delhi, India since 2012 and having a total of 25 years of teaching plus research experience. He received his Ph.D. degree from S.V. University, Tirupati, Andhra Pradesh. He received three Best Teacher Awards from K. L. University, Vijayawada, Andhra Pradesh, before joining DTU. He has guided 8 students for Ph.D. degree and currently guiding 12. He has handled nearly 1.5 crores worth of projects funded by ISRO and DST and presently handling 1.0 crores worth of sponsored projects funded by DST and UGC as PI and mentor. His research interests are photonics and atmospheric sciences. He has published 100 plus research papers in international journals and presented nearly 140 papers in national/international conferences. His h-index is 28.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	05

1. M. Kumar and **A. S. Rao**, "Concentration-dependent reddish-orange photoluminescence studies of Sm^{3+} ions in borosilicate glasses", *Optical Materials*, vol. 109, pp. 110356, 2020. Impact Factor: 2.779.
2. Y. Tayal and **A. S. Rao**, "Orange color emitting Sm^{3+} ions doped borosilicate glasses for optoelectronic device applications", *Optical Materials*, vol. 107, pp. 110070, 2020. Impact Factor: 2.779.
3. A. Prasad, **A. S. Rao** and G. V. Prakash, "Up-conversion luminescence and EPR properties of $\text{KGdF}_4:\text{Yb}^{3+}/\text{Tm}^{3+}$ nanophosphors", *Optik*, vol. 208, pp. 164538, 2020. Impact Factor: 2.187.
4. A. Prasad, **A. S. Rao** and G. V. Prakash, "A study on up-conversion and energy transfer kinetics of $\text{KGdF}_4:\text{Yb}^{3+}/\text{Er}^{3+}$ nanophosphors", *Journal of Molecular Structure*, vol. 1205, pp. 127647, 2020. Impact Factor: 2.463.
5. S. Kaur, A. S. Rao, M. Jayasimhadri, V. V. Jaiswal and D. Haranath, " Tb^{3+} ion induced color tunability in calcium aluminozincate phosphor for lighting and display devices", *Journal of Alloys and Compounds*, vol. 826, pp. 154212, 2020. Impact Factor: 4.650.

Concentration-dependent reddish-orange photoluminescence studies of Sm^{3+} ions in borosilicate glasses

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

Abstract: This paper elucidates the concentration-dependent photoluminescence properties of samarium ions in Lithium bismuth alumino borosilicate (LiBiAlBSi) glasses using XRD, FT-IR, absorption, excitation, emission & decay to quantify the luminescence properties of the titled glasses. XRD and FT-IR spectral data ascertain the non-crystalline nature and vibrational energies in host glass respectively. The intense excitation band observed at 400 nm in near UV region (under $\lambda_{\text{em}} = 600$ nm) is employed to read the emission spectra. Under 400 nm intense excitation wavelength, the titled glasses show intense visible reddish-orange emission at 600 nm. From the emission spectra, it is observed that 0.5 mol% of Sm^{3+} ions concentration in LiBiAlBSi glass is optimum for reddish-orange emission. The CIE coordinates estimated for LiBiAlBSi glasses are in good proximity with the reddish-orange emission coordinates specified by Nichia Corporation. Branching ratios, emission cross-sections, quantum efficiency, and CIE coordinates estimated finally reveals the aptness of the LiBiAlBSi glasses for reddish-orange optoelectronic device applications.

For details refer to <https://doi.org/10.1016/j.optmat.2020.110356>

Orange color emitting Sm^{3+} ions doped borosilicate glasses for optoelectronic device applications

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

Abstract: An intense orange color emitting Sm^{3+} activated $\text{Li}_2\text{O}-\text{PbO}-\text{ZnO}-\text{Al}_2\text{O}_3-\text{B}_2\text{O}_3-\text{SiO}_2$ (LPZABS) glasses were propitiously fabricated by using sudden quenching method to study the luminescent potentiality using spectroscopic techniques such as XRD, FT-IR, optical absorption, photoluminescence (PL) and PL decay. XRD and FT-IR reveals the glassy nature and various functional groups present in LPZABS host glass respectively. Judd-Ofelt parameters derived from absorption spectra are used to estimate various radiative parameters for the excited states of Sm^{3+} ions in LPZABS glasses. Under 400 nm excitation, the luminescence spectra in the as prepared glasses exhibit three emission bands that corresponds to ${}^4\text{G}_{5/2} \rightarrow {}^6\text{H}_{5/2}$ (562 nm), ${}^4\text{G}_{5/2} \rightarrow {}^6\text{H}_{7/2}$ (598 nm) and ${}^4\text{G}_{5/2} \rightarrow {}^6\text{H}_{9/2}$ (645 nm) transitions of Sm^{3+} ions. Among these three, ${}^4\text{G}_{5/2} \rightarrow {}^6\text{H}_{9/2}$ transition observed in orange region (598 nm) is relatively more intense and prominent. The PL decay curves recorded for ${}^4\text{G}_{5/2}$ fluorescent level reveal exponential behavior and single exponential fitting is applied to evaluate the experimental lifetimes (τ). The values are found to be decreasing with Sm^{3+} ion content due to cross-relaxation energy transfer process. The results reveal that the as prepared glasses can be effectively used in fabricating intense visible orange color emitting optoelectronic devices.

For details refer to <https://doi.org/10.1016/j.optmat.2020.110070>

**Corresponding Author*

Up-conversion luminescence and EPR properties of $\text{KGdF}_4:\text{Yb}^{3+}/\text{Tm}^{3+}$ nanophosphors

Aman Prasad, **A. S. Rao*** and G. Vijaya. Prakash

Abstract: Synthesis of $\text{KGdF}_4:\text{Yb}^{3+}/\text{Tm}^{3+}$ up-conversion nanoparticles (UCNPs) via wet chemical route has been reported. HR-TEM, EDAX and EPR studies were performed on the samples. The samples emit intense blue light centred at 472 nm ($^1\text{G}_4 \rightarrow ^3\text{H}_6$) under 980 nm CW laser excitation. Energy transfer (ET), ground/excited state absorption (ESA/GSA) and cooperative energy transfer (CET) were established as the possible energy transfer mechanisms in the up-conversion (UC) process. Since these UCNPs, synthesized by a much cost effective route, have sizes comparable at cellular level and exhibit the ability of up-conversion, we propose to utilize these UCNPs for prospective bio-photonic applications.

For details refer to <https://doi.org/10.1016/j.ijleo.2020.164538>

A study on up-conversion and energy transfer kinetics of $\text{KGdF}_4:\text{Yb}^{3+}/\text{Er}^{3+}$ nanophosphors⁺

Aman Prasad, **A. S. Rao*** and G. Vijaya Prakash

Abstract: Potassium gadolinium fluoride (KGdF_4) up-conversion nano particles (UCNPs) doped with ytterbium (Yb^{3+}) and co-doped with erbium (Er^{3+}) ions were prepared via wet chemical route. Morphological confirmation was achieved through high resolution transmission electron microscopy (HR-TEM) and EDAX studies. The size of the nanoparticles lie in the range of 5–7 nm. The samples emit intense up-converted green light centered at 545 nm ($4\text{S}_{3/2} \rightarrow 4\text{I}_{15/2}$) under 980 nm CW laser excitation. A red emission centered at around 650 nm ($4\text{F}_{9/2} \rightarrow 4\text{I}_{15/2}$) is also seen. Detailed study on up-conversion process showed involvement of energy transfer (ET) and ground/excited State absorption (ESA/GSA) processes between dopant ions. Decay kinetics of these UCNPs at 545 nm emission under 980 nm CW laser excitation were studied. These UCNPs exhibit lifetimes in the range of 0.909 ms–1.162 ms. Inokuti- Hirayama (I–H) model was applied to establish the mechanism of energy transfer between the dopant ions. I–H model analysis proved that the interaction between Yb^{3+} and Er^{3+} ions is dipole-dipole in nature. Electron paramagnetic resonance (EPR) study was conducted to study the effect of having Gd^{3+} in the host lattice. The observed g values in the EPR spectra correspond to the characteristic “U” spectrum of gadolinium. Given their small sizes, ability to exhibit up-conversion and high lifetimes, we propose to utilize these UCNPs for bio-photonic applications.

For details refer to <https://doi.org/10.1016/j.molstruc.2019.127647>

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+Eligible for Certificate only

Tb³⁺ ion induced color tunability in calcium aluminozincate phosphor for lighting and display devices⁺

Sumandeep Kaur, **A. S. Rao***, M. Jayasimhadri*, Vishnu Vikesh Jaiswal and D. Haranath

Abstract: Terbium (Tb₃₊) ions doped calcium aluminozincate (CAZ) phosphors with different concentration of Tb₃₊ ions (0.0-5.0 mol%) have been successfully prepared by sol-gel method. The crystal phase analysis and morphology of the as prepared phosphors have been studied from X-ray diffraction (XRD) patterns and field emission scanning electron microscope (FE-SEM) image. The luminescence behaviour of Tb₃₊ doped CAZ phosphors have been studied relative to variable dopant ion concentration. The intense emission has been observed at 543 nm under 238 nm excitation for all the phosphors. The decay curve analysis manifests the energy transfer as a consequence of dipole-dipole interaction between Tb₃₊ ions in the host. The colorimetric property has been understood on the basis of evaluated CIE color coordinates. The systematic study of Tb₃₊ doped CAZ phosphors determine the potential utility of these phosphors in lighting and display applications.

For details refer to <https://doi.org/10.1016/j.jallcom.2020.154212>

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+Eligible for Certificate only



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Dr. Ajeet Kumar was born in 1983 in India. He received the B.Sc. degree from Deen Dayal Upadhyay Gorakhpur University, Gorakhpur, India, in 2002, the M.Sc. degree from the Indian Institute of Technology Roorkee, Roorkee, India, in 2004, and the Ph.D. degree from the Indian Institute of Technology Roorkee, Roorkee, India, in 2009. He was a Postdoctoral Fellow in the Gwangju Institute of Science and Technology (GIST), Korea. In July 2010, he joined the Delhi Technological University, Delhi, where he is currently an Assistant Professor. He has published more than 120 research articles in journal and conferences. His current research interests include novel large mode area single-mode fibers, segmented cladding fibers, fiber optic sensors, nonlinear fiber, and waveguide long period gratings. Dr. Kumar has recipient of Young Scientist Award by Uttarakhand Government, India. He is a Life member of Optical Society of India (OSI), Indian Laser association (ILA) and The Indian Science Congress Association (ISCA) and member of Optical Society of America (OSA).

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. R. Sharma, S. Kaur, P. Chauhan, and **A. Kumar**, “Computational design and analysis of GeSe₂-As₂Se₃-PbSe based rib waveguide for mid-infrared supercontinuum generation”, *Optik*, vol. 220, pp. 165032, 2020. Impact Factor: 2.187.
2. P. Chauhan, **A. Kumar**, and Y. Kalra, “Numerical exploration of coherent supercontinuum generation in multicomponent GeSe₂-As₂Se₃-PbSe chalcogenide based photonic crystal fiber”, *Optical Fiber Technology*, vol. 54, pp. 102100, 2020. Impact Factor: 2.212.

Computational design & analysis of GeSe₂-As₂Se₃-PbSe based Rib waveguide for mid-infrared supercontinuum generation

Rohan Sharma, Surleen Kaur, Pooja Chauhan, and **Ajeet Kumar***

Abstract: We report computational modelling and numerical analysis of rib optical waveguide composed of chalcogenide GeSe₂-As₂Se₃-PbSe and MgF₂ glasses for mid infrared supercontinuum generation. Employing finite element method, we analyse the influence of geometrical parameters on waveguide dispersion & nonlinearity and perform dispersion engineering to minimize dispersion effects. Later, we analyse the influence of laser operating conditions on spectral broadening. Our simulations report a waveguide featuring zero dispersion wavelength at 2680 nm and 3310 nm in the mid infrared region, 1.4–7.6 μm spectral broadening when pumped at 3.1 μm wavelength with 85 fs pulses at peak power of 5.2 kW in a 10 mm long waveguide and nonlinearity of 991 W⁻¹ km⁻¹ making it suitable for mid infrared nonlinear applications.

For detail refer to <https://doi.org/10.1016/j.ijleo.2020.165032>

Numerical exploration of coherent supercontinuum generation in multicomponent GeSe₂-As₂Se₃-PbSe chalcogenide based photonic crystal fiber

Pooja Chauhan, **Ajeet Kumar*** and Yogita Kalra

Abstract: Numerical modeling of a photonic crystal fiber made up of multicomponent chalcogenide glass system has been reported for highly coherent supercontinuum generation in the mid-infrared spectral region. Numerical simulations based on the finite element method have been performed. Optical dispersion engineering technique has been adopted to minimize the dispersion effect at pump wavelength by alteration of geometrical parameters of designed fiber. By injecting an input pulse of 85 fs durations in the normal dispersion region, a coherent ultrabroadband supercontinuum spectrum ranging from ~2 to 11 μm has been obtained in a 10 mm long fiber length using low input peak power of 950 W at 3.1 μm.

For detail refer to <https://doi.org/10.1016/j.yofte.2019.102100>

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DR. AMAN PRASAD
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Dr. Aman Prasad completed his PhD in the area of Nanoscience and Nanotechnology, Delhi Technological University, Delhi, India. His thesis title is: “**Synthesis, Morphology and Luminescent Properties of Rare Earth doped Visible Up-Conversion Nanophosphors for Bio-Imaging Applications**”. He has published 13 research papers till date in journals of international and national repute. He has been a DST INSPIRE scholar and DST INSPIRE fellow.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. Prasad**, A. S. Rao and G. V. Prakash, “A study on up-conversion and energy transfer kinetics of $\text{KGdF}_4:\text{Yb}^{3+}$ ”, *Journal of Molecular Structure*, vol. 1205, pp. 127647, 2020. Impact Factor: 2.463.

A study on up-conversion and energy transfer kinetics of $\text{KGdF}_4:\text{Yb}^{3+}/\text{Er}^{3+}$ nanophosphors

Aman Prasad, A. S. Rao and G. Vijaya Prakash

Abstract: Potassium gadolinium fluoride (KGdF_4) up-conversion nano particles (UCNPs) doped with ytterbium (Yb^{3+}) and co-doped with erbium (Er^{3+}) ions were prepared via wet chemical route. Morphological confirmation was achieved through high resolution transmission electron microscopy (HR-TEM) and EDAX studies. The size of the nanoparticles lie in the range of 5-7nm. The samples emit intense up-converted green light centered at 545nm ($^4\text{S}_{3/2} \rightarrow ^4\text{I}_{15/2}$) under 980nm CW laser excitation. A red emission centered at around 650nm ($^4\text{F}_{9/2} \rightarrow ^4\text{I}_{15/2}$) is also seen. Detailed study on up-conversion process showed involvement of energy transfer (ET) and ground/excited State absorption (ESA/GSA) processes between dopant ions. Decay kinetics of these UCNPs at 545nm emission under 980nm CW laser excitation were studied. These UCNPs exhibit lifetimes in the range of 0.909ms to 1.162ms. Inokuti- Hirayama (I-H) model was applied to establish the mechanism of energy transfer between the dopant ions. I-H model analysis proved that the interaction between Yb^{3+} and Er^{3+} ions is dipole-dipole in nature. Electron paramagnetic resonance (EPR) study was conducted to study the effect of having Gd^{3+} in the host lattice. The observed g values in the EPR spectra correspond to the characteristic “U” spectrum of gadolinium. Given their small sizes, ability to exhibit up-conversion and high lifetimes, we propose to utilize these UCNPs for bio-photonic applications

For details refer to <https://doi.org/10.1016/j.molstruc.2019.127647>

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Dr. Amrish K. Panwar is working as Assistant Professor in Department of Applied Physics, Delhi Technological University, Delhi since August 2010. He has worked as senior lecturer in Department of Physics, JUET, Guna (M.P.) during 2008 to 2010. He did M.Sc. in Solid State Physics from CCS University, Meerut (U.P.). He received Ph.D. degree in Condensed Matter Physics from department of Physics, Indian Institute of Technology Roorkee, India in 2005. After completing PhD degree, he joined Department of Metallurgical & Materials Engineering, IIT Kharagpur, West Bengal. as Postdoctoral Research Associate from 2006 to 2008. Besides of teaching assignment in condensed matter physics and energy storage, he is actively involved in research and development work. His area of research includes: energy storage and conversion devices (lithium/ sodium ion batteries/ supercapacitors) materials synthesis to prototype device fabrication, study of multiferroic and thermoelectric materials and surface modification of low energy solids. Dr. Panwar has been awarded ‘Young Scientist fast track project’ as a principal investigator by SERB-DST, Govt. of India during 2012-2015. He also received equipment grant of Rs. 23 Lakh under DST sponsored FIST project grant awarded to Department of Physics during 2012-2017 to explore LIBT research. He has supervised 02 Ph.D., 23 M.Tech and more than 60 B. Tech students. He has published about 75 research papers in journal of international/ national repute and in proceedings of national and international conferences.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. P. Tanwar, **A. K. Panwar**, S. Singh and A. K. Srivatava, “Microstructural and optical properties investigation of variable thickness of tin telluride thin films”, *Thin Solid Films*, vol. 693, pp. 137708, 2020. Impact Factor: 2.030.
2. A. Jain and **A. K. Panwar**, “Synergetic effect of rare-earths doping on the microstructural and electrical properties of Sr and Ca co-doped BaTiO₃ nanoparticles”, *Ceramics International*, vol. 46, no. 8, pp. 10270-10278, 2020. Impact Factor: 3.830.

Microstructural and optical properties investigation of variable thickness of tin telluride thin films

Praveen Tanwar, **Amrish K. Panwar***, Sukhvir Singh and A.K. Srivastava

Abstract: A series of Tin Telluride (SnTe) thin films of varied thicknesses are deposited on glass substrates at room temperature using thermal evaporation technique. The optical and microstructural properties of SnTe thin films of thicknesses 33 nm to 275 nm are reported. High-resolution x-ray diffraction patterns of SnTe thin films revealed the polycrystalline nature with [200] orientation having cubic structure. The microstructural and morphological structures of these films were examined using high-resolution transmission electron microscopy and scanning electron microscopy, respectively. The distribution of isotopes of various elements in the thin film along with lateral and longitudinal directions was determined by depth profile measurement using the time of flight - secondary ion mass spectroscopy technique. Fourier transform infrared spectroscopy spectra reveal the molecular vibrations, narrow bandgap property of material and suitability of materials in infrared applications. Longitudinal – optical phonon scattering due to the [222] orientation was observed in the micro-Raman spectra at room temperature which corresponds to a peak in the range 120–130 Raman shift/cm⁻¹. Hence, the change in optical and microstructural properties at the nano-regime resulted in a shift towards the near-infrared region with an increase in the thickness of the thin films.

For detail refer to <https://doi.org/10.1016/j.tsf.2019.137708>

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Synergetic effect of rare-earths doping on the microstructural and electrical properties of Sr and Ca co-doped BaTiO₃ nanoparticles

Aditya Jain and **Amrish K. Panwar***

Abstract: Single-phase BST-BCT ceramic doped with different rare-earth materials (La, Gd, Dy, and Yb) have been prepared using a modified mechano-chemical activation technique. The modified BaTiO₃ doped with different rare-earths elements have manifested improved characteristics and desirable application in the field of high-power pulse capacitors. In this work, a comparative study has been performed to analyze the effect of different rare-earths on the dielectric, ferroelectric, piezoelectric and electrical breakdown strength of already optimized Sr and Ca co-doped BaTiO₃ ceramic. As predicted from finite element simulation, the doping of rare-earth may lead to a change in microstructure and surface characteristics of Sr and Ca co-doped BaTiO₃ ceramic and therefore, an enhancement in electrical characteristics of the material. The addition of various rare-earths with the same cationic charge but different ionic radii has resulted in a significant change in morphology of BST-BST ceramic. The XRD results indicate that all the samples retain the parent perovskite tetragonal crystal symmetry, and there is no substantial change in the crystal structure compared to the base material. The addition of rare-earths has resulted in a decrease in transition temperature and significant changes in the electrical properties of modified BaTiO₃ ceramic. Lanthanum and Gadolinium doping have resulted in an overall improvement in electrical characteristics; however, Dysprosium and Ytterbium doping deteriorated the same characteristics, which is mainly attributed to a significant change in the microstructure of the materials.

For detail refer to <https://doi.org/10.1016/j.ceramint.2020.01.020>

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Dr. Deshraj Meena is working as Assistant professor in the department of Applied Physics in DTU since February 2017. He has completed his PhD and Master in Science from IIT Delhi and his area of research is fabrication and characterization of advanced functional materials. Presently, he has five research articles in peer reviewed international journals and have an experience of five years of research. He has guided around 20 B. Tech. Project students in last four years in DTU.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **D. Meena**, B. Singh, A. Anand, M. Singh and M. C. Bhatnagar, "Phase dependent selectivity shifting behavior of Cd₂SnO₄ nanoparticles based gas sensor towards volatile organic compounds (VOC) at low operating temperature", *Journal of Alloys and Compounds*, vol. 820, pp. 153117, 2020. Impact Factor: 4.650.
2. **D. Meena**, M.C. Bhatnagar and B. Singh, "Synthesis, characterization and gas sensing properties of the rhombohedral ilmenite CdSnO₃ nanoparticles", *Physica B: Condensed Matter*, vol. 578, pp. 411848, 2020. Impact Factor: 1.902.

Phase dependent selectivity shifting behavior of Cd₂SnO₄ nanoparticles-based gas sensor towards volatile organic compounds (VOC) at low operating temperature

Deshraj Meena, Bharti Singh, Abhishek Anand, Mukhtiyar Singh and M. C. Bhatnagar

Abstract: Orthorhombic as well as cubic phase Cd₂SnO₄ nanoparticles have been synthesized by one step solution combustion method. X-ray diffraction result confirms the high crystallinity and phase purity of the synthesized nanoparticles. TEM images reveals, the synthesized nanoparticles have spherical morphology with an average diameter of 30 nm for both phases. EDS spectra affirms the stoichiometric Cd₂SnO₄ nanoparticles. Further, the gas sensors were fabricated using thick film, deposited on alumina substrate by doctor blade method, of the synthesized nanoparticles. In order to determine the sensitivity and detection limit, 1 μL of diluted VOCs was inserted into the sensing chamber at atmospheric pressure and the variation of resistance with respect to time has been monitored. The sensing result suggests that cubic and orthorhombic phase nanoparticles are highly sensitive (S~65%) and selective towards isopropanol and methanol vapors, respectively, at 170 °C. The phase dependent selectivity and high sensitivity of the Cd₂SnO₄ spherical nanoparticles based sensors at low operating temperature towards diluted isopropanol and methanol at atmospheric pressure are the important findings of the present work.

For details refer to <https://doi.org/10.1016/j.jallcom.2019.153117>

Synthesis, characterization and gas sensing properties of the rhombohedral ilmenite CdSnO₃ nanoparticles

Deshraj Meena, M.C. Bhatnagar and Bharti Singh

Abstract: Herein, we report the synthesis of rhombohedral ilmenite CdSnO₃ nanoparticles through coprecipitation method. The effect of sintering temperatures on phase purity of nanoparticles was observed from X-ray diffraction (XRD) analysis and further their structure parameters were determined. XRD patterns confirmed the formation of stable and phase pure rhombohedral ilmenite crystal structure of nanoparticles calcinated at 900 °C. For the first time, experimental observation of theoretically calculated various Raman active modes corresponding to CdSnO₃ samples has been reported. The electron microscopy results suggest that synthesized nanoparticles have spherical shape with diameter lying in the range of 40–45 nm which is in accordance with the crystallite size as calculated using XRD data. The gas sensors were fabricated to explore the sensing properties of synthesized nanoparticles at different operating temperature. The sensing results shows that the sensor have good selectivity for propanol against the other gases at relatively lower temperature of 150 °C.

For details refer to <https://doi.org/10.1016/j.physb.2019.411848>



MS. HARPREET KAUR
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Ms. Harpreet Kaur is currently pursuing her Ph.D. degree in Department of Applied Physics, Delhi Technological University, Delhi, India. Her research interest focuses on the preparation of RE doped luminescent materials via various synthesis techniques and studying its structural, morphological and photoluminescence properties for lighting applications. She has received her master's degree in Physics from Jamia Millia Islamia, Delhi, India with condensed matter physics as a specialization. She has received her bachelor's degree (B.Sc. (H.)) in Physics from University of Delhi, India. She has qualified GATE 2016 and awarded scholarship from CBSE for meritorious result in 12th exams for three years during graduation. She has been awarded Best Poster (First) Prize in ICAFMD-19 organized by NIT Warangal, Telangana, India. She has received Commendable Research Award for excellence in 2020 from Research and Council Board of DTU, Delhi. She has published 05 SCI/SCIE/Scopus Indexed Journals and presented her research work in several national and international conferences.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **H. Kaur**, M. Jayasimhadri, M. K. Sahu, P. K. Rao and N. S. Reddy, "Synthesis of orange emitting Sm^{3+} doped sodium calcium silicate phosphor by sol-gel method for photonic device", *Ceramics International*, vol. 46, no. 16, Part B, pp. 26434-26439, 2020. Impact Factor: 3.830.

Synthesis of orange emitting Sm³⁺ doped sodium calcium silicate phosphor by sol-gel method for photonic device

Harpreet Kaur, M. Jayasimhadri, Mukesh K. Sahu, P. Koteswara Rao and N.S. Reddy

Abstract: Samarium (Sm³⁺) doped sodium calcium silicate (Na₂CaSiO₄: NCS) phosphors have been synthesized by employing a sol-gel technique. The structural, morphological, excitation and emission spectral studies have been carried out for the as-prepared phosphors. The phase purity in synthesized NCS phosphor with cubic structure has been confirmed by X-ray diffraction (XRD) pattern. The scanning electron microscopic images depict the irregular morphology and non-uniform microcrystalline particles in synthesized phosphor. The excitation spectra of NCS: Sm³⁺ phosphors disclose strong absorption in UV (ultraviolet), n-UV (near UV) and blue spectral regions. The emission spectra recorded under 402 nm excitation exhibit peaks at 565, 602 and 649 nm attributed to characteristic 4f-4f transitions of Sm³⁺ ions. The Sm³⁺ concentration optimized for NCS host as 1.0 mol%, and concentration quenching phenomenon has been discussed in detail. The chromaticity coordinates (0.579, 0.419) for optimized NCS: Sm³⁺ phosphor lie in the pure orange region. The temperature-dependent photoluminescence studies demonstrate that luminescence intensity even at 423 and 463 K persists up to 85.4 and 79.6% of the intensity at room temperature, respectively. Above mentioned results substantiate the potentiality of NCS: Sm³⁺ phosphor to use as a thermally stable orange emitting component in photonic devices.

For details refer to <https://doi.org/10.1016/j.ceramint.2020.04.224>



DR. M. JAYASIMHADRI
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Dr. Jayasimhadri Mula is an Assistant Professor in the Department of Applied Physics, Delhi Technological University, Delhi, India. He has more than 15 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 honors 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 and *Bharat Vikas Award* by ISR India. Five 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 100 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 36; *i10-index*: 70, and *Citations* are >3250.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	08

1. M. K. Sahu and **M. Jayasimhadri**, “Conversion of blue emitting thermally stable $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ host as a color tunable phosphor via energy transfer for luminescent devices”, *Journal of Luminescence*, vol. 227, pp. 117570, 2020. Impact Factor: 3.280.
2. H. Kaur and **M. Jayasimhadri**, “Optimization of structural and luminescent properties with intense red emitting thermally stable Sm^{3+} doped CaBiVO_5 phosphors for w-LED applications”, *Optical Materials*, vol. 107, pp. 110119, 2020. Impact Factor: 2.779.
3. S. Shankar, O. P. Thakur and **M. Jayasimhadri**, “Structural, multiferroic, and magnetoelectric properties of $(1-x) \text{Bi}_{0.85}\text{La}_{0.15}\text{FeO}_3\text{-xBaTiO}_3$ composite ceramics”, *Journal of Materials Science: Materials in Electronics*, vol. 31, no. 15, pp. 12226 - 12237, 2020. Impact Factor: 2.220.
4. S. Shankar, I. Maurya, A. Raj, S. Singh, O. P. Thakur and **M. Jayasimhadri**, “Dielectric and tunable ferroelectric properties in $\text{BiFeO}_3\text{-BiCoO}_3\text{-BaTiO}_3$ ternary compound”, *Applied Physics A*, vol. 126, no. 9, pp. 1-10, 2020. Impact Factor: 1.810.
5. S. Shankar, O.P. Thakur and **M. Jayasimhadri**, “Impedance spectroscopy and conduction behavior in $\text{CoFe}_2\text{O}_4\text{-BaTiO}_3$ composites”, *Journal of Electronic Materials*, vol. 49, no. 1, pp. 472–484, 2020. Impact Factor: 1.774.
6. M. K. Sahu, H. Kaur, B. V. Ratnam, J. S. Kumar and **M. Jayasimhadri**, “Structural and spectroscopic characteristics of thermally stable Eu^{3+} activated barium zinc orthophosphate phosphor for white LEDs”, *Ceramics International*, vol. 46, no. 16, Part B, pp. 26410-26415, 2020. Impact Factor: 3.830.
7. H. Kaur, **M. Jayasimhadri**, M. K. Sahu, P. K. Rao and N. S. Reddy, “Synthesis of orange emitting Sm^{3+} doped sodium calcium silicate phosphor by sol-gel method for photonic device”, *Ceramics International*, vol. 46, no. 16, Part B, pp. 26434-26439, 2020. Impact Factor: 3.830.
8. S. Kaur, A. S. Rao, **M. Jayasimhadri**, V. V. Jaiswal and D. Haranath, “ Tb^{3+} ion induced color tunability in calcium aluminozincate phosphor for lighting and display devices”, *Journal of Alloys and Compounds*, vol. 826, pp. 154212, 2020. Impact Factor: 4.650.

Conversion of blue emitting thermally stable $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ host as a color tunable phosphor via energy transfer for luminescent devices

Mukesh K. Sahu and **M. Jayasimhadri** *

Abstract: Eulytite type crystalline structure of Eu^{3+} activated $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ phosphors have been synthesized via solid-state reaction method in an ambient atmosphere. The diffraction pattern of the synthesized phosphor confirmed the formation of pure and single-phase crystalline with a cubic structure of $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ microparticles. The SEM image of $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ illustrates the growth of heterogeneous microstructures with some agglomeration. The $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ host shows the broad emission peak at 434 nm (blue region) under the excitation wavelength of 326 nm ascribing to $^3\text{P}_1 \rightarrow ^1\text{S}_0$ electronic transition of Bi^{3+} ions. The Eu^{3+} activated $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ phosphors exhibited intense red emission band centered at $\lambda_{\text{em}} = 612$ nm ($^5\text{D}_0 \rightarrow ^7\text{F}_2$) at excitation wavelengths of 393 & 465 nm and perceived that the optimized Eu^{3+} ion concentration is 8.0 mol%. The host blue emission intensity diminished with increasing Eu^{3+} concentration, whereas the intensity enhanced for the characteristic peaks of Eu^{3+} ions located in 550–725 nm range under the host excitation wavelength ($\lambda_{\text{ex}} = 326$ nm). This suggests that part of host emission energy was transferred to the activator when the host was doped with Eu^{3+} activator ions. The CIE color coordinates for the $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ host lie in the blue region, which has been modulated towards the red region with increasing Eu^{3+} ions concentration. However, the CIE coordinate values for Eu^{3+} doped $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ phosphor fall in the red region at $\lambda_{\text{ex}} = 393$ & 465 nm with high color purity. The average decay time of the optimized phosphor was in the range of milliseconds. The PL intensity persists up to 75.45% at 200 °C that of at ambient temperature, assuring the excellent thermal stability of phosphor. The combination of the above revealed results recommends that $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$: Eu^{3+} phosphor can be a probable contestant in near-UV/blue excited luminescent devices.

For details refer to <https://doi.org/10.1016/j.jlumin.2020.117570>

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Optimization of structural and luminescent properties with intense red emitting thermally stable Sm³⁺ doped CaBiVO₅ phosphors for w-LED applications

Harpreet Kaur and M. Jayasimhadri *

Abstract: Sm³⁺ doped CaBiVO₅ (CBV: Sm³⁺) phosphors synthesized namely by solid-state reaction (SSR), combustion (CB) and citrate sol-gel (SG) method to optimize the synthesis procedure and also to enhance the luminescent properties for the first time. X-ray powder diffraction patterns and scanning electron micrographs recorded for the synthesized CBV: Sm³⁺ phosphors to analyse structural and morphological aspects, respectively. The excitation spectra measured by monitoring emission at 649 nm for CBV: Sm³⁺ phosphors reveal significant absorption in ultraviolet (UV), near (n)-UV and blue spectral regions. The comparative photoluminescence (PL) spectra measured under 343 nm excitation for differently synthesized CBV: Sm³⁺ phosphors, which exhibit significantly enhanced emission intensity for SG derived phosphor than other adopted methods. The PL spectra for SG derived 1.0 mol% Sm³⁺ doped CBV phosphor at $\lambda_{ex} = 275$ and 343 nm exhibit sharp peaks located at 566, 606 and 649 nm along with weak host emission broadband and for $\lambda_{ex} = 406$ nm, similar sharp peaks of Sm³⁺ transitions are observed without any host emission. Unlike mostly explored Sm³⁺ doped phosphors, emission peak in red spectral region (649 nm) is more intense as compared to the emission peak in orange region (599 nm) in the present work. The energy transfer mechanism responsible for concentration quenching in CBV phosphors is discussed in detail. The CBV: Sm³⁺ phosphors manifest color tunability from orange to orange-red region by modulating excitation from 275 nm (0.567, 0.404) to 343 nm (0.591, 0.399) and finally to 406 nm (0.620, 0.376). The temperature-dependent PL studies indicate appreciable thermal stability of as-prepared phosphor. Above mentioned results suggest that CBV: Sm³⁺ phosphor has great potential for use in white light-emitting diode (w-LED) applications.

For details refer to <https://doi.org/10.1016/j.optmat.2020.110119>

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Structural, multiferroic, and magnetoelectric properties of $(1-x)\text{Bi}_{0.85}\text{La}_{0.15}\text{FeO}_3-x\text{BaTiO}_3$ composite ceramics

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

Abstract: Multiferroic magnetoelectric composites are beneficial in device fabrication because of their tunable ferroelectricity and magnetism. The partial substitution in bismuth ferrite (BiFeO_3) is one of the best possible ways for synthesizing pure phase BiFeO_3 -based materials. A comprehensive study of $(1-x)\text{Bi}_{0.85}\text{La}_{0.15}\text{FeO}_3-x\text{BaTiO}_3$ ($x=0-0.3$) was done by coalescing ferroelectric, dielectric, magnetic, and magnetoelectric properties with structural and microstructural characterizations to explore the effect of BaTiO_3 (BT) into $\text{Bi}_{0.85}\text{La}_{0.15}\text{FeO}_3$ (BLFO) and forming composite ceramics. The X-ray diffraction study reveals the phase purity in BLFO and a structural transformation from rhombohedral to cubic phase with increasing content of BT. The Raman spectroscopy and scanning electron micrographs confirm the co-existence of composite formation in BLFO- x BT. The Raman modes shift towards lower wavenumber with increasing BT concentration suggests lattice compression. The room temperature $M-H$ hysteresis curve shows the existence of weak ferromagnetism in BLFO-BT composites and superparamagnetism in BLFO-10BT ceramic. The curve fitting of $M-H$ curve for BLFO-10BT showed the existence of superparamagnetic particles. The ferroelectric hysteresis $P-E$ loop measurements produced unsaturated oval-shaped loops with high leakage and displayed a lossy dielectric nature. The effect of magnetic field on polarization versus electric field curve reveals the interfacial interaction due to the origin of magnetoelectric interaction in BLFO-BT composite ceramics. All the samples display peak broadening in temperature-permittivity plot and confirm relaxor behavior. The superparamagnetic behavior and magnetic field-dependent energy storage capacity of BLFO-10BT composite ceramic make this material a potential candidate for magnetoelectric devices.

For details refer to <https://link.springer.com/article/10.1007/s10854-020-03768-y>

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Dielectric and tunable ferroelectric properties in BiFeO_3 - BiCoO_3 - BaTiO_3 ternary compound⁺

S. Shankar, I. Maurya, Abhishek Raj, Sukhbir Singh, O. P. Thakur and **M. Jayasimhadri***

Abstract: The ternary compound BiFeO_3 - BiCoO_3 - BaTiO_3 (BFO-BCO-BT) was prepared using the solid-state reaction method. The dielectric studies display strong frequency-dependent anomaly in the vicinity of Curie temperature (T_C) ≈ 350 °K and exhibit strong diffusive relaxor behavior with ($\gamma \approx 1.61$). The dielectric measurements confirm stabilization in BFO-BT solid solution due to BCO addition. The P - E loops display strong ferroelectric behavior and frequency variation indicating major dominant domain wall movement on high dielectric constant in the BFO-BCO-BT ternary compound. The magnetic field variation in the P - E loop displays strong magnetoelectric coupling originating from interfacial polarization with maximum coupling coefficient of 115 mV/cm-Oe at field of 500 Oe. The temperature variation of P - E shows enhanced configurational entropy due to increase in activation energy, with the highest isothermal energy (ΔS) = 0.15 J/kg/K obtained for E = 15 kV/cm and T = 125 °C. These studies provide tunable ferroelectric properties of BFO-BCO-BT for exploration of promising applications such as refrigeration and magnetoelectricity.

For details refer to <https://doi.org/10.1007/s00339-020-03872-0>

Impedance spectroscopy and conduction behavior in CoFe_2O_4 - BaTiO_3 composites⁺

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

Abstract: Magnetoelectric composites combining ferromagnetic cobalt ferrite (CFO) and ferroelectric barium titanate (BT) are prepared using conventional solid-state reaction. Dielectric measurements reveal that CFO and CFO-BT composites exhibit Maxwell-Wagner polarization and temperature-dependent relaxation originating due to the presence of ions/defects vacancies. Prominently, CFO-30% BT composite showed an unexpected low dielectric loss ≈ 0.5 above 1 kHz and has potential for device application. Impedance spectroscopy confirms the thermally activated relaxation mechanism and high impedance behavior in the samples. Modulus analysis affirms the statistically distributed non-Debye type behavior existing in CFO-BT composites. The electric conductivity takes place via correlated barrier hopping in CFO and CFO-10BT composite and overlapping large polaron tunneling in CFO-30BT composite. The addition of BT in CFO initiates the structural modification and results in conductivity cross-over with improved conductivity. These results are useful for exploring devices based on CFO-BT composites.

For details refer to <https://doi.org/10.1007/s11664-019-07700-x>

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+Eligible for Certificate only

Structural and spectroscopic characteristics of thermally stable Eu³⁺ activated barium zinc orthophosphate phosphor for white LEDs⁺

Mukesh K. Sahu, Harpreet Kaur, B. V. Ratnam, J. Suresh Kumar, **M. Jayasimhadri**

Abstract: Crystalline monoclinic phase of europium (Eu³⁺) doped barium zinc orthophosphate [BaZn₂(PO₄)₂: BZP] phosphor has been synthesized via solid-state reaction technique. The phase purity, morphology and luminescent features of the as-synthesized phosphors have been examined using the results of X-ray diffraction (XRD), scanning electron microscopy (SEM) and photoluminescence (PL), respectively. The XRD results indicate pure phase formation of Eu³⁺ doped BZP (BZP:Eu³⁺) phosphor due to exact matching with the standard data of BZP. The SEM image specifies irregular shape of micro sized particles and non-uniform morphology. The BZP:Eu³⁺ phosphor exhibits intense emission at 592 nm wavelength under ultraviolet (UV), near-UV and blue light excitations. The emission spectra disclose that the emission intensity improved with increase in Eu³⁺ ions concentration up to 4.0 mol% and intensity decreases beyond it. The CIE coordinates (0.625, 0.363) calculated for the optimized BZP:Eu³⁺ phosphor, which fall in the pure red region and close to commercially available red phosphor Y₂O₂S: Eu³⁺ (0.647, 0.343). The PL intensity sustained up to 62.25% at 150 °C as compared to the intensity at room temperature indicating good thermal stability of BZP phosphor. All the above mentioned results signify the potential candidature of BZP:Eu³⁺ phosphors for white light emitting devices.

For details refer to <https://doi.org/10.1016/j.ceramint.2020.07.263>

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Synthesis of orange emitting Sm³⁺ doped sodium calcium silicate phosphor by sol-gel method for photonic device⁺

Harpreet Kaur, **M. Jayasimhadri**, Mukesh K. Sahu, P. Koteswara Rao and N.S. Reddy

Abstract: Samarium (Sm³⁺) doped sodium calcium silicate (Na₂CaSiO₄: NCS) phosphors have been synthesized by employing a sol-gel technique. The structural, morphological, excitation and emission spectral studies have been carried out for the as-prepared phosphors. The phase purity in synthesized NCS phosphor with cubic structure has been confirmed by X-ray diffraction (XRD) pattern. The scanning electron microscopic images depict the irregular morphology and non-uniform microcrystalline particles in synthesized phosphor. The excitation spectra of NCS: Sm³⁺ phosphors disclose strong absorption in UV (ultraviolet), n-UV (near UV) and blue spectral regions. The emission spectra recorded under 402 nm excitation exhibit peaks at 565, 602 and 649 nm attributed to characteristic 4f-4f transitions of Sm³⁺ ions. The Sm³⁺ concentration optimized for NCS host as 1.0 mol%, and concentration quenching phenomenon has been discussed in detail. The chromaticity coordinates (0.579, 0.419) for optimized NCS: Sm³⁺ phosphor lie in the pure orange region. The temperature-dependent photoluminescence studies demonstrate that luminescence intensity even at 423 and 463 K persists up to 85.4 and 79.6% of the intensity at room temperature, respectively. Above mentioned results substantiate the potentiality of NCS: Sm³⁺ phosphor to use as a thermally stable orange emitting component in photonic devices.

For details refer to <https://doi.org/10.1016/j.ceramint.2020.04.224>

Tb³⁺ ion induced color tunability in calcium aluminozincate phosphor for lighting and display devices⁺

Sumandeep Kaur, A.S. Rao, **M. Jayasimhadri***, Vishnu Vikesh Jaiswal and D. Haranath

Abstract: Terbium (Tb³⁺) ions doped calcium aluminozincate (CAZ) phosphors with different concentration of Tb³⁺ ions (0.0-5.0 mol%) have been successfully prepared by sol-gel method. The crystal phase analysis and morphology of the as prepared phosphors have been studied from X-ray diffraction (XRD) patterns and field emission scanning electron microscope (FE-SEM) image. The luminescence behaviour of Tb³⁺ doped CAZ phosphors have been studied relative to variable dopant ion concentration. The intense emission has been observed at 543 nm under 238 nm excitation for all the phosphors. The decay curve analysis manifests the energy transfer as a consequence of dipole-dipole interaction between Tb³⁺ ions in the host. The colorimetric property has been understood on the basis of evaluated CIE color coordinates. The systematic study of Tb³⁺ doped CAZ phosphors determine the potential utility of these phosphors in lighting and display applications.

For details refer to <https://doi.org/10.1016/j.jallcom.2020.154212>

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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 & 05), 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 & 15) and National Chiao Tung University (2019), Taiwan. He is the author and co-author of more than 90 research papers and conference proceedings, including eight as a single author and three in **NPG**. He received about two crore rupees funding for his research, which includes five major research projects of DST (2004), DAE-BRNS (2012), DST (2012), SERB-DST (2016) and DST-RFBR (2017). 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, optoelectronic devices, QLEDs, etc.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	05

1. P. Sharma and **M. S. Mehata**, “Colloidal MoS₂ quantum dots based optical sensor for detection of 2,4,6-TNP explosive in an aqueous medium”, *Optical Materials*, vol. 100, pp. 109646, 2020. Impact Factor: 2.779.
2. M. K. Singh and **M. S. Mehata**, “Enhanced photoinduced catalytic activity of transition metal ions incorporated TiO₂ nanoparticles for degradation of organic dye: Absorption and photoluminescence spectroscopy”, *Optical Materials*, vol. 109, pp. 110309, 2020. Impact Factor: 2.779.
3. N. Fatma, **M. S. Mehata**, N. Pandey and S. Pant, “Flavones fluorescence-based dual response chemosensor for metal ions in aqueous media and fluorescence recovery”, *Journal of Fluorescence*, vol. 30, pp. 759–772, 2020. Impact Factor: 2.093.
4. N. Pandey, **M. S. Mehata**, N. Fatma and S. Panta, “Modulation of Fluorescence properties of 5-aminoquinoline by Ag⁺ in aqueous media via charge transfer”, *Journal of Photochemistry and Photobiology A: Chemistry*, vol. 396, pp. 112549, 2020. Impact Factor: 3.306.2020.
5. P. Sharma and **M. S. Mehata**, “Rapid sensing of lead metal ions in an aqueous medium by MoS₂ quantum dots fluorescence turn-off”, *Materials Research Bulletin*, vol. 131, pp. 110978, 2020. Impact Factor: 4.019.

Colloidal MoS₂ quantum dots based optical sensor for detection of 2,4,6-TNP explosive in an aqueous medium

Prateek Sharma and **Mohan Singh Mehata***

Abstract: Facile single pot hydrothermal approach has been used to synthesize water-dispersible fluorescent molybdenum disulfide (MoS₂) quantum dots (QDs) capped with 1,4-diaminobutane (DAB). The developed MoS₂ QDs were investigated with different techniques and further used for selective sensing of the explosive 2,4,6-trinitrophenol (TNP) up to a limit of detection of 5 μM. The PL intensity of QDs is quenched in the presence of TNP following the radiative energy transfer mechanism.

For details refer to <https://doi.org/10.1016/j.optmat.2019.109646>

Enhanced photoinduced catalytic activity of transition metal ions incorporated TiO₂ nanoparticles for degradation of organic dye: absorption and photoluminescence spectroscopy

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

Abstract: Transition metal ions (Ag⁺, Cu²⁺, and Ni²⁺) doped and undoped TiO₂ nanoparticles (NPs) were synthesized via cost effective sol-gel method with 1.0 wt% dopant concentration. The microstructure and chemical compositions of these NPs were examined using various techniques such as x-ray diffractometry, field emission scanning electron microscopy, high-resolution transmission electron microscopy, Fourier transform infrared and absorption and photoluminescence (PL) spectroscopy. The average size of the NPs is in the range of 10–20 nm and lattice spacing is 0.36 nm corresponding (101) plane. The absorption and photoluminescence (PL)-excitation spectra of metal-doped TiO₂ NPs are shifted to the longer wavelength region, which indicates reduced bandgap than the bare TiO₂ NPs. The absorption and PL spectra of methylene blue (MB) in the presence of undoped and metal ions doped TiO₂ NPs show dramatic changes upon UV-irradiation. The absolute absorption intensity reduced entirely and the solution of MB became colorless in the presence of UV irradiation. The PL of the degraded dye exhibits a new band in the shorter wavelength region, which has a multi-exponential decay function and an increased average PL lifetime. Among all the samples, Cu²⁺ ions-doped TiO₂ NPs shows the superior photocatalytic activity for the degradation of dye and followed pseudo-first-order kinetics.

For details refer to <https://doi.org/10.1016/j.optmat.2020.110309>

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Flavones fluorescence-based dual response chemosensor for metal ions in aqueous media and fluorescence recovery

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

Abstract: Responsiveness of sensing materials 3-hydroxyflavone (3HF) towards metal ions in aqueous medium has been explored following photoexcitation. 3HF exhibited both colorimetric and fluorescence (FL) turn-off response towards Cu^{2+} and Fe^{2+} with high sensitivity and selectivity. Meanwhile, the distinct colour change and the rapid quenching of FL intensity provide naked-eye detection. On successive addition of Cu^{2+} and Fe^{2+} ions, FL of 3HF was “turned off,” whereas there is no change in wavelength of FL bands. Quenching efficiencies for Cu^{2+} and Fe^{2+} ions are 88% and 49%, respectively. The detection limit of the sensor towards Cu^{2+} and Fe^{2+} was 1.54 μM and 1.98 μM , respectively. The binding strategy between 3HF and metal ions (Cu^{2+} , Fe^{2+}) and the nature of quenching have been explored with the Benesi-Hildebrand and Stern-Volmer plots, respectively. The FL of 3HF significantly quenched in the presence of Cu^{2+} ions, and then recovered upon addition of HCl, providing the possibility of constructing a sensitive Cu^{2+} -HCl off-on fluorescent probe. Moreover, the proposed simple, quick response and visual test strip-based chemosensor could be used for the detection of Fe^{2+} and Cu^{2+} ions.

For details refer to <https://doi.org/10.1007/s10895-020-02540-z>

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Modulation of fluorescence properties of 5-aminoquinoline by Ag⁺ in aqueous media via charge transfer⁺

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

Abstract: The effect of silver ions (Ag⁺) on the photophysical behavior of 5-aminoquinoline (5AQ) has been studied in an aqueous environment using steady-state and time-resolved spectroscopic techniques. 5-AQ exhibits two weak fluorescence (FL) bands in an aqueous medium. The successive addition of Ag⁺ ions to the aqueous solution of 5AQ amplify the FL intensity of the large Stokes shifted band upto 21 folds accompanied by a red-shift as a result of the acceleration of charge transfer (CT) process and restriction of hydrogen bonding in the excited state. 5AQ exhibits good selectivity for Ag⁺ ion over other metal ions (Li⁺, K⁺, Pb²⁺, Zn²⁺, Fe²⁺, Mn²⁺, Mg²⁺, Cu²⁺, Cd²⁺, Co²⁺, Cr³⁺, Ni²⁺). The Benesi-Hildebrand and Hills equations together with DFT calculations demonstrated the formation of 1:1 complex between 5AQ and Ag⁺. Furthermore, 5AQ can perform as an INHIBIT logic gate triggered by Ag⁺ and H⁺ ions. Hence, the proposed study appears to be interesting in the detection of Ag⁺ ions in aqueous media to a certain extent, indicating that 5AQ would have potential applications in the environmental and biological monitoring of Ag⁺ ions. Additionally, practical application carried out indicates that 5AQ can be used for the recognition of Ag⁺ ions in drinking water samples.

For details refer to <https://doi.org/10.1016/j.jphotochem.2020.112549>

Rapid sensing of lead metal ions in an aqueous medium by MoS₂ quantum dots fluorescence turn-off⁺

Prateek Sharma and **Mohan Singh Mehata***

Abstract: The traditional methods used for the detection of heavy metal ions in an aqueous medium have been considered as complicated and time-consuming; therefore, it is highly recommended to find a rapid and sensitive probe. The functionalized molybdenum disulfide (MoS₂) quantum dots (QDs) were developed and used as a sensitive fluorescent probe for monitoring the lead (Pb²⁺) ions in an aqueous medium. Photoluminescence (PL)/fluorescence intensity of the QDs strongly quenched in the presence of Pb²⁺ ions. The responsiveness of PL of QDs with Pb²⁺ in the range of 33 μM to 8.0 mM makes it a wide dynamic range sensing probe with a limit of detection (LOD) of 50 μM. Besides, the linear dependence of an absolute absorption intensity with the concentration of Pb²⁺ ions makes it a significant probe for monitoring the lead metal ions in an aqueous environment.

For details refer to <https://doi.org/10.1016/j.materresbull.2020.110978>

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Ms. Monika Yadav was born in Delhi, India. She received her Bachelor's and Master's degree from University of Delhi, Delhi, India, in 2010 and 2012, respectively. She is a UGC NET- JRF fellow. Currently, She is pursuing her Ph.D. degree with the Delhi Technological University, Delhi in collaboration with the University of Delhi, India. She is currently working on the theory and simulation of laser-plasma interaction and its applications for electron acceleration and electromagnetic radiation generation. She is an active member of IEEE (Institute of Electrical and Electronics Engineers). She has published 3 Research papers in the SCI international refereed journals and 2 conference proceedings.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **M. Yadav**, D. N. Gupta, S. C. Sharma and H. Suk, "Plasma bubble evolution in laser wakefield acceleration in petawatt regime", *Laser Physics Letters*, vol. 17, no. 7, pp. 076001, 2020. Impact Factor: 1.884.
2. **M. Yadav**, D. N. Gupta, and S. C. Sharma, "Electron plasma wave excitation by a q-Gaussian laser beam and subsequent electron acceleration", *Physics of Plasmas*, vol. 27, no. 9, pp. 093106, 2020. Impact Factor: 1.830.

Plasma bubble evolution in laser wakefield acceleration in petawatt regime

Monika Yadav, Devki Nandan Gupta, Suresh C Sharma and Hyyong Suk

Abstract: The bubble regime of the laser wakefield acceleration is one of the most recent and promising mechanisms for generating quasi-monoenergetic electron beams. In this work, we propose to study the dynamics of bubble (a wake structure devoid of electrons created in underdense plasma by a highly-intense ultrashort laser pulse) in a petawatt regime. The dependence of the electron beam energy and the quality of the electron beam on the shape of the bubble is the main motivation behind this work. The bubble length as well as bubble shape have been investigated using two-dimensional particle-in-cell simulations. The evolution of the bubble with time, and the correlation of bubble length (longitudinal and transverse radius) with the intensity of laser pulse have been revealed in this study. The change of bubble dimensions can be estimated by various determining factors such as the laser pulse focusing, the beam loading, the residual electrons, and the bubble velocity. It has also been confirmed that the shape of the bubble cannot be predicted using fixed shape models as spherical or elliptical. Simulations unveil that as the bubble traverses in plasma, it evolves from spherical shape to the highly elliptical shape. And, as it approaches the dephasing length, the eccentricity decreases further. Consequently, the self-injection of plasma electrons in the bubble is seriously affected by the bubble evolution. Comparison of the electron energy gain at different intensities of laser pulse has also been provided. Various scaling laws for electron beam energy estimations are predicted in this investigation. High quality electron beam can be obtained by controlling the bubble evolution, which may have significant applications in future coherent light sources, biomedical, condensed matter physics, and x-ray generation by table-top FEL.

For details refer to <https://doi.org/10.1088/1612-202X/ab8fa9>

Electron plasma wave excitation by a q-Gaussian laser beam and subsequent electron acceleration

Monika Yadav, Devki Nandan Gupta, and Suresh C. Sharma

Abstract: A theoretical study is investigated to understand the propagation dynamics of a q-Gaussian laser beam in a plasma under the influence of relativistic and ponderomotive nonlinearities. A q-Gaussian laser beam exhibits unique characteristics while interacting with the plasma. On account of the interaction of the q-Gaussian laser beam, the plasma density distribution becomes more finite and leads to affect the self-focusing of the laser beam. A comparative study of self-focusing for Gaussian and q-Gaussian laser beam is reported. The results are illustrated with numerical analysis, revealing a strong self-focusing of the q-Gaussian laser beam in plasmas, which is desirable to excite a large amplitude plasma wave for electron accelerations by extending the interaction length. We then extended this study to investigate the electron plasma wave excitation by the q-Gaussian laser beam. The generation of electron plasma wave is seen to be modified by the self-focusing of q-Gaussian laser beam. It is evident from the results that the electron plasma wave field intensity is enhanced more than two-fold for q-Gaussian laser beam in comparison with the case of Gaussian laser beam. And consequently, the energy gained by the accelerated electrons trapped in the plasma wave is also found to be significantly enhanced for q-Gaussian laser beam case. The numerical analysis has been done for this study for the established set of laser and plasma parameters.

For details refer to <https://doi.org/10.1063/5.0007998>



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Mr. Mukesh K. Sahu is currently working as a fulltime Research Scholar in the Department of Applied Physics, Delhi Technological University (DTU), Delhi, India. He did his M. Tech in Nanotechnology from Jamia Millia Islamia, New Delhi and Bachelor of Engineering in electronics and communication engineering from Guru Ghasidas Vishwavidyalay, Bilaspur Chhattisgarh, India. He started his research in Nanoelectronics during his master thesis work at Alternative Energy Materials Group, CSIR-NPL, India. After the completion of his master's, he worked as a Junior Research Fellow and Senior Research Fellow in SERB-DST sponsored project in Luminescent Materials Research Lab (LMRL) Department of Applied Physics, DTU Delhi, India. He received the Commendable Research Award in three consecutive years (2017-19) for the excellence in research. He qualified UGC-NET (Two times) in Electronic Science. Currently, he has published 10 research papers in internationally reputed SCI/SCIE journals and also presented more than 15 research papers work in several national and international conferences.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **M. K. Sahu**, H. Kaur, B. V. Ratnam, J. S. Kumar and M. Jayasimhadri, "Structural and spectroscopic characteristics of thermally stable Eu^{3+} activated barium zinc orthophosphate phosphor for white LEDs", *Ceramics International*, vol. 46, no. 16, Part B, pp. 26410-26415, 2020. Impact Factor: 3.830.
2. **M. K. Sahu** and M. Jayasimhadri, "Conversion of blue emitting thermally stable $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ host as a color tunable phosphor via energy transfer for luminescent devices", *Journal of Luminescence*, vol. 227, pp. 117570, 2020. Impact Factor: 3.280.

Structural and spectroscopic characteristics of thermally stable Eu^{3+} activated barium zinc orthophosphate phosphor for white LEDs

Mukesh Kumar Sahu, Harpreet Kaur, B. V. Ratnam, J. Suresh Kumar, M. Jayasimhadri

Abstract: Crystalline monoclinic phase of europium (Eu^{3+}) doped barium zinc orthophosphate [$\text{BaZn}_2(\text{PO}_4)_2$: BZP] phosphor has been synthesized via solid-state reaction technique. The phase purity, morphology and luminescent features of the as-synthesized phosphors have been examined using the results of X-ray diffraction (XRD), scanning electron microscopy (SEM) and photoluminescence (PL), respectively. The XRD results indicate pure phase formation of Eu^{3+} doped BZP (BZP: Eu^{3+}) phosphor due to exact matching with the standard data of BZP. The SEM image specifies irregular shape of micro sized particles and non-uniform morphology. The BZP: Eu^{3+} phosphor exhibits intense emission at 592 nm wavelength under ultraviolet (UV), near-UV and blue light excitations. The emission spectra disclose that the emission intensity improved with increase in Eu^{3+} ions concentration up to 4.0 mol% and intensity decreases beyond it. The CIE coordinates (0.625, 0.363) calculated for the optimized BZP: Eu^{3+} phosphor, which fall in the pure red region and close to commercially available red phosphor $\text{Y}_2\text{O}_2\text{S}:\text{Eu}^{3+}$ (0.647, 0.343). The PL intensity sustained up to 62.25% at 150 °C as compared to the intensity at room temperature indicating good thermal stability of BZP phosphor. All the above mentioned results signify the potential candidature of BZP: Eu^{3+} phosphors for white light emitting devices.

For details refer to <https://doi.org/10.1016/j.ceramint.2020.07.263>

Conversion of blue emitting thermally stable $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ host as a color tunable phosphor via energy transfer for luminescent devices

Mukesh Kumar Sahu and M. Jayasimhadri

Abstract: Eulytite type crystalline structure of Eu^{3+} activated $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ phosphors have been synthesized via solid-state reaction method in an ambient atmosphere. The diffraction pattern of the synthesized phosphor confirmed the formation of pure and single-phase crystalline with a cubic structure of $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ microparticles. The SEM image of $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ illustrates the growth of heterogeneous microstructures with some agglomeration. The $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ host shows the broad emission peak at 434 nm (blue region) under the excitation wavelength of 326 nm ascribing to $^3\text{P}_1 \rightarrow ^1\text{S}_0$ electronic transition of Bi^{3+} ions. The Eu^{3+} activated $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ phosphors exhibited intense red emission band centered at $\lambda_{\text{em}} = 612$ nm ($^5\text{D}_0 \rightarrow ^7\text{F}_2$) at excitation wavelengths of 393 & 465 nm and perceived that the optimized Eu^{3+} ion concentration is 8.0 mol%. The host blue emission intensity diminished with increasing Eu^{3+} concentration, whereas the intensity enhanced for the characteristic peaks of Eu^{3+} ions located in 550–725 nm range under the host excitation wavelength ($\lambda_{\text{ex}} = 326$ nm). This suggests that part of host emission energy was transferred to the activator when the host was doped with Eu^{3+} activator ions. The CIE color coordinates for the $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ host lie in the blue region, which has been modulated towards the red region with increasing Eu^{3+} ions concentration. However, the CIE coordinate values for Eu^{3+} doped $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ phosphor fall in the red region at $\lambda_{\text{ex}} = 393$ & 465 nm with high color purity. The average decay time of the optimized phosphor was in the range of milliseconds. The PL intensity persists up to 75.45% at 200 °C that of at ambient temperature, assuring the excellent thermal stability of phosphor. The combination of the above revealed results recommends that $\text{Ca}_3\text{Bi}(\text{PO}_4)_3: \text{Eu}^{3+}$ phosphor can be a probable contestant in near-UV/blue excited luminescent devices.

For details refer to <https://doi.org/10.1016/j.jlumin.2020.117570>



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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. K. Arora and **N. K. Puri**, “Chemiresistive sensing platform based on PdO-PANI/ITO heterostructure for room temperature hydrogen detection”, *Materials Chemistry and Physics*, vol. 247, pp. 122850, 2020. Impact Factor: 3.408.
2. R. Khatri and **N. K. Puri**, “Electrochemical study of hydrothermally synthesised reduced MoS₂ layered nanosheets”, *Vacuum*, vol. 175, pp. 109250, 2020. Impact Factor: 2.906.

Chemiresistive sensing platform based on PdO-PANI/ITO heterostructure for room temperature hydrogen detection

Kamal Arora and **Nitin K. Puri***

Abstract: Heterostructure of palladium oxide (PdO)-polyaniline (PANI)/indium tin oxide (ITO) have been used to enhance the sensitivity of chemiresistive sensors towards hydrogen (H_2) gas at room temperature. The fabricated sensor assembly is facile and economical as it uses direct metallic electrical contact with the sensing element, which eliminates the need of expensive interdigitated electrodes (IDE). Pristine PANI, 5 wt%, and 10 wt% PdO-PANI nanocomposites are synthesized using one pot in-situ wet chemical polymerization method. Pristine PANI, 5 wt%, and 10 wt% PdO-PANI composites thin film are uniformly interfaced over sputtered indium tin oxide (ITO) layer coated glass substrate using spin coating process. Solid state sensing element consisting of PANI/ITO, 5 wt%, and 10 wt% PdO-PANI/ITO heterojunction has been used for detection of (1, 3, 10, and 20) % H_2 concentration at room temperature. Two folds increase in the sensitivity of PdO-PANI nanocomposite towards 1% H_2 gas concentration has been observed in comparison to pristine PANI based sensing element and further the sensitivity also increases as the percentage concentration of PdO within nanocomposite increases from 5 wt% to 10 wt% respectively. It has been observed that the proposed heterostructure based sensing assembly is highly sensitive towards H_2 gas compared to similar previously reported sensors. With the onset of the hydrogen economy, this research work will pave the way in large scale production of sensitive and responsive handheld H_2 gas sensors that can be used in common households along with industries.

For details refer to <https://doi.org/10.1016/j.matchemphys.2020.122850>

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Electrochemical study of hydrothermally synthesised reduced MoS₂ layered nanosheets

Ritika Khatri and Nitin K.Puri*

Abstract: In this work, we report one-step, facile and cost-effective synthesis of 2-dimensional (2D) reduced MoS₂ (r-MoS₂) nanostructures via hydrothermal method using two reducing agents. The detection of hexagonal phase, estimation of lattice parameters and crystallite size is done using X-ray diffraction and Williamson-Hall plots are drawn to estimate strain produced in the sample. Field emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM) confirms the formation of nanosheet like structures. MoS₂ reduced using hydrazine hydrate is found to have better electrochemical properties with heterogenous rate transfer constant equal to 5.03×10^{-4} cm/s and electroactive surface area calculated as 7.05×10^{-4} cm². Raman spectra, TEM images and W–H plots explains the better electrochemical performance of rMoS₂ synthesised using hydrazine hydrate. Also, it is observed that out of electrochemical impedance spectroscopy (EIS), cyclic voltammetry and differential pulse voltammetry, EIS turns out to be best technique for studying electrochemical properties of layered materials. This work provides theoretical guidance to use chemically synthesised rMoS₂ as a matrix for electrochemical sensing applications where an increase or decrease in current/resistance value gives confirmation of attachment of bio/gas molecules and determination of parameters like heterogenous rate transfer constant can indicate sensitivity towards a particular analyte.

For details refer to <https://doi.org/10.1016/j.vacuum.2020.109250>

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Mr. Pranav Mani Tripathi is pursuing B.Tech in Engineering Physics from the Applied Physics department of Delhi Technological University. He has a keen interest in the field of nanodevices and semiconductors and is working in the same field with profound enthusiasm. He attended the 14th IEEE Nanotechnology Materials and Devices Conference (NMDC) in Stockholm, Sweden, to present his research paper on the topic “GaN Silicon-on-Insulator (SOI) N-Channel FinFET for High Performance Low Power applications”. He is also a member of the IEEE, USA.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **P. M. Tripathi**, H. Soni, R. Chaujar and A. Kumar, “Numerical Simulation and Parametric Assessment of GaN Buffered Trench Gate MOSFET for Low Power Applications”, *IET Circuits, Devices & Systems*, vol. 14, no. 6, pp. 915–922 2020. Impact Factor: 1.290.

Numerical Simulation and Parametric Assessment of GaN Buffered Trench Gate MOSFET for Low Power Applications

Pranav M. Tripathi, Harshit Soni, Rishu Chaujar and Ajay Kumar

Abstract: This study presents numerical simulation of a novel gallium nitride buffered trench gate (GaN-BTG) metal oxide semiconductor field effect transistor (MOSFET) for high-speed and low-power applications. The electrical characteristics of GaN-BTG-MOSFET are compared with BTG MOSFET and conventional trench gate MOSFET. A comparative study of different performance factors such as electric field, electron velocity, threshold voltage (V_{th}), electron mobility, and sub-threshold swing (SS) of these devices has been performed. Results reveal a 43.85% improvement in SS and 9.83% decrement in V_{th} for GaN-BTG-MOSFET. Furthermore, the frequency analysis has been performed in terms of scattering (S) parameters, cut-off frequency (f_T) and maximum oscillator frequency (f_{MAX}) to show how the device is also suitable for radio frequency applications. Furthermore, the study of parametric variation of GaN-BTG-MOSFET with the change in channel length, oxide thickness (t_{ox}), and doping concentration has also been presented. Results show that GaN-BTG-MOSFET can act as a promising structure for further scaling down of the trenched MOSFET and assures better performance for sub-20 nm trenched MOSFET.

For details refer to <https://doi.org/10.1049/iet-cds.2020.0041>



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Prof R. K. Sinha has completed M.Sc. Physics from IIT Kharagpur in 1984 and Ph.D. in the area of Fiber Optics and Optoelectronics in 1989. 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 (now NIT) Hamirpur H.P. and DCE/DTU. 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 350 research papers in journals (161) and conference proceedings (196) and 06 book chapters and 02 books, filed 05 patent, supervised 22 sponsored projects and 18 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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. K. S. Modi, J. Kaur, S. P. Singh, U. Tiwari and **R. K. Sinha**, “Extremely high figure of merit in all-dielectric split asymmetric arc metasurface for refractive index sensing”, *Optics Communications*, vol. 462, pp. 125327, 2020. Impact Factor: 2.125.

Extremely high figure of merit in all-dielectric split asymmetric arc metasurface for refractive index sensing

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

Abstract: In this paper, we have proposed the design of an all-dielectric metasurface that consists of a 2-dimensional periodic array of split asymmetric silicon arcs, making closed rings, on a silica substrate. The numerical simulation shows that the proposed metasurface exhibit Fano resonance due to close loop current density in asymmetric silicon arcs, at the wavelength of 967 nm for air as analyte surrounding the metasurface. The maximum achieved spectral contrast of the Fano resonance peak is 99%. It is also observed from the numerical simulation that the Fano-resonance wavelength and its linewidth is dependent on the refractive index and the thickness of the analyte above the silica substrate. The calculated sensitivity, quality factor (Q-Factor) and extremely high figure of merit (FoM) of the proposed sensor are 324 nm/RIU, 8720 and 2465, respectively.

For details refer to <https://doi.org/10.1016/j.optcom.2020.125327>

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DR. RISHU CHAUJAR
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Dr. Rishu Chaujar is presently working as an Associate 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 and wireless applications; and Solar Cell Modeling and Design. She has authored or co-authored more than 280 papers in various reputed international and national journals and conferences. She has supervised around 15 M.Tech 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 and 2020. 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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	05

1. A. Kumar, N. Gupta, M. M. Tripathi and **R. Chaujar**, “Analysis of structural parameters on sensitivity of black phosphorus junctionless recessed channel MOSFET for biosensing application”, *Microsystem Technologies*, vol. 26, pp. 2227–2233, 2020. Impact Factor: 1.737.
2. J. Madan, R. Pandey and **R. Chaujar**, “Conducting polymer based gas sensor using PNIN-gate all around - tunnel FET”, *Silicon*, vol. 12, pp. 2947–2955. Impact Factor: 1.499.
3. S. Rajjal, H. M. M. Ahmed and **R. Chaujar**, “Rapid detection of biomolecules in a dielectric modulated GaN MOSHEMT”, *Journal of Materials Science: Materials in Electronics*, vol. 31, no. 19, pp. 16609–16615, 2020. Impact Factor: 2.220.
4. N. Gupta, A. Kumar and **R. Chaujar**, “Design considerations and capacitance dependent parametric assessment of gate metal engineered SiNW MOSFET for ULSI switching applications”, *Silicon*, vol. 12, pp. 1501–1510. Impact Factor: 1.499.
5. P. M. Tripathi, H. Soni, **R. Chaujar** and A. Kumar, “Numerical simulation and parametric assessment of GaN buffered trench gate MOSFET for low power applications”, *IET Circuits, Devices & Systems*, vol. 14, no. 6, pp. 915–922 2020. Impact Factor: 1.290.

Analysis of structural parameters on sensitivity of black phosphorus junctionless recessed channel MOSFET for biosensing application

Ajay Kumar, Neha Gupta, M. M. Tripathi and **Rishu Chaujar***

Abstract: This paper presents a technology computer-aided design analysis of an ultrasensitive black phosphorus junctionless recessed channel MOSFET as a biosensor. A nano cavity gap is embedded in the gate insulator region (for molecules immobilization) due to which gate capacitance changes owing to the accumulation of different molecules which reflects the deviation in threshold voltage. Higher sensitivity (1.7) is achieved for protein at low V_{ds} (0.2 V) in comparison to streptavidin (1.17) and Biotin (1.24). Further, the effect of cavity gap length and oxide thickness variation is also examined. All the results pave the way for early detection techniques of protein-related diseases such as Alzheimer's diseases, ovarian cancer and coronary artery disease with the existing complementary metal-oxide-semiconductor technology.

For details refer to <https://doi.org/10.1007/s00542-019-04545-6>

Conducting polymer based gas sensor using PNIN-gate all around-tunnel FET

Jaya Madan, Rahul Pandey and **Rishu Chaujar***

Abstract: In the present work, the n^+ source pocket PIN gate all around tunnel FET (PNIN-GAA-TFET) based gas sensor has been proposed. Various analyte gases such as hexane, methanol, isopropanol, dichloromethane, and chloroform have been examined for their sensitivity and stability. The sensing of various analyte gases relies on the fact of work function modulation of the conducting polymer (used as gate) on the exposure of the gas vapors. Subsequently, the work function modulation of the conducting polymer gate alters the characteristics of the device that is calibrated for examining the sensitivity of the proposed gas sensor. The shift in the subthreshold current after the exposure of the analyte gas has been used as a sensing metric. Moreover, the influence of ambient temperature, conduction path, i.e., the channel radius and the oxide thickness of gate on the sensitivity and the characteristics of the proposed gas sensors have also been examined. The employment of the proposed PNIN-GAA-TFET based gas sensor may fulfill the perpetual demands of chemical and pharmaceutical industries, biomedical diagnostics, environmental monitoring and automotive industries by offering a low power, highly sensitive and reliable analyte gas detection.

For details refer to <https://doi.org/10.1007/s12633-020-00394-5>

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Rapid detection of biomolecules in a dielectric modulated GAN MOSHEMT

Shaveta, H. M. Maali Ahmed and **Rishu Chaujar***

Abstract: Biosensors are the devices that find application in almost every field nowadays. In this paper, GaN MOSHEMT based biosensor is proposed for detection of biomolecules such as ChOx, protein, streptavidin and Uricase. The effect of biomolecule species on the performance parameters of the device has been studied. It has been observed that there is a significant increase in the drain current and g_d is observed with the addition of biomolecule in the nanocavity. The electron concentration contour is studied which shows the rise of carrier concentration with biomolecule. Maximum positive shift is observed in threshold voltage for Uricase due to lowest dielectric constant. Similarly, the change in transconductance is also obtained with biomolecules. The effect of cavity dimensions on sensitivity is also studied. The maximum increase of 10% in channel potential is noted due biomolecule presence in the cavity. This device has shown good sensing and can be used for biosensing applications efficiently in addition to the high power performance of MOS-HEMTs.

For details refer to <https://doi.org/10.1007/s10854-020-04216-7>

Design considerations and capacitance dependent parametric assessment of gate metal engineered SiNW MOSFET for ULSI switching applications⁺

Neha Gupta, Ajay Kumar and **Rishu Chaujar***

Abstract: This work investigates design consideration of Gate Electrode Workfunction Engineered (GEWE) silicon nanowire MOSFET at room temperature. It is perceived from the results that the parasitic capacitances are higher in the deep inversion region, however; the coupling of parasitic capacitance is weak in GEWE-SiNW due to lower gate metal workfunction at the drain end. Moreover, the influence of drain voltage on C_{gs} is very less owing to constant depletion charges at the source side which results in almost constant value of C_{gs} with the change in V_{ds} . With tuning of channel length (L_g) and oxide thickness (t_{ox}), the effect of capacitances in GEWE-SiNW further reduces significantly due to quantization effect at such scaled dimensions. Furthermore, Transconductance Frequency Product (TFP), Energy Delay Product (EDP) and Gain Bandwidth Product (GBP) have also been calculated with an aim to analyze the device DC and switching performance as they are directly or indirectly linked with parasitic capacitance. Calibrated 3D simulations validate that the GEWE-SiNW MOSFET exhibit 2.57, 34.5 and 2.75 times improvement in TFP, EDP and GBP respectively in comparison to SiNW in the linear region.

For details refer to <https://doi.org/10.1007/s12633-019-00246-x>

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Numerical simulation and parametric assessment of GaN buffered trench gate MOSFET for low power applications+

Pranav M. Tripathi, Harshit Soni, **Rishu Chaujar*** and Ajay Kumar

Abstract: This study presents numerical simulation of a novel gallium nitride buffered trench gate (GaN-BTG) metal oxide semiconductor field effect transistor (MOSFET) for high-speed and low-power applications. The electrical characteristics of GaN-BTG-MOSFET are compared with BTG MOSFET and conventional trench gate MOSFET. A comparative study of different performance factors such as electric field, electron velocity, threshold voltage (V_{th}), electron mobility, and sub-threshold swing (SS) of these devices has been performed. Results reveal a 43.85% improvement in SS and 9.83% decrement in V_{th} for GaN-BTG-MOSFET. Furthermore, the frequency analysis has been performed in terms of scattering (S) parameters, cut-off frequency (f_T) and maximum oscillator frequency (f_{MAX}) to show how the device is also suitable for radio frequency applications. Furthermore, the study of parametric variation of GaN-BTG-MOSFET with the change in channel length, oxide thickness (t_{ox}), and doping concentration has also been presented. Results show that GaN-BTG-MOSFET can act as a promising structure for further scaling down of the trenched MOSFET and assures better performance for sub-20 nm trenched MOSFET.

For details refer to <https://doi.org/10.1049/iet-cds.2020.0041>

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DR. S. SHANKAR SUBRAMANIAN
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Dr. S. Shankar Subramanian, has completed his Ph.D. from Department of Applied Physics, Delhi Technological University under the supervision of Dr. M. Jayasimhadri and Prof. O. P. Thakur in 2020. He has published more than 20 publications in reputed journals and attended several national and international conferences.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **S. Shankar**, I. Maurya, A. Raj, S. Singh, O. P. Thakur and M. Jayasimhadri, “Dielectric and tunable ferroelectric properties in BiFeO₃-BiCoO₃-BaTiO₃ ternary compound”, *Applied Physics A*, vol. 126, no. 9, pp. 1-10, 2020. Impact Factor: 1.810.
2. **S. Shankar**, O.P. Thakur and M. Jayasimhadri, “Impedance spectroscopy and conduction behavior in CoFe₂O₄-BaTiO₃ composites”, *Journal of Electronic Materials*, vol. 49, no. 1, pp. 472–484, 2020. Impact Factor: 1.774.

Impedance spectroscopy and conduction behavior in CoFe_2O_4 - BaTiO_3 composites

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

Abstract: Magnetolectric composites combining ferromagnetic cobalt ferrite (CFO) and ferroelectric barium titanate (BT) are prepared using conventional solid-state reaction. Dielectric measurements reveal that CFO and CFO-BT composites exhibit Maxwell–Wagner polarization and temperature-dependent relaxation originating due to the presence of ions/defects vacancies. Prominently, CFO- 30% BT composite showed an unexpected low dielectric loss ≈ 0.5 above 1 kHz and has potential for device application. Impedance spectroscopy confirms the thermally activated relaxation mechanism and high impedance behavior in the samples. Modulus analysis affirms the statistically distributed non-Debye type behavior existing in CFO-BT composites. The electric conductivity takes place via correlated barrier hopping in CFO and CFO-10BT composite and overlapping large polaron tunneling in CFO-30BT composite. The addition of BT in CFO initiates the structural modification and results in conductivity cross-over with improved conductivity. These results are useful for exploring devices based on CFO-BT composites.

For details refer to <https://doi.org/10.1007/s11664-019-07700-x>

Dielectric and tunable ferroelectric properties in BiFeO_3 - BiCoO_3 - BaTiO_3 ternary compound

S. Shankar, I. Maurya, Abhishek Raj, Sukhbir Singh, O. P. Thakur and M. Jayasimhadri

Abstract: The ternary compound BiFeO_3 - BiCoO_3 - BaTiO_3 (BFO–BCO–BT) was prepared using the solid-state reaction method. The dielectric studies display strong frequency-dependent anomaly in the vicinity of Curie temperature (T_c) ≈ 350 °K and exhibit strong diffusive relaxor behavior with ($\gamma \approx 1.61$). The dielectric measurements confirm stabilization in BFO–BT solid solution due to BCO addition. The P – E loops display strong ferroelectric behavior and frequency variation indicating major dominant domain wall movement on high dielectric constant in the BFO–BCO–BT ternary compound. The magnetic field variation in the P – E loop displays strong magnetolectric coupling originating from interfacial polarization with maximum coupling coefficient of 115 mV/cm-Oe at field of 500 Oe. The temperature variation of P – E shows enhanced configurational entropy due to increase in activation energy, with the highest isothermal energy (ΔS) = 0.15 J/kg/K obtained for E = 15 kV/cm and T = 125 °C. These studies provide tunable ferroelectric properties of BFO–BCO–BT for exploration of promising applications such as refrigeration and magnetolectricity.

For details refer to <https://doi.org/10.1007/s00339-020-03872-0>



BIOGRAPHY

MS. SUMAN DAHIYA
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Ms. Suman Dahiya is currently working as a Ph.D. Research Scholar at the Department of Applied Physics, Delhi Technological University, Delhi, India. She received her bachelor's and master's degree in Physics from University of Delhi and DCRUST, India, respectively. She has published 5 research papers in international journals and conferences. Her research interests include Quantum Physics, Non-linear physics, Nano-photonics and Optics.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Dahiya**, S. Lahon and R. Sharma, "Effects of temperature and hydrostatic pressure on the optical rectification associated with the excitonic system in a semi-parabolic quantum dot", *Physica E: Low-dimensional Systems and Nanostructures*, vol. 118, pp. 113918, 2020. Impact Factor: 3.570.

Effects of temperature and hydrostatic pressure on the optical rectification associated with the excitonic system in a semi-parabolic quantum dot

Suman Dahiya, Siddhartha Lahon and Rinku Sharma

Abstract: The optical rectification for a GaAs quantum dot with an excitonic system is investigated for the various applied hydrostatic pressure, ambient temperature, and different effective size. The dependence of Optical Rectification Coefficient (ORC) on the temperature, radius and hydrostatic pressure in the strong confinement regime for both excitonic as well as without excitonic effects has been studied. This work demonstrates the intricate dependence of ORC on electron-hole pair localization, temperature change, alteration in radius and variation in hydrostatic pressure.

For details refer to <https://doi.org/10.1016/j.physe.2019.113918>



DR. SUMANDEEP KAUR
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Dr. Sumandeep Kaur has received her bachelor's and master's degree from SGTB Khalsa College, University of Delhi, New Delhi. She has received her Ph.D. degree from Applied Physics Department, Delhi Technological University under the joint supervision of Prof. A.S. Rao and Dr. M. Jayasimhadri. Her research interest is Rare earth doped phosphors and glasses for different photonic applications. She is currently working as CSIR research associate in Department of Applied Physics, Delhi Technological University under mentorship of Prof. A. S. Rao.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Kaur**, A. S. Rao, M. Jayasimhadri, V. V. Jaiswal and D. Haranath, "Tb³⁺ ion induced color tunability in calcium aluminozincate phosphor for lighting and display devices", *Journal of Alloys and Compounds*, vol. 826, pp. 154212, 2020. Impact Factor: 4.650.

Tb³⁺ ion induced color tunability in calcium aluminozincate phosphor for lighting and display devices

Sumandeep Kaur, A.S. Rao, M. Jayasimhadri, Vishnu Vikesh Jaiswal and D. Haranath

Abstract: Terbium (Tb³⁺) ions doped calcium aluminozincate (CAZ) phosphors with different concentration of Tb³⁺ ions (0.0-5.0 mol%) have been successfully prepared by sol-gel method. The crystal phase analysis and morphology of the as prepared phosphors have been studied from X-ray diffraction (XRD) patterns and field emission scanning electron microscope (FE-SEM) image. The luminescence behaviour of Tb³⁺ doped CAZ phosphors have been studied relative to variable dopant ion concentration. The intense emission has been observed at 543 nm under 238 nm excitation for all the phosphors. The decay curve analysis manifests the energy transfer as a consequence of dipole-dipole interaction between Tb³⁺ ions in the host. The colorimetric property has been understood on the basis of evaluated CIE color coordinates. The systematic study of Tb³⁺ doped CAZ phosphors determine the potential utility of these phosphors in lighting and display applications.

For details refer to <https://doi.org/10.1016/j.jallcom.2020.154212>



PROF. SURESH C. SHARMA

Department of Applied Physics

Dr. Suresh C. Sharma is working as a Professor with the Department of Applied Physics, Delhi Technological University, Delhi. He has been assigned the administrative responsibilities of Dean (Acad-PG). He was awarded the Young Scientist project as a Principal Investigator by the Department of Science and Technology (DST), Govt. of India for two year duration (1997-99). He was a Monbusho Postdoctoral Fellow under Japanese Govt. fellowship, Department 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 the Center for Atomic and Molecular Technologies (CAMT), Osaka University, Japan. Besides, he was awarded Senior Research Associate under the Scientist's Pool Scheme by CSIR, Govt. of India for 3 years duration (1999-2002) and worked in the Department of Physics and Astrophysics, University of Delhi from April 1999 to January 2002.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	05

1. A. Gahlot, **S. C. Sharma** and J. Sharma, "The effect of dust grains on the weibel instability in presence of large amplitude electrostatic waves", *Physics of Plasmas*, vol. 27, no. 4, pp. 043702, 2020. Impact Factor: 1.830.
2. R. Sharma and **S. C. Sharma**, "Theoretical analysis for transmission of gaussian and sine time irradiance of electromagnetic beam in collisional dusty plasmas", *Contributions to Plasma Physics*, vol. 60, no. 8, pp. e201900175, 2020. Impact Factor: 1.226.

3. R. Gupta and **S. C. Sharma**, "Parametric study of plasma characteristics and carbon nanofibers growth in PECVD system: Numerical modeling", *Plasma Chemistry and Plasma Processing*, vol. 40, pp. 1331–1350, 2020. Impact Factor: 2.178.
4. M. Yadav, D. N. Gupta, and **S. C. Sharma**," Electron plasma wave excitation by a q-Gaussian laser beam and subsequent electron acceleration", *Physics of Plasmas*, vol. 27, no. 9, pp. 093106, 2020. Impact Factor: 1.830.
5. M. Yadav, D. N. Gupta, **S. C. Sharma** and H. Suk, "Plasma bubble evolution in laser wakefield acceleration in petawatt regime", *Laser Physics Letters*, vol. 17, no. 7, pp. 076001, 2020. Impact Factor: 1.884.

The effect of dust grains on the weibel instability in presence of large amplitude electrostatic waves

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

Abstract: Theoretical investigations on the effect of dust charge fluctuations on Weibel instability in a plasma, with an electron beam in the presence of large amplitude electrostatic Langmuir waves, have been performed. It is observed that the dust charge fluctuations enhance the growth rate of electromagnetic (EM) perturbations. An increase in the electron to ion temperature ratio amplifies the EM perturbations, leading to an enhanced magnetic field due to Weibel instability. It has been found that the growth rate of Weibel instability strongly depends on the dust grain size for different values of ion to electron density ratio d_m . Moreover, the electron to ion temperature ratio also destabilizes the Weibel instability.

For details refer to <https://doi.org/10.1063/1.5133756>

Theoretical analysis for transmission of gaussian and sine time irradiance of electromagnetic beam in collisional dusty plasmas

Ruchi Sharma and **Suresh C. Sharma***

Abstract: A theoretical model of propagation of Gaussian and Sine time irradiance of an electromagnetic beam in collisional dusty plasma has been done in the present analysis. It contains equilibrium of dust charge, particle density, and energy of plasma ingredients having charge neutrality. Ionization of neutral particles, recombination of free electrons with ions, adsorption and emission of electrons from dust grain surface, and binary collisions between plasma components are also considered in this treatment. Time varying behavior of modified electron temperature and collision frequency has been illustrated numerically as a function of dust densities. Also, the comparative analyses of variation of beam waist parameter with the dimensionless length of transmission for both the Gaussian and Sine time irradiance are involved in this model as a function of distinguishable time width, collision frequencies, and dust densities under the condition that the size of dust nebulous is greater than the electrons mean free path for the adsorption on the dust grain surface. The observed results are significant for the applications in industry and astrophysics.

For details refer to <https://doi.org/10.1002/ctpp.201900175>

**Corresponding Author*

Parametric study of plasma characteristics and carbon nanofibers growth in PECVD System: Numerical modeling

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

Abstract: The aim of the present work is to develop a numerical model to understand and optimize the process parameters for the growth of carbon nanofibers (CNFs) inside the plasma enhanced chemical vapor deposition system containing acetylene, hydrogen, and argon gases. Two-dimensional axis-symmetrical inductive couple plasma module is implemented using COMSOL Multiphysics 5.2 simulation software to analyze the density profiles and temperatures of electrons, ions, and neutral species in the plasma at different gas pressures and input plasma powers. The outcomes of the COMSOL computational model show that the electron density in the plasma decreases with increase in gas pressure and increases with increase in plasma power. Other than the computational model, an analytical model is developed in the present paper that accounts the plasma sheath equations to study the fluxes and energies of the plasma species. The results obtained from the plasma sheath model at the catalyst-substrate surface boundary are fed as the input parameters to surface deposition model to investigate the growth characteristics of carbon nanofibers, i.e., poisoning of the catalyst nanoparticle, height, and diameter of carbon nanofibers at different gas pressures and input plasma powers. It is found that electron density decays at the faster rate when gas pressure is increased and decays at slower rate when input plasma power is raised. Moreover, it is also found that growth rate of CNFs increases with increase in gas pressure and plasma power. However, the significant drop in CNF growth rate is observed when the gas pressure is high enough (above and around 50 Torr). From the results obtained, it can be concluded that the CNFs having good growth characteristics can be obtained at some optimum pressure range, i.e., one order of the magnitude in the units of Torr. A good comparison between numerical simulation results and analytical results with each other and with existing experimental results confirms the adequacy of the computational and analytical approach.

For details refer to <https://doi.org/10.1007/s11090-020-10090-2>

**Corresponding Author*

Electron plasma wave excitation by a q-Gaussian laser beam and subsequent electron acceleration⁺

Monika Yadav, Devki Nandan Gupta, and **Suresh C. Sharma***

Abstract: A theoretical study is investigated to understand the propagation dynamics of a q-Gaussian laser beam in a plasma under the influence of relativistic and ponderomotive nonlinearities. A q-Gaussian laser beam exhibits unique characteristics while interacting with the plasma. On account of the interaction of the q-Gaussian laser beam, the plasma density distribution becomes more finite and leads to affect the self-focusing of the laser beam. A comparative study of self-focusing for Gaussian and q-Gaussian laser beam is reported. The results are illustrated with numerical analysis, revealing a strong self-focusing of the q-Gaussian laser beam in plasmas, which is desirable to excite a large amplitude plasma wave for electron accelerations by extending the interaction length. We then extended this study to investigate the electron plasma wave excitation by the q-Gaussian laser beam. The generation of electron plasma wave is seen to be modified by the self-focusing of q-Gaussian laser beam. It is evident from the results that the electron plasma wave field intensity is enhanced more than two-fold for q-Gaussian laser beam in comparison with the case of Gaussian laser beam. And consequently, the energy gained by the accelerated electrons trapped in the plasma wave is also found to be significantly enhanced for q-Gaussian laser beam case. The numerical analysis has been done for this study for the established set of laser and plasma parameters.

For details refer to <https://doi.org/10.1063/5.0007998>

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+Eligible for Certificate only

Plasma bubble evolution in laser wakefield acceleration in petawatt regime+

Monika Yadav, Devki Nandan Gupta, **Suresh C. Sharma*** and Hyyong Suk

Abstract: The bubble regime of the laser wakefield acceleration is one of the most recent and promising mechanisms for generating quasi-monoenergetic electron beams. In this work, we propose to study the dynamics of bubble (a wake structure devoid of electrons created in underdense plasma by a highly-intense ultrashort laser pulse) in a petawatt regime. The dependence of the electron beam energy and the quality of the electron beam on the shape of the bubble is the main motivation behind this work. The bubble length as well as bubble shape have been investigated using two-dimensional particle-in-cell simulations. The evolution of the bubble with time, and the correlation of bubble length (longitudinal and transverse radius) with the intensity of laser pulse have been revealed in this study. The change of bubble dimensions can be estimated by various determining factors such as the laser pulse focusing, the beam loading, the residual electrons, and the bubble velocity. It has also been confirmed that the shape of the bubble cannot be predicted using fixed shape models as spherical or elliptical. Simulations unveil that as the bubble traverses in plasma, it evolves from spherical shape to the highly elliptical shape. And, as it approaches the dephasing length, the eccentricity decreases further. Consequently, the self-injection of plasma electrons in the bubble is seriously affected by the bubble evolution. Comparison of the electron energy gain at different intensities of laser pulse has also been provided. Various scaling laws for electron beam energy estimations are predicted in this investigation. High quality electron beam can be obtained by controlling the bubble evolution, which may have significant applications in future coherent light sources, biomedical, condensed matter physics, and x-ray generation by table-top FEL.

For details refer to <https://doi.org/10.1088/1612-202X/ab8fa9>

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BIOGRAPHY

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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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. R. Ranga, **Y. Kalra** and K. Kishor, “Petal shaped nanoantenna for solar energy harvesting”, *Journal of Optics*, vol. 22, no. 3, pp. 035001, 2020. Impact Factor: 2.379.

Petal shaped nanoantenna for solar energy harvesting

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

Abstract: In this article, a petal shaped nanoantenna has been designed and studied for radiation efficiency and harvesting efficiency (HE). Various geometrical parameters, such as the length, the width, the height and the gap of the nanoantenna have been varied to find their effect on the radiation efficiency and the HE. Additionally, the significance of the material of the nanoantenna has also been studied by choosing four different types of materials, and their corresponding radiation efficiency, HE and electric field enhancement have been reported.

For details refer to <https://iopscience.iop.org/article/10.1088/2040-8986/ab6ae5>

**Corresponding Author*



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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **A. Kalsi**, S. M. Celin and J. G. Sharma, “Aerobic biodegradation of high explosive hexahydro-1,3,5- trinitro-1,3,5-triazine by *Janibacter cremeus* isolated from contaminated soil”, *Biotechnology Letters*, vol. 42, no. 11, pp. 2299–2307, 2020. Impact Factor: 1.977.
2. **A. Kalsi**, S. M. Celin, P. Bhanot, S. Sahai and J. G. Sharma, “Microbial remediation approaches for explosive contaminated soil: Critical assessment of available technologies, recent innovations and future prospects”, *Environmental Technology and Innovation*, vol. 18, pp. 100721, 2020. Impact Factor: 3.356.

Aerobic biodegradation of high explosive hexahydro-1,3,5- trinitro-1,3,5-triazine by *Janibacter cremeus* isolated from contaminated soil

Anchita Kalsi, S. Mary Celin and Jai Gopal Sharma

Abstract: Objective: To evaluate the ability of *Janibacter cremeus* a soil bacterium isolated from explosive contaminated site in degradation of hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) and to study enzyme responsible for degradation.

Results: The isolate exhibited 88% degradation of RDX in 30 days of incubation. The biodegradation process followed the first order kinetics. The half- life of RDX was calculated to be 11.088 days. The RDX degradation process was complemented by concomitant release of nitrite ions with 0.78 mol of nitrite released per mole of RDX. The metabolites; Trinitroso- RDX, diamino-RDX, trimino-RDX, bis- (hydroxymethyl) nitramine and methylenedintramine derivative, viz, methylene- *N*-(hydroxy- methyl)- hydroxylamine- *N*-(hydroxymethyl) nitroamine corresponding to the molecular weights 174, 162, 132, 122 and 167 Da respectively were also detected. Nitroreductase enzyme was found to be responsible for RDX degradation.

Conclusion: *J. cremeus* could degrade RDX as sole source of nitrogen, via three different pathways wherein, Nitroreductase enzyme was found to play a major role. The efficient degradation of RDX makes *J. cremeus* suitable in treatment of contaminated water and soil at field scale levels.

For details refer to <https://doi.org/10.1007/s10529-020-02946-6>

Microbial remediation approaches for explosive contaminated soil: Critical assessment of available technologies, recent innovations and future prospects

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

Abstract: Soils contaminated with explosives are a major threat to the environment. Explosives in soil can migrate to the ground water leading to harmful effects to human life and the environment. Several technologies have been proposed for the remediation of explosive contaminated soil, including, physical, chemical and biological methods. Physical and chemical treatment technologies, though fast, suffer from a major drawback of being environmentally unsafe. Hence, with environment in center stage, biological treatment methods have gained importance. Microbial remediation, a type of biological treatment technology plays a major role in bioremediation of explosive contaminated sites. Microbes, being ubiquitous find application in various forms to serve the purpose of remediation. This review critically assesses the various microbial treatment technologies, both in situ and ex situ available for remediation of explosive contaminated soil. Also, it discusses the environmental impact of these technologies along with the various emerging trends in the field of microbial remediation in the past decade. And finally, we explore the future prospects of microbial remediation that can provide a sustainable solution for soil explosive contamination.

For details refer to <https://doi.org/10.1016/j.eti.2020.100721>



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Dr. Asmita Das completed her PhD in Immunology from Jawaharlal Nehru University, New Delhi, India and thereafter did postdoctoral research in the Laboratory of Immunogenetics in National Institute of Allergy and Infectious Diseases (NIAID) at National Institutes of Health (NIH) for 5 years. She has been engaged in extensive research in NK cell development and NK receptor modulation and signaling. Her research focus is on combinatorial immunotherapy for cancer and immunodiagnostics. She is also involved in research in immune-informatics and genomics with special thrust on theranostics. Apart from her core area of research, she is also engaged in multi-institution interdisciplinary research with IIT Delhi in the field of Computational Fluid Dynamics in Immune complex diagnostics, with AIIMS in tumor microenvironment studies and with JNU in a project on nanoparticle mediated drug delivery system development. Her research work in autophagy and NK receptor signaling has generated several high impact publications like 11.1(Autophagy), 21(Immunity) and many others.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. K. Bhatia, Bhumika and **A. Das**, “Combinatorial drug therapy in cancer - New insights”, *Life Sciences*, vol. 258, pp. 118134, 2020. Impact Factor: 3.647.

Combinatorial drug therapy in cancer - New insights

Karanpreet Bhatia, Bhumika and **Asmita Das***

Abstract: Cancer can arise due to mutations in numerous pathways present in our body and thus has many alternatives for getting aggravated. Due to this attribute, it gets difficult to treat cancer patients with monotherapy alone and has a risk of not being eliminated to the full extent. This necessitates the introduction of combinatorial therapy as it employs cancer treatment using more than one method and shows a greater success rate. Combinatorial therapy involves a complementary combination of two different therapies like a combination of radio and immunotherapy or a combination of drugs that can target more than one pathway of cancer formation like combining CDK targeting drugs with Growth factors targeting drugs. In this review, we discuss the various aspects of cancer which include, its causes; four regulatory mechanisms namely: apoptosis, cyclin-dependent kinases, tumor suppressor genes, and growth factors; some of the pathways involved; treatment: monotherapy and combinatorial therapy and combinatorial drug formulation in chemotherapy. The present review gives a holistic account of the different mechanisms of therapies and also drug combinations that may serve to not only complement the monotherapy but can also surpass the resistance against monotherapy agents.

For details refer to <https://doi.org/10.1016/j.lfs.2020.118134>

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BIOGRAPHY

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Prof. Bansi D. Malhotra received the Ph.D. degree from the University of Delhi, New Delhi, in 1980. He is currently an 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 coauthored text books *Nanomaterials for Biosensors: Fundamentals and Applications* and *Biosensors: Fundamentals and Applications*. His current research activities include nanobiomaterials, biosensors, bio-fuel cells, ordered molecular assemblies, conducting polymers, Langmuir–Blodgett films, self-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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. S. Solanki, C. M. Pandey, R. K. Gupta and **B. D. Malhotra**, “Emerging trends in microfluidics based devices”, *Biotechnology Journal*, vol. 15, no. 5, pp. 1900279, 2020. Impact Factor: 3.912.
2. S. Nara, R. Kandpal, V. Jaiswal, S. Augustine, S. Wahie, J. G. Sharma, R. Takeuchi, S. Takenaka and **B. D. Malhotra**, “Exploring *Providencia rettgeri* for application to eco-friendly paper based microbial fuel cell”, *Biosensors and Bioelectronics*, vol. 165, pp. 112323, 2020. Impact Factor: 10.257.
3. S. S. Sandhu, S. Kumar, S. Augustine, U. Saha, K. Arora, S. Bayan, S. K. Ray, N. K. Puri and **Bansi D. Malhotra**, “Nanoengineered Conductive Polyaniline Enabled Sensor for Sensitive Humidity Detection”, *IEEE Sensors Journal*, vol. 20, no. 21, pp. 12574-12581, 2020. Impact Factor: 3.073.

Emerging trends in microfluidics based devices

Shipra Solanki, Chandra M Pandey, Rajinder K Gupta and **Bansi D Malhotra***

Abstract: One of the major challenges for scientists and engineers today is to develop technologies for the improvement of human health in both developed and developing countries. However, the need for cost-effective, high-performance diagnostic techniques is very crucial for providing accessible, affordable, and high-quality healthcare devices. In this context, microfluidic-based devices (MFDs) offer powerful platforms for automation and integration of complex tasks onto a single chip. The distinct advantage of MFDs lies in precise control of the sample quantities and flow rate of samples and reagents that enable quantification and detection of analytes with high resolution and sensitivity. With these excellent properties, microfluidics (MFs) have been used for various applications in healthcare, along with other biological and medical areas. This review focuses on the emerging demands of MFs in different fields such as biomedical diagnostics, environmental analysis, food and agriculture research, etc., in the last three or so years. It also aims to reveal new opportunities in these areas and future prospects of commercial MFDs.

For details refer to <https://doi.org/10.1002/biot.201900279>

Exploring *Providencia rettgeri* for application to eco-friendly paper based microbial fuel cell

Sharda Nara, Rahul Kandpal, Veeru Jaiswal, Shine Augustine, Srishti Wahie, Jai Gopal Sharma, Ryusuke Takeuchi, Shigeori Takenaka and **Bansi Dhar Malhotra***

Abstract: We report results of the studies relating to improved stability (40 days) of small sized microbial fuel cell (MFC) fabricated using agarose embedded paper-based proton exchange membrane. A fermentative bacterium *Providencia rettgeri* was isolated from rotten potato slurry and identified by 16S rRNA sequencing. The electroactivity of the bacteria was monitored *via* chronoamperometric and cyclic voltammetric studies using a three-electrode system which indicated the presence of bacterial redox mediator. The Matrix-Assisted Laser Desorption/Ionization-Time of Flight (MALDI-TOF) and UV-Vis absorption spectroscopy provided the evidence that *Providencia rettgeri* synthesized folate (vitamin B₉) during fermentation that was found to act for the first time as a redox mediator in an MFC. The paper based designed MFC fed with *Providencia rettgeri* yielded open circuit voltage of 787.9 mV with power and current density of 5.02 W/m³ and 11.26 A/m³, respectively when measured across 10 kΩ. The microbial re-chargeable battery comprising of an assembly of parallelly aligned four units of MFCs when connected in series (total 16 MFCs), generated 1.5 V that was used for powering a red-light emitting device (LED).

For details refer to <https://doi.org/10.1016/j.bios.2020.112323>

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Nanoengineered Conductive Polyaniline Enabled Sensor for Sensitive Humidity Detection

Samar S. Sandhu, Saurabh Kumar, Shine Augustine, Udiptya Saha, Kamal Arora, Sayan Bayan, Samit K. Ray, Nitin K. Puri and **Bansi D. Malhotra***

Abstract: We report results of the studies relating to the fabrication of a paper-based humidity sensing element comprising a nanostructured polyaniline (PANI) coating on a filter paper substrate. The electrical conductivity of the PANI integrated conductive paper increases from $1.9 \times 10^{-6} \text{ Scm}^{-1}$ to $1.1 \times 10^{-1} \text{ Scm}^{-1}$ on modification of the polymerization protocol. This increase in conductivity is ascribed to the change in morphology of the PANI coating from nanogranular (N_g) to partially nanofibrous (pN_f). We investigate the effect of observed morphologies of PANI-paper composites on their resistive-type humidity sensing performances. The partially nanofibrous (pN_f) PANI-paper exhibits a bimodal humidity response due to polymer-swelling effect at higher humidity ($\geq 55\% \text{ RH}$). However, the nanogranular (N_g) PANI-paper yields a unimodal, linear humidity response within the humidity range, 16-96.2% RH, with a sensitivity of $9.79 \text{ k}\Omega/\% \text{ RH}$ ($R^2 \approx 0.996$). Hence, the N_g PANI-paper is a promising alternative to the conventional humidity sensors fabricated on ITO glass/bare glass/PET substrates.

For details refer to <https://doi.org/10.1109/JSEN.2020.3001599>

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Ms. Dia Advani is a PhD research scholar in the Department of Biotechnology at Delhi Technological University. Her research interest is repurposing of anticancer drugs for therapeutic implication in neurodegenerative disorders. Dia has qualified CSIR national eligibility test (NET) and receiving her fellowship from Department of Biotechnology, Govt. of India as a JRF. She has passed her Bachelor's and Master's degrees from Jai Narain Vyas University, Rajasthan.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **D. Advani**, R. Gupta, R. Tripathi, S. Sharma, R. K. Ambasta and P. Kumar, "Protective role of anticancer drugs in neurodegenerative disorders: A drug repurposing approach", *Neurochemistry International*, vol. 140, pp. 104841, 2020. Impact Factor: 3.881.

Protective role of anticancer drugs in neurodegenerative disorders: A drug repurposing approach

Dia Advani, Rohan Gupta, Rahul Tripathi, Sudhanshu Sharma, Rashmi K. Ambasta and Pravir Kumar

Abstract: The disease heterogeneity and little therapeutic progress in neurodegenerative diseases justify the need for novel and effective drug discovery approaches. Drug repurposing is an emerging approach that reinvigorates the classical drug discovery method by divulging new therapeutic uses of existing drugs. The common biological background and inverse tuning between cancer and neurodegeneration give weight to the conceptualization of repurposing of anticancer drugs as novel therapeutics. Many studies are available in the literature, which highlights the success story of anticancer drugs as repurposed therapeutics. Among them, kinase inhibitors, developed for various oncology indications evinced notable neuroprotective effects in neurodegenerative diseases. In this review, we shed light on the salient role of multiple protein kinases in neurodegenerative disorders. We also proposed a feasible explanation of the action of kinase inhibitors in neurodegenerative disorders with more attention towards neurodegenerative disorders. The problem of neurotoxicity associated with some anticancer drugs is also highlighted. Our review encourages further research to better encode the hidden potential of anticancer drugs with the aim of developing prospective repurposed drugs with no toxicity for neurodegenerative disorders.

For details refer to <https://doi.org/10.1016/j.neuint.2020.104841>



MS. NEERAJ KUMARI
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Neeraj Kumari has completed PhD in Department of Biotechnology at Delhi Technological University from July 2014 to September 2020. She has completed M.Sc. in Biotechnology from Dr. Bhim Rao Ambedkar University, Agra, India in June 2012. She has completed B.Sc. in Biotechnology (Hons.) from Dr. Bhim Rao Ambedkar University, Agra, India in 2010.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **N. Kumari**, A. Das and A. N. Bhatt, “Interleukin-6 confers radio-resistance by inducing Akt-mediated glycolysis and reducing mitochondrial damage in cells”, *The Journal of Biochemistry*, vol. 167, no. 3, pp. 303–314, 2020. Impact Factor: 2.476.

Interleukin-6 confers radio-resistance by inducing Akt-mediated glycolysis and reducing mitochondrial damage in cells

Neeraj Kumari, Asmita Das and Anant Narayan Bhatt

Abstract: Interleukin-6 (IL-6)-induced glycolysis and therapeutic resistance is reported in some cell systems; however, the mechanism of IL-6-induced glycolysis in radio-resistance is unexplored. Therefore, to investigate, we treated Raw264.7 cells with IL-6 (1 h prior to irradiation) and examined the glycolytic flux. Increased expression of mRNA and protein levels of key glycolytic enzymes was observed after IL-6 treatment, which conferred glycolysis dependent resistance from radiation-induced cell death. We further established that IL-6-induced glycolysis is activated by Akt signalling and knocking down Akt or inhibition of pan Akt phosphorylation significantly abrogated the IL-6-induced radio-resistance. Moreover, reduction of IL-6-induced pAkt level suppressed the expression of Hexokinase-2 and its translocation to the mitochondria, thereby inhibiting the glycolysis-induced resistance to radiation. IL-6-induced glycolysis also minimized the radiation-induced mitochondrial damage. These results suggest that IL-6-induced glycolysis observed in cells may be responsible for IL-6-mediated therapeutic radio-resistance in cancer cells, partly by activation of Akt signalling.

For details refer to <https://doi.org/10.1093/jb/mvz091>



PROF. PRAVIR KUMAR
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Dr. Pravir Kumar is working as Professor and Head in the Department of Biotechnology at DTU. He has also served as a Dean Alumni Affairs. Before joining DTU, Dr. Kumar has served as an Associate Professor (Biosciences) and Assistant Director (Center) at VIT University, Vellore. He has obtained MS degree from BHU, Varanasi with Molecular and clinical genetics specialization, and PhD degree from J. W. Goethe University, Germany in the field of coronary artery diseases and cardiovascular physiology. Before returning to India, he has spent several years in the Neurology Department at Tufts University School of Medicine, Boston, USA as a postdoctoral fellow and later at faculty position. Until April 2016, he was holding an adjunct Faculty status in the Neurology Department at Tufts University School of Medicine (TUSM). His areas of research interest and expertise include molecular chaperone and ubiquitin E3 ligase in neurodegenerative disorders along with the aberrant cell cycle re-entry into aged neurons and muscles.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	05

1. I. Bisht, R. K. Ambasta and **P. Kumar**, “An integrated approach to unravel a putative crosstalk network in alzheimer’s disease and parkinson’s disease”, *Neuropeptides*, vol. 83, pp. 102078, 2020. Impact Factor: 2.411.
2. D. Kumar, R. K. Ambasta and **P. Kumar**, “Ubiquitin biology in neurodegenerative disorders: From impairment to therapeutic strategies”, *Ageing Research Reviews*, vol. 61, pp. 101078, 2020. Impact Factor: 10.616.
3. D. Advani, R. Gupta, R. Tripathi, S. Sharma, R. K. Ambasta and **P. Kumar**, “Protective role of anticancer drugs in neurodegenerative disorders: A drug repurposing approach”, *Neurochemistry International*, vol. 140, pp. 104841, 2020. Impact Factor: 3.881.
4. R. Gupta, R. K. Ambasta and **P. Kumar**, “Identification of novel class I and class IIb histone deacetylase inhibitor for alzheimer’s disease therapeutics”, *Life Sciences*, vol. 256, pp. 117912, 2020. Impact Factor: 3.647.
5. R. Gupta, R. K. Ambasta and **P. Kumar**, “Pharmacological intervention of histone deacetylase enzymes in the neurodegenerative disorders”, *Life Sciences*, vol. 243, 117278, 2020. Impact Factor: 3.647.

An integrated approach to unravel a putative crosstalk network in alzheimer's disease and parkinson's disease

Indu Bisht, Rashmi K. Ambasta and **Pravir Kumar***

Abstract: Integration of multiple profiling data and construction of functional regulatory networks provide a powerful approach to uncover functional relationships and significant molecular entities from transcriptomic data, highlighting the molecular mechanisms of complex diseases. Despite having an overlap in the neuropathologies of AD and PD, the molecular entities overlapped and mechanisms behind them are less known. Here we used an integrated strategy to analyze miRNA and gene transcriptomic data to understand the role of miRNAs and genes in regulatory activities taking place in cells, and find transcriptomic signatures linking AD and PD. We preprocessed and analyzed publicly available microarray datasets and identified 97 DEGs and 21 DE miRs that may be involved in the overlapped mechanisms between these two disorders. Among the DEGs, we found HSPA9, PGK1, SDHC, FH, DLD, YWHAZ and ACLY as the major protein-coding genes involved in the crosstalk for AD-PD pathogenesis. Further we integrated these DEGs and DE miRs with regulatory TFs to construct an overlapped dysregulated network of AD and PD. In the network, miR-27a-3p, miR-148a-3p and miR-15a-5p were found to be the most relevant with maximum interactions, describing their significance in the potential crosstalk. We also looked into the dysregulated biological processes and pathways overlapped in AD and PD. In conclusion, we highlighted the DEGs, DE miRs, their interactions and related pathways overlapped in AD and PD pathogenesis, also describing a potential crosstalk at molecular level. Besides, our findings can further be used for molecular studies to reveal an assured AD-PD crosstalk.

For details refer to <https://doi.org/10.1016/j.npep.2020.102078>

**Corresponding Author*

Ubiquitin biology in neurodegenerative disorders: From impairment to therapeutic strategies

Dhiraj Kumar, Rashmi K. Ambasta and **Pravir Kumar***

Abstract: The abnormal accumulation of neurotoxic proteins is the typical hallmark of various age-related neurodegenerative disorders (NDDs), including Alzheimer's disease, Parkinson's disease, Huntington's disease, Amyotrophic lateral sclerosis and Multiple sclerosis. The anomalous proteins, such as $A\beta$, Tau in Alzheimer's disease and α -synuclein in Parkinson's disease, perturb the neuronal physiology and cellular homeostasis in the brain thereby affecting the millions of human lives across the globe. Here, ubiquitin proteasome system (UPS) plays a decisive role in clearing the toxic metabolites in cells, where any aberrancy is widely reported to exaggerate the neurodegenerative pathologies. In spite of well-advancement in the ubiquitination research, their molecular markers and mechanisms for target-specific protein ubiquitination and clearance remained elusive. Therefore, this review substantiates the role of UPS in the brain signaling and neuronal physiology with their mechanistic role in the NDD's specific pathogenic protein clearance. Moreover, current and future promising therapies are discussed to target UPS-mediated neurodegeneration for better public health.

For details refer to <https://doi.org/10.1016/j.arr.2020.101078>

Protective role of anticancer drugs in neurodegenerative disorders: A drug repurposing approach

Dia Advani, Rohan Gupta, Rahul Tripathi, Sudhanshu Sharma, Rashmi K.Ambasta and **Pravir Kumar***

Abstract: The disease heterogeneity and little therapeutic progress in neurodegenerative diseases justify the need for novel and effective drug discovery approaches. Drug repurposing is an emerging approach that reinvigorates the classical drug discovery method by divulging new therapeutic uses of existing drugs. The common biological background and inverse tuning between cancer and neurodegeneration give weight to the conceptualization of repurposing of anticancer drugs as novel therapeutics. Many studies are available in the literature, which highlights the success story of anticancer drugs as repurposed therapeutics. Among them, kinase inhibitors, developed for various oncology indications evinced notable neuroprotective effects in neurodegenerative diseases. In this review, we shed light on the salient role of multiple protein kinases in neurodegenerative disorders. We also proposed a feasible explanation of the action of kinase inhibitors in neurodegenerative disorders with more attention towards neurodegenerative disorders. The problem of neurotoxicity associated with some anticancer drugs is also highlighted. Our review encourages further research to better encode the hidden potential of anticancer drugs with the aim of developing prospective repurposed drugs with no toxicity for neurodegenerative disorders.

For details refer to <https://doi.org/10.1016/j.neuint.2020.104841>

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Identification of novel class I and class IIb histone deacetylase inhibitor for alzheimer's disease therapeutics

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

Abstract: Histone deacetylase enzymes were prominent chromatin remodeling drug that targets in the pathophysiology of Alzheimer's disease associated with transcriptional dysregulation. *In vitro* and *in vivo* models of AD have demonstrated overexpression of HDAC activity. Non-specificity and non-selectivity of HDAC are the major problems of existing HDAC inhibitors. Hence, we aim to set up a methodology describing the rational development of isoform-selective HDAC inhibitor targeting class, I and class IIb. A convenient multistage virtual screening followed by machine learning and IC_{50} screenings were used to classify the 5064 compounds into inhibitors and non-inhibitors classes retrieved from the ChEMBL database. ADMET analysis identified the pharmacokinetics and pharmacodynamics properties of selected compounds. Molecular docking, along with mutational analysis of eleven compounds, characterized the inhibiting potency. Herein, for the first time, we reported ChEMBL1834473 (2-[[5-(4-chlorophenyl)-1,3,4-thiadiazol-2-yl] amino]-N-hydroxypyrimidine-5-carboxamide) as the isoform-selective HDAC inhibitor, which interact central Zn^{2+} atom. The negative energy and interacting residue of the ChEMBL1834473 with six HDAC isoform has also been tabulated and mapped. Moreover, our findings concluded histidine, glycine, phenylalanine, and aspartic acid as key residues in protein-ligand interaction and classify 2347 compounds as HDAC inhibitors. Later, a protein-protein interaction network of six HDAC with the key proteins involved in the progression of an AD and signaling pathway, which describes the relationship between ChEMBL1834473 and AD, has been demonstrated using PPI network where the chosen inhibitor will work. Altogether, we conclude that the compound ChEMBL1834473 may be capable of inhibiting all isoforms of class I and class IIb HDAC based on computational analysis for AD therapeutics.

For details refer to <https://doi.org/10.1016/j.lfs.2020.117912>

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Pharmacological intervention of histone deacetylase enzymes in the neurodegenerative disorders+

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

Abstract: Reversal of aging symptoms and related disorders are the challenging task where epigenetic is a crucial player that includes DNA methylation, histone modification; chromatin remodeling and regulation that are linked to the progression of various neurodegenerative disorders (NDDs). Overexpression of various histone deacetylase (HDACs) can activate Glycogen synthase kinase 3 which promotes the hyperphosphorylation of tau and inhibits its degradation. While HDAC is important for maintaining the neuronal morphology and brain homeostasis, at the same time, these enzymes are promoting neurodegeneration, if it is deregulated. Different experimental models have also confirmed the neuroprotective effects caused by HDAC enzymes through the regulation of neuronal apoptosis, inflammatory response, DNA damage, cell cycle regulation, and metabolic dysfunction. Apart from transcriptional regulation, protein-protein interaction, histone post-translational modifications, deacetylation mechanism of non-histone protein and direct association with disease proteins have been linked to neuronal imbalance. Histone deacetylases inhibitors (HDACi) can be able to alter gene expression and shown its efficacy on experimental models, and in clinical trials for NDD's and found to be a very promising therapeutic agent with certain limitation, for instance, non-specific target effect, isoform-selectivity, specificity, and limited number of predicted biomarkers.

Herein, we discussed (i) the catalytic mechanism of the deacetylation process of various HDAC's in in vivo and in vitro experimental models, (ii) how HDACs are participating in neuroprotection as well as in neurodegeneration, (iii) a comprehensive role of HDACi in maintaining neuronal homeostasis and (iv) therapeutic role of biomolecules to modulate HDACs.

For details refer to <https://doi.org/10.1016/j.lfs.2020.117278>

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+Eligible for Certificate only



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Dr. Rashmi K. Ambasta received her PhD from J.W Goethe University, Frankfurt am Main (Germany) in 2004. After being a postdoctoral fellow at Boston, USA for four years, Dr. Ambasta moved to Vellore Institute of Technology (VIT), Vellore as an Assistant Professor, where she later became Associate Professor in the Department of Biotechnology. Dr. Ambasta also worked as SERB young scientist and CSIR Scientific Pool Officer at Delhi Technological University (DTU) to continue her research passion. She has also worked as Guest Faculty at Delhi Technological University. Besides research and teaching she is also an active reviewer of prestigious high impact factor journals, member of several scientific organizations like SBTI, SNCI, IACR. She has received awards and certifications like Biomedical writing certification from University of Pennsylvania, USA 2007, Centenary RA fellowship from IISC Bangalore, India 2007, SERB Young Scientist 2012, Elsevier TIV Outstanding Reviewer certification 2017, Commendable Research Award from DTU 2017 and 2019. Her current and future research interest involves drug screening for diseases like cancer, diabetes, neurodegenerative disorder. Dr. Ambasta has co-authored six book chapters, more than fifty research and review article with cumulative citation of 1619 and h index 19.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **R. K. Ambasta**, K. Adeshara, S. Yadav, and P. Kumar, “VEGF/CDK2 are involved in diabetic organ regeneration”, *Biochemical and Biophysical Research Communications*, vol. 529, no. 4, pp. 1094-1100, 2020. Impact Factor: 2.985.

VEGF/CDK2 are involved in diabetic organ regeneration

Rashmi K. Ambasta, Krishna Adeshara, Shivangi Yadav, and Pravir Kumar

Abstract: *Aim/Hypothesis:* Diabetes is a hyperglycaemic disease treated by a set of allopathic drugs and natural biomolecules along with many variety of stem cell. We aim to investigate the role of these drugs in targeting common protein molecule in diabetes and its associated disease. We also aim to investigate the organ degeneration mechanistic pathway in diabetes.

Method: We have generated diabetes using streptozotocin injection and treated them using bone marrow transplantation and curcumin administration. The organs were studied histopathologically and by immunofluorescence analysis while drugs were studied Pharmacogenomically.

Result: Mice injected with streptozotocin have higher glucose and lower insulin, islet number/diameter, bone marrow cell number compared to control and bone marrow transplanted and curcumin administered mice. Histopathology staining demonstrates damaged morphology of pancreas, kidney, brain and cardiac muscle. Further, upon comparison of all allopathic and ayurvedic drugs used for diabetes several protein targets have been identified by reverse pharmacophore analysis using PharmMapper. VEGF, CDK2, insulin receptor, HSp90, eNOS, Fructose1,6 bisphosphatase, neprilysin, AchE, MAPK are several common protein targets of anti-diabetic drugs.

Conclusion: This article demonstrates that VEGF and CDK2 are critical marker in organ damage in diabetes as well as organ regeneration.

For details refer to <https://doi.org/10.1016/j.bbrc.2020.07.014>



MR. ROHAN GUPTA
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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 B.Tech from Dr. B. R. Ambedkar National Institute of Technology, Jalandhar, Punjab and M.Tech from Delhi Technological University, Delhi. He is GATE qualified and receiving fellowship from DTU-JRF.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **R. Gupta**, R. K. Ambasta and P. Kumar, “Identification of novel class I and class IIb histone deacetylase inhibitor for alzheimer’s disease therapeutics”, *Life Sciences*, vol. 256, pp. 117912, 2020. Impact Factor: 3.647.
2. **R. Gupta**, R. K. Ambasta and P. Kumar, “Pharmacological intervention of histone deacetylase enzymes in the neurodegenerative disorders”, *Life Sciences*, vol. 243, pp. 117278, 2020. Impact Factor: 3.647.

Identification of novel class I and class IIb histone deacetylase inhibitor for Alzheimer's disease therapeutics

Rohan Gupta, Rashmi K. Ambasta and Pravir Kumar

Abstract: Histone deacetylase enzymes were prominent chromatin remodeling drug that targets in the pathophysiology of Alzheimer's disease associated with transcriptional dysregulation. In vitro and in vivo models of AD have demonstrated overexpression of HDAC activity. Non-specificity and non-selectivity of HDAC are the major problems of existing HDAC inhibitors. Hence, we aim to set up a methodology describing the rational development of isoform-selective HDAC inhibitor targeting class, I and class IIb. A convenient multistage virtual screening followed by machine learning and IC₅₀ screenings were used to classify the 5064 compounds into inhibitors and non-inhibitors classes retrieved from the ChEMBL database. ADMET analysis identified the pharmacokinetics and pharmacodynamics properties of selected compounds. Molecular docking, along with mutational analysis of eleven compounds, characterized the inhibiting potency. Herein, for the first time, we reported ChEMBL1834473 (2-[[5-(4-chlorophenyl)-1,3,4-thiadiazol-2-yl]amino]-N-hydroxypyrimidine-5-carboxamide) as the isoform-selective HDAC inhibitor, which interact central Zn²⁺ atom. The negative energy and interacting residue of the ChEMBL1834473 with six HDAC isoform has also been tabulated and mapped. Moreover, our findings concluded histidine, glycine, phenylalanine, and aspartic acid as key residues in protein-ligand interaction and classify 2347 compounds as HDAC inhibitors. Later, a protein-protein interaction network of six HDAC with the key proteins involved in the progression of an AD and signaling pathway, which describes the relationship between ChEMBL1834473 and AD, has been demonstrated using PPI network where the chosen inhibitor will work. Altogether, we conclude that the compound ChEMBL1834473 may be capable of inhibiting all isoforms of class I and class IIb HDAC based on computational analysis for AD therapeutics.

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Pharmacological intervention of histone deacetylase enzymes in the neurodegenerative disorders

Rohan Gupta, Rashmi K. Ambasta and Pravir Kumar

Abstract: Reversal of aging symptoms and related disorders are the challenging task where epigenetic is a crucial player that includes DNA methylation, histone modification; chromatin remodeling and regulation that are linked to the progression of various neurodegenerative disorders (NDDs). Overexpression of various histone deacetylase (HDACs) can activate Glycogen synthase kinase 3 which promotes the hyperphosphorylation of tau and inhibits its degradation. While HDAC is important for maintaining the neuronal morphology and brain homeostasis, at the same time, these enzymes are promoting neurodegeneration, if it is deregulated. Different experimental models have also confirmed the neuroprotective effects caused by HDAC enzymes through the regulation of neuronal apoptosis, inflammatory response, DNA damage, cell cycle regulation, and metabolic dysfunction. Apart from transcriptional regulation, protein-protein interaction, histone post-translational modifications, deacetylation mechanism of non-histone protein and direct association with disease proteins have been linked to neuronal imbalance. Histone deacetylases inhibitors (HDACi) can be able to alter gene expression and shown its efficacy on experimental models, and in clinical trials for NDD's and found to be a very promising therapeutic agent with certain limitation, for instance, non-specific target effect, isoform-selectivity, specificity, and limited number of predicted biomarkers.

Herein, we discussed (i) the catalytic mechanism of the deacetylation process of various HDAC's in in vivo and in vitro experimental models, (ii) how HDACs are participating in neuroprotection as well as in neurodegeneration, (iii) a comprehensive role of HDACi in maintaining neuronal homeostasis and (iv) therapeutic role of biomolecules to modulate HDACs.

For details refer to <https://doi.org/10.1016/j.lfs.2020.117278>



BIOGRAPHY

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Mr. Saksham Garg is a third year B.Tech student in Department of Biotechnology at Delhi Technological University. His areas of research include various areas of biological sciences including cancer biology, virology and immunology and possesses an aptitude for the same.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Garg** and A. Roy, “In silico analysis of selected alkaloids against main protease (M^{pro}) of SARS-CoV-2”, *Chemico-Biological Interactions*, vol. 332, pp. 109309, 2020. Impact Factor: 3.723.

In silico analysis of selected alkaloids against main protease (M^{pro}) of SARS-CoV-2

Saksham Garg and Arpita Roy

Abstract: In the present situation, COVID-19 has become the global health concern due to its high contagious nature. It initially appeared in December 2019 in Wuhan, China and now affected more than 190 countries. As of now preventive measures are the sole solution to stop this disease for further transmission from person to person transmissions as there is no effective treatment or vaccine available to date. Research and development of new molecule is a laborious process; therefore, drug repurposing can be an alternative solution that involves the identification of potential compounds from the already available data. Alkaloids are potential source of therapeutic agents which might be able to treat novel COVID-19. Therefore, in the present study, twenty potential alkaloid molecules that possess antiviral activity against different viral diseases have taken into consideration and scrutinized using Lipinski’s rule. Then out of twenty compounds seventeen were further selected for docking study. Docking study was performed using Autodock software and the best four molecule which provides maximum negative binding energy was selected for further analysis. Two alkaloids namely thalimonine and sophaline D showed potential activity to inhibit the M^{pro} but to confirm the claim further in-vitro studies are required.

For details refer to <https://doi.org/10.1016/j.cbi.2020.109309>



DR. SHILPI

Department of Biotechnology

Dr. Shilpi is currently working in Panjab University, Chandigarh. She was a research scholar in Delhi Technological University from 2013-2018 and was awarded Ph.D in Biotechnology in May 2018. She holds a Master degree in Food Engineering and Technology and has a diverse & rich experience in academic as well as research. Her research interests include environment and food microbiology, food waste management, food quality management, optimization, modelling and simulation.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Ahluwalia**, R. Bidlan, A. K. Shrivastav, R. K. Goswami, P. Singh and J. G. Sharma, "Optimization of protein extraction from detoxified Jatropha seed cake using response surface methodology and amino acid analysis", *International Journal of Environmental Science and Technology*, vol. 17, no. 2, pp. 1087–1100, 2020. Impact Factor: 2.540.

Optimization of protein extraction from detoxified *Jatropha* seed cake using response surface methodology and amino acid analysis

S. Ahluwalia, R. Bidlan, A. K. Shrivastav, R. K. Goswami, P. Singh and J. G. Sharma

Abstract: *Jatropha* seed cake is a by-product of biodiesel industry which is rich in proteins and carbohydrates and contains many bioactive compounds. Besides having a good protein quality, the essential amino acid content (except lysine) is also high in *Jatropha* seed cake, and therefore, *Jatropha* proteins can be exploited for many technical applications. The major hindrance for its use as a protein supplement is the presence of anti-nutritional factors and toxins, especially the phorbol esters. The detoxification of *Jatropha* seed cake for the removal of phorbol esters has been shown in our earlier studies. Proteins were extracted from the detoxified *Jatropha* seed cake and analyzed for amino acid content. Various parameters such as temperature, solubilization pH, precipitation pH and extraction time were studied for their effect on protein content, and the process was optimized using response surface methodology among 5 best samples selected based on protein content and protein yield from dry concentrates. The amount of dry matter, protein content and protein yield of 17.1%, 41.98% and 38.66%, respectively, was obtained under the optimized conditions of 60 °C temperature, solubilization pH 11.0, precipitation pH 4.41 and extraction time of 0.78 h. Amino acid contents revealed that the extracted samples contained a higher concentration of essential amino acids, especially leucine (4.40 ± 0.98 g/100 g). The results indicated that the protein extraction procedure from *Jatropha* seed cake affected the amino acid content, yet the values were close to FAO/WHO reference protein, and thus, the *Jatropha* proteins can be explored further for their use as feed supplement.

For details refer to <https://doi.org/10.1007/s13762-019-02340-4>



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Department of Biotechnology

Dr. Yasha Hasija is currently working as Associate Professor, Department of Biotechnology and Associate Dean (Alumni Affairs) at Delhi Technological University. She has published more than 50 research articles and review papers in national and international journals of high repute, 10 book chapters; and 26 conference papers. She is also on the Editorial Board of numerous international journals. Her work has earned recognition and received several prestigious awards, including the Govt. of India- Department of Science and Technology Award for attending the meeting of Nobel Laureates and Students in Lindau, Germany in 2002; and Human Gene Nomenclature Award at the Human Genome Meeting-2010 held at Montpellier, France. She has also been awarded Commendable Research Award, DTU for three consecutive years- 2018, 2019 and 2020. Her broad areas of research include genome informatics, integration of genome-scale data for systems biology, and machine learning applications in healthcare.

Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01

1. R. Chakraborty and **Y. Hasija**, “Predicting MicroRNA Sequence Using CNN and LSTM Stacked in Seq2Seq Architecture”, *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, vol. 17, no. 6, pp. 2183-2188, 2020. Impact Factor: 3.015.

Predicting MicroRNA Sequence Using CNN and LSTM Stacked in Seq2Seq Architecture

Rajkumar Chakraborty and Yasha Hasija*

Abstract: CNN and LSTM have proven their ability in feature extraction and natural language processing, respectively. So, we tried to use their ability to process the language of RNAs, i.e., predicting sequence of microRNAs using the sequence of mRNA. The idea is to extract the features from sequence of mRNA using CNN and use LSTM network for prediction of miRNA. The model has learned the basic features such as seed match at first 2-8 nucleotides starting at the 5' end and counting toward the 3' end. Also, it was able to predict G-U wobble base pair in seed region. While validating on experimentally validated data, the model was able to predict on average 72 percent of miRNAs for specific mRNA and shows highest positive expression fold change of predicted targets on a microarray data generated using anti 25 miRNAs compare to other predicted tools. Codes are available at <https://github.com/rajkumar1501/sequence-prediction-using-CNN-and-LSTMs>.

For details refer to <https://doi.org/10.1109/TCBB.2019.2936186>

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Dr. Shilpa Pal is working as Associate Professor, Department of Civil Engineering, Delhi Technological University, Delhi. She has done her B.E. (Hons.) from Thapar Institute of Engineering & Technology, Patiala, M.E. (Gold Medalist) in Structural Engineering from Punjab University, Chandigarh and Ph.D. in Earthquake Engineering from IIT Roorkee. Her areas of interest are 2-D & 3-D Seismic Analysis of Dams, Seismic Slope Stability Analysis, Landslide/Seismic Hazard, Vulnerability and Risk Assessment Studies, Application of Soft Computing Techniques in Civil Engineering problems, Damage detection in Buildings, Self-Healing Bacterial concrete. She has published more than 50 research papers in International and National Journals and Conferences. She has guided 03 Ph.D. and 90 M.Tech Dissertations.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Pal**, M. Shariq, H. Abbas, A. K. Pandit and A. Masood, “Strength characteristics and microstructure of hooked-end steel fiber reinforced concrete containing fly ash, bottom ash and their combination”, *Construction and Building Materials*, vol. 247, pp. 118530, 2020. Impact Factor: 4.419.

Strength Characteristics and Microstructure of Hooked-End Steel Fiber Reinforced Concrete containing Fly Ash, Bottom Ash and their combination

Shilpa Pal, M. Shariq, H. Abbas, A. K. Pandit and A. Masood

Abstract: The paper presents the effect of fly ash (FA), bottom ash (BA), and their combination on the age dependent strength characteristics and microstructure of hooked-end steel fiber reinforced concrete (SFRC). High volumes of FA and BA (25% and 50%) were used as partial replacement of cement and fine aggregate, respectively. The fiber volume fractions of 0.5% and 1.5% were used. The compressive and splitting tensile strength of concrete was determined up to 90 days. It is found that the utilization of BA and FA slows down the strength gain but attains strength comparable with plain concrete at later ages, either with or without steel fibers. The increase in strength of fiber reinforced concrete due to the increase in the percentage of steel fibers is affected by the shape of the test specimen with the cylinders giving more enhancement than the cubes. The experimental results are validated with the microstructure analysis by using scanning electron microscopy. Semi-empirical mathematical models are developed for predicting the age-dependent compressive and splitting tensile strength of SFRC.

For details refer to <https://doi.org/10.1016/j.conbuildmat.2020.118530>



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Dr. Abhilasha Sharma is currently working as an Assistant Professor in Department of Computer Science & Engineering at Delhi Technological University, Delhi, India. She has 13 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. She has completed her PhD in Information Technology from Delhi Technological University, Delhi, India. 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 Modeling.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. A. Kumar and **A. Sharma**, "Socio-Sentic framework for sustainable agricultural governance", *Sustainable Computing: Informatics and Systems*, vol. 28, pp. 100274, 2020. Impact Factor: 2.798.

Socio-Sentic framework for sustainable agricultural governance

Akshi Kumar and **Abhilasha Sharma***

Abstract: Livelihood security plays a critical role in strengthening the socio- economic situation of a country. Agriculture is one such sector which is expected to provide a complete array of economic, social, and environmental services. Good governance and management of allied policies at all levels is favorable for long-term sustainability of agricultural sector. The accountability of government is a direct measure of its social responsibility and sustainability. Social media as a powerful online platform reinforces hype and provides opportunities to extract and analyze public opinion about various governmental schemes and policies including the ones related to agriculture. The e-participation platforms such as Twitter offer unparalleled means to intelligently gauge the consensus and orientation of people towards an agricultural policy. Motivated by this, the work presented in this research, proffers a Socio-Sentic framework for sustainable agricultural governance which probes the sentiment polarity of user-content on Twitter pertaining to government policies, specifically agricultural policies. In this intelligent analytic frame-work, supervised machine learning algorithms have been implemented and compared using tweets on an Indian Agricultural Policy launched in 2016, 'Pradhan Mantri Fasal Bima Yojana' (PMFBY). The preliminary results indicate that the adoption of the proposed framework for soliciting and probing citizen feedback for government policy evaluation can lead to a sustainable agricultural development.

For details refer to <https://doi.org/10.1016/j.suscom.2018.08.006>

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DR. AKSHI KUMAR

Department of Computer Science
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Dr. Akshi Kumar is an Assistant Professor in the Department of Computer Science & Engineering at Delhi Technological University (formerly Delhi College of Engineering). She has been with the university for nearly 13 years. She received her Ph.D. in Computer Engineering from Faculty of Technology, University of Delhi in 2011. She is a recipient of “*Commendable Research Award for Excellence in Research*” at Delhi Technological University, 2018, 2019 and “*VIWA Outstanding Women in Engineering (Computer Science & Engineering)*” 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 presented several papers in international conferences and published work in peer-reviewed and science cited journals. Her cumulative research impact factor (IF) is 82.418 with an average IF of 3.434. Her research interests are in the area of artificial intelligence, affective computing, sentiment analysis, natural language understanding and cognitive systems.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	07

1. **A. Kumar** and A. Arora, “An ANFIS-based compatibility scorecard for IoT integration in websites”, *The Journal of Supercomputing*, vol. 76, pp. 2568–2596, 2020. Impact Factor: 2.469.
2. D. K. Jain, **A. Kumar** and V. Sharma, “Tweet recommender model using adaptive neuro-fuzzy inference system”, *Future Generation Computer Systems*, vol. 112, pp. 996-1009, 2020. Impact Factor: 6.125.
3. **A. Kumar**, “Using cognition to resolve duplicacy issues in socially connected healthcare for smart cities”, *Computer Communications, Computer Communications*, vol. 152, pp. 272-281, 2020. Impact Factor: 2.816.
4. **A. Kumar** and K. Srinivasan, W. H. Cheng, A. Y. Zomaya. “Hybrid context enriched deep learning model for fine-grained sentiment analysis in textual and visual semiotic modality social data”, *Information Processing and Management*, vol. 57, no. 1, pp. 102141, 2020. Impact Factor: 4.787.
5. D. K. Jain, **A. Kumar** and G. Garg, “Sarcasm detection in mash-up language using soft-attention based bi-directional LSTM and feature-rich CNN”, *Applied Soft Computing*, vol. 91, pp. 106198, 2020. Impact Factor: 5.472.
6. **A. Kumar** and A. Sharma, “Socio-Sentic framework for sustainable agricultural governance”, *Sustainable Computing: Informatics and Systems*, vol. 28, pp. 100274, 2020. Impact Factor: 2.798.
7. **A. Kumar** and G. Garg, “Systematic literature review on context-based sentiment analysis in social multimedia”, *Multimedia Tools and Applications*, vol. 79, pp. 15349–15380, 2020. Impact Factor: 2.313.

An ANFIS-based compatibility scorecard for IoT integration in websites

Akshi Kumar and Anshika Arora

Abstract: Cyber-physical systems and Internet of Things (IoT) form two different levels of the vertical digital integration. Integration of websites with IoT-connected devices has compelled creation of new web design and development strategies where websites are designed keeping in mind the permutations of smart devices. The design should be seamless across different devices and the website design company or web designer should be well informed and aware of the different considerations for design with IoT interactions. In this work, we expound the effectiveness of IoT integration in website design. To realize an IoT-powered IT ecosystem as an essential technology for improving customer experience, a strength–weakness–opportunity–threat analysis is done. Further, with an intent to apprehend the integration support that an existing GUI front end may provide to a smart device, an ANFIS model is proposed to determine the compatibility of an e-commerce website for integration with IoT devices. A dataset of 600 e-commerce websites from .com domain is used to train and test the learning model. Seven features (page loading speed, broken links, browser compatibility, resolution, total size, privacy and security, and interface and typography) which impact the compatibility of IoT integration in websites have been used. Evaluation criteria for assigning score to each feature has been identified. Finally, the compatibility score, the IoTscore_{site} which evaluates the websites' integration capabilities and support to IoT devices is generated by adding all the feature scores. The preliminary results generated using the prediction model clearly determine the worthiness of website for IoT integration.

For details refer to <https://doi.org/10.1007/s11227-019-03026-x>

Tweet recommender model using adaptive neuro-fuzzy inference system

Deepak Kumar Jain, **Akshi Kumar*** and Vibhuti Sharma

Abstract: Twitter is a ubiquitous, socially engaging and a rapid communication medium. To filter the relevant information like news, hashtags, links, followers, retweets for better user experience recommender systems have been extensively used on Twitter. Uncertainty in user preference, fuzziness in the rating process and the imprecision associated with the voluminous and varied Twitter data are some of the difficulties associated which impede enhanced recommendations. This research put forwards an Adaptive Neuro-Fuzzy Inference System (ANFIS) based tweet recommender model to handle the uncertainty, impreciseness and vagueness in item features and user's behavior. The proposed hybrid content-based and collaborative filtering based recommended model learns the interests of source and target users to categorize tweets. The users are characterized as source user and target user to whom the tweet is to be recommended. The interests of the source and target user are extracted and the correlation between user interests is established which along with the category of the target tweet are then used to build the neuro-fuzzy model. The results show that the proposed model predicts the recommendation score correctly most of the time with the satisfactory Root Mean Square Error (RMSE) value indicating the fitness of the designed ANFIS model.

For details refer to <https://doi.org/10.1016/j.future.2020.04.001>

Using cognition to resolve duplicacy issues in socially connected healthcare for smart cities

Akshi Kumar

Abstract: Social web has transformed healthcare communication as patients reach out to seek support and advice by connecting with other patients, caregivers and healthcare professionals. The influx of health-related queries and the volume of answers within the medical forums is a testimony to this adaption. The scalability, natural interaction and dynamism of the continuously collected and connected user-generated social big data can support health assessment, intervention and provisioning to produce the best kind of cognitive smart city. On the flip side the use of social media for healthcare communication suffers from data deluge, lack of reliability and quality, confidentiality and privacy (location/personal) issues. Duplicate questions, that is, queries with similar semantics (meaning) corrupt the filtering mechanism, increase the response time and compromise with the quality of the answer too. This research puts forward solutions to resolve the key challenge of duplicacy within the medical community Question-Answering sites (Medical CQAs). We propose to solve the semantic question matching problem for duplicate question pair detection, using a hybrid deep learning model, which combines a Co-attention based Bi-Directional Long Short-Term Memory (Bi-LSTM) Siamese neural network and a Multi-layer perceptron classifier to output the probability of a similarity match between the two questions. Euclidean distance function is then used to compute the similarity between questions. The proposed model is validated on 100 question pairs which are scrapped from three featured groups, namely, ‘Irritable Bowel Syndrome’, ‘Anxiety Disorder’ and ‘Menopause’ of Patient.info community forum and an accuracy of 86.375% is observed. The results obtained are comparable to that of the Quora’s state-of-the-art results for duplicate detection.

For details refer to <https://doi.org/10.1016/j.comcom.2020.01.041>

Hybrid context enriched deep learning model for fine-grained sentiment analysis in textual and visual semiotic modality social data

Akshi Kumar, Kathiravan Srinivasan, ChengWen-Huang and Albert Y.Zomaya

Abstract: Detecting sentiments in natural language is tricky even for humans, making its automated detection more complicated. This research proffers a hybrid deep learning model for fine-grained sentiment prediction in real-time multimodal data. It reinforces the strengths of deep learning nets in combination to machine learning to deal with two specific semiotic systems, namely the textual (written text) and visual (still images) and their combination within the online content using decision level multimodal fusion. The proposed contextual ConvNet-SVM_{BoVW} model, has four modules, namely, the discretization, text analytics, image analytics, and decision module. The input to the model is multimodal text, $m \in \{\text{text, image, info-graphic}\}$. The discretization module uses Google Lens to separate the text from the image, which is then processed as discrete entities and sent to the respective text analytics and image analytics modules. Text analytics module determines the sentiment using a hybrid of a convolution neural network (ConvNet) enriched with the contextual semantics of SentiCircle. An aggregation scheme is introduced to compute the hybrid polarity. A support vector machine (SVM) classifier trained using bag-of-visual-words (BoVW) for predicting the visual content sentiment. A Boolean decision module with a logical OR operation is augmented to the architecture which validates and categorizes the output on the basis of five fine-grained sentiment categories (truth values), namely ‘highly positive,’ ‘positive,’ ‘neutral,’ ‘negative’ and ‘highly negative.’ The accuracy achieved by the proposed model is nearly 91% which is an improvement over the accuracy obtained by the text and image modules individually.

For details refer to <https://doi.org/10.1016/j.ipm.2019.102141>

**Corresponding Author*

Sarcasm detection in mash-up language using soft-attention based bi-directional LSTM and feature-rich CNN⁺

Deepak Jain, **Akshi Kumar*** and Geetanjali Garg

Abstract: Analyzing explicit and clear sentiment is challenging owing to the growing use of emblematic and multilingual language constructs. This research proposes sarcasm detection using deep learning in code-switch tweets, specifically the mash-up of English with Indian native language, Hindi. The proposed model is a hybrid of bidirectional long short-term memory with a *softmax* attention layer and convolution neural network for real-time sarcasm detection. To evaluate the performance of the proposed model, real-time mash-up tweets are extracted on the trending political (#government) and entertainment (#cricket, #bollywood) posts on Twitter. The randomly sampled dataset contains 3000 sarcastic and 3000 non-sarcastic bilingual Hinglish (Hindi + English) tweets. Feature engineering is done using pre-trained GloVe word embeddings to extract English semantic context vector, hand-crafted features using subjective lexicon Hindi-SentiWordNet to generate the SentiHindi feature vector and an auxiliary pragmatic feature vector depicting the count of pragmatic markers in tweet. Performance analysis is done to compare and validate the proposed ^{softAtt}BiLSTM-_{feature-rich}CNN model. The model outperforms the baseline deep learning models with a superior classification accuracy of 92.71% and F-measure of 89.05%.

For details refer to <https://doi.org/10.1016/j.asoc.2020.106198>

Socio-Sentic framework for sustainable agricultural governance⁺

Akshi Kumar and Abhilasha Sharma

Abstract: Livelihood security plays a critical role in strengthening the socio-economic situation of a country. Agriculture is one such sector which is expected to provide a complete array of economic, social, and environmental services. Good governance and management of allied policies at all levels is favourable for long-term sustainability of agricultural sector. The accountability of government is a direct measure of its social responsibility and sustainability. Social media as a powerful online platform reinforces hype and provides opportunities to extract and analyze public opinion about various governmental schemes and policies including the ones related to agriculture. The e-participation platforms such as Twitter offer unparalleled means to intelligently gauge the consensus and orientation of people towards an agricultural policy. Motivated by this, the work presented in this research, proffers a Socio-Sentic framework for sustainable agricultural governance which probes the sentiment polarity of user-content on Twitter pertaining to government policies, specifically agricultural policies. In this intelligent analytic framework, supervised machine learning algorithms have been implemented and compared using tweets on an Indian Agricultural Policy launched in 2016, 'Pradhan Mantri Fasal Bima Yojana' (PMFBY). The preliminary results indicate that the adoption of the proposed framework for soliciting and probing citizen feedback for government policy evaluation can lead to a sustainable agricultural development.

For details refer to <https://doi.org/10.1016/j.suscom.2018.08.006>

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+Eligible for Certificate only

Systematic literature review on context-based sentiment analysis in social multimedia⁺

Akshi Kumar and Geetanjali Garg

Abstract: The opinion seeking behavior of people for good decision making has greatly enhanced the importance of social media as a platform for exchange of information. This trend has led to a sudden spurt of information overflow on the Web. The huge volume of such information has to be technically processed for segregating the relevant knowledge. Sentiment analysis is the popular method extensively used for this purpose. It is defined as the computational study of mining the opinions from the available content about the entity of interest. Existing Sentiment analysis techniques quite efficiently capture opinions from text written in syntactically correct and explicit language. However, while dealing with the informal data, limitation has been observed in performance of sentiment analysis techniques. With a view to deal with the imperfect and indirect language used by the netizens, it has become necessary to work on improvement in the existing sentiment analysis techniques. In this regard, the conventional sentiment analysis techniques have shown some improvement on applying the appropriate context information. However, still there is ample scope for further research to find the relevant “context” and applying it to a given scenario. This systematic literature review paper intends to explore and analyze the existing work on the context-based sentiment analysis and to report gaps and future directions in the said research area.

For details refer to <https://doi.org/10.1007/s11042-019-7346-5>

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+Eligible for Certificate only



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Ms. Anshu Khurana is a Teaching cum Research Fellow in Department of Computer Science and Engineering at Delhi Technological University, since 2017. Her research area is optimal text classification. She has published papers in SCIE journals, international conferences and book chapter. She has a teaching experience of 10 years in Delhi Technological University.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. Khurana** and O. P. Verma, “Novel approach with nature-inspired and ensemble techniques for optimal text classification”, *Multimedia Tools and Applications*, vol. 79, no. 33, pp. 23821–23848, 2020. Impact Factor: 2.313.

Novel approach with nature-inspired and ensemble techniques for optimal text classification

Anshu Khurana and Om Prakash Verma

Abstract: Text classification reduces the time complexity and space complexity by dividing the complete task into the different classes. The main problem with text classification is a vast number of features extracted from the textual data. Pre-processed dataset have many features, some of which are not desirable and act only like noise. In this paper, a novel approach for optimal text classification based on nature-inspired algorithm and ensemble classifier is proposed. In the proposed model, feature selection was performed with Biogeography Based Optimization (BBO) algorithm along with ensemble classifiers (Bagging). The use of ensemble classifiers for classification delivers better performance for optimal text classification as compared to an individual classifier, and hence, improving the accuracy. Ensemble classifiers combines the weakness of individual classifiers. The individual classifiers are unable to improve the classification results when compared to ensemble classifier. The selected features, after feature selection using BBO algorithm, are classified into various classes using six machine learning classifier. The experimental results are computed on ten text classification datasets taken from UCI repository and one real-time dataset of an airlines. The four different measures namely; Accuracy, Precision, Recall and F- measure are used to validate performance of our model with ten-fold cross-validation. For feature selection process, a comparison is performed among state-of-the-art algorithms available in the literature. Results shows that BBO for feature selection outperforms the other similar nature-based optimization techniques. Our proposed approach of BBO with ensemble classifier is also compared with techniques proposed by other researchers and we analyzed the results quantitatively and qualitatively.

For details refer to <https://doi.org/10.1007/s11042-020-09013-2>



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Dr. Ashish Kumar has completed his Ph.D. in computer science and engineering from Delhi Technological University (formerly DCE), New Delhi, India in 2020. He is also working as an assistant professor with Bharati Vidyapeeth's College of Engineering, GGSIPU, New Delhi, India. He received his M.Tech degree (with Distinction) in computer science and engineering from Guru Gobind Singh Indraprastha University, New Delhi, India in 2009. He has qualified Gate-2007 and received MHRD scholarship during his post graduation. He has completed B.E. (with HONS) from M.D. University in 2007. He has published many research papers in various reputed national and international journals and conferences. His current research interests include object tracking, image processing, and machine learning.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. **A. Kumar**, G. S. Walia and K. Sharma, "A novel approach for multi-cue feature fusion for robust object tracking", *Applied Intelligence*, vol. 50, pp. 3201–3218, 2020. Impact Factor: 3.325.
2. **A. Kumar**, G. S. Walia and K. Sharma, "Real-time visual tracking via multi-cue based adaptive particle filter framework", *Multimedia Tools and Applications*, vol. 79, no.29, pp. 20639–20663, 2020. Impact Factor: 2.313.
3. **A. Kumar**, G. S. Walia and K. Sharma, "Recent trends in multicue based visual tracking: A review", *Expert Systems with Applications*, vol. 162, pp. 113711, 2020. Impact Factor: 5.452.

A novel approach for multi-cue feature fusion for robust object tracking

Ashish Kumar, Gurjit Singh Walia and Kapil Sharma

Abstract: Object tracking is a significant problem of computer vision due to challenging environmental variations. Single cue appearance model is not sufficient to handle the variations. To this end, we propose a multi-cue tracking framework in which complementary cues namely, LBP and HOG were exploited to develop a robust appearance model. The proposed feature fusion captures the high-level relationship between the features and diminishes the low-level relationship. Transductive reliability is also integrated at each frame to make tracker adaptive with the changing environment. In addition, K-Means based classifier creates clear and concise boundary between positive and negative fragments which are further used to update the reference dictionary. This adaptation strategy prevents the erroneous updation of the proposed tracker during background clutters, occlusion, and fast motion. Qualitative and quantitative analysis on challenging video sequences from OTB-100 dataset, VOT dataset and UAV123 reveal that the proposed tracker performs favorably against 13 others state-of-the-art trackers.

For details refer to <https://doi.org/10.1007/s10489-020-01649-9>

Real-time visual tracking via multi-cue based adaptive particle filter framework

Ashish Kumar, Gurjit Singh Walia and Kapil Sharma

Abstract: Visual tracking using particle filter has been extensively investigated due to its myriad of application in the field of computer vision. However, particle filter framework performance is heavily impaired due to its inherent problems namely, particle degeneracy and impoverishment. In addition, most of the tracking methods using single cue are greatly affected by dynamic environmental challenges. To address these issues, we propose an adaptive multi-cue particle filter based real-time visual tracking framework. Three complementary cues namely, color histogram, LBP and pyramid of histogram of gradient have been exploited for object's appearance model. These cues are integrated using the proposed adaptive fusion model for the automatic boosting of important particles and suppression of unimportant particles. Resampling method using butterfly search optimization relocate low performing particles to high likelihood area. Proposed outlier detection mechanism not only helps in detecting low performing particles but also aids in updating of the reference dictionary. Online estimation of cue reliability along with its multi-cue fusion leads to quick adaptation of the proposed tracker. On average of the outcome, our tracker achieves average center location error of 6.89 (in pixels) and average F-measure of 0.786 when evaluated on OTB-100 and VOT dataset against 13 others state-of-the-art.

For details refer to <https://doi.org/10.1007/s11042-020-08655-6>

Recent trends in multicue based visual tracking: A review

Ashish Kumar, Gurjit Singh Walia and Kapil Sharma

Abstract: In the recent years, multicue visual tracking frameworks have been preferred over single cue visual tracking approaches to address critical environmental challenges. In literature, it has been well accepted that combining multiple complementary cues extracted from single sensor or multiple sensors, deep features and features extracted from different layers of deep learning architecture enhance tracking performance and accuracy. In this paper, we have categorized the multi-cue object tracking work based on the exploited appearance model into traditional architecture and deep learning based trackers. The categorized work have been tabulated to provide detailed overview of the representative work and to list out the new trends in the domain. Also, we have briefly analyzed the various tracking benchmark and tabulated their substantial parameters. Our review work analyze the recent trends in the field of object tracking alongwith the latest tracking benchmark to indicate the future directions to the researchers. In addition, we have experimentally evaluated the state-of-the-arts on OTB-15, UAV123, VOT2017 and LaSOT datasets under various tracking challenges.

For details refer to <https://doi.org/10.1016/j.eswa.2020.113711>



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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. A. Kumar and **G. Garg**, “Systematic literature review on context-based sentiment analysis in social multimedia”, *Multimedia Tools and Applications*, vol. 79, pp. 15349–15380, 2020. Impact Factor: 2.313.

Systematic literature review on context-based sentiment analysis in social multimedia

Akshi Kumar and **Geetanjali Garg***

Abstract: The opinion seeking behavior of people for good decision making has greatly enhanced the importance of social media as a platform for exchange of information. This trend has led to a sudden spurt of information overflow on the Web. The huge volume of such information has to be technically processed for segregating the relevant knowledge. Sentiment analysis is the popular method extensively used for this purpose. It is defined as the computational study of mining the opinions from the available content about the entity of interest. Existing Sentiment analysis techniques quite efficiently capture opinions from text written in syntactically correct and explicit language. However, while dealing with the informal data, limitation has been observed in performance of sentiment analysis techniques. With a view to deal with the imperfect and indirect language used by the netizens, it has become necessary to work on improvement in the existing sentiment analysis techniques. In this regard, the conventional sentiment analysis techniques have shown some improvement on applying the appropriate context information. However, still there is ample scope for further research to find the relevant “context” and applying it to a given scenario. This systematic literature review paper intends to explore and analyze the existing work on the context-based sentiment analysis and to report gaps and future directions in the said research area.

For details refer to <https://doi.org/10.1007/s11042-019-7346-5>

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Dr. Keshav Gupta completed his Ph.D. degree in the Computer Science and Engineering Department, Delhi Technological University, New Delhi, India. He also completed his M. Tech. in software engineering from Delhi Technological University, New Delhi. His current research interests include biometric systems, pattern recognition, image processing and machine learning. He has published many research papers in reputed international journals and conferences. He is currently working as Assistant Professor in Galgotias University.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **K. Gupta**, G. Walia and K. Sharma, “Quality based adaptive score fusion approach for multimodal biometric system”, *Applied Intelligence*, vol. 50, no. 4, pp. 1086-1099, 2020. Impact Factor: 3.325

Quality based adaptive score fusion approach for multimodal biometric system

Kehsav Gupta, Gurjit Singh Walia and Kapil Sharma

Abstract: Multimodal Biometric Systems are extensively employed over unimodal counterparts for user authentication in the digital world. However, the application of multimodal systems to security-critical applications is limited mainly due to non-adaptiveness of these systems to the dynamic environment and inability to distinguish between spoofing attack and the noisy input image. In order to address these issues, a multimodal biometric system, which adaptively combines the scores from individual classifiers is proposed. For this, three modalities viz. face, finger, and iris are used to extract individual classifier scores. These classifier scores are adaptively fused considering that concurrent modalities are boosted and discordant modalities are suppressed. The conflicting belief among classifiers is resolved not only to achieve optimum fusion of classifier scores but also to cater dynamic environment. The proposed quality based score fusion also distinguish between spoofing attacks and noisy inputs as well. The performance of the proposed multimodal biometric system is experimentally validated using three chimeric multimodal databases. On an average, the proposed system achieves an accuracy of 99.5%, an EER of 0.5% and also outperforms state-of-the-art methods.

For details refer to <https://doi.org/10.1007/s10489-019-01579-1>



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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **L. Jain**, R. Katarya, and S. Sachdeva, "Opinion leader detection using whale optimization algorithm in online social network", *Expert Systems with Applications*, vol. 142, pp. 113016, 2020. Impact Factor: 5.452.

Opinion leader detection using whale optimization algorithm in online social network

Lokesh Jain, Rahul Katarya, and Shelly Sachdeva

Abstract: In the current digital era, optimization is one of the most significant problems in the social network. Most of the issues related to optimization are NP-complete and not possible to solve them in polynomial time. Detection of opinion leader based on their optimized centrality measure is a critical issue. The opinion leaders have a non-trivial influence on the other user's decision-making process and can solve various problems related to the diffusion of new products and innovations in the real world. In this paper, we proposed a new Social Network-based Whale Optimization Algorithm (SNWOA) to find the top-N opinion leaders by measuring the reputation of the user using various standard optimization function in the network. The proposed algorithm is advantageous to determine the opinion leaders because it based on the bubble-net hunting behavior of humpback whales. The algorithm found the best possible solution as the number of users raises progressively in the network; therefore, the general complexity of the algorithm remains unchanged. Besides, we also proposed a new approach to categorize the communities based on the similarity index comprising neighbor similarity and clustering coefficient as the significant components. Initially, we computed the objective function of each user by using their centralities and deployed the proposed algorithm with different optimization functions to identify the local and universal opinion leaders. We implemented the proposed algorithm on the real and synthesized datasets and compared the result based on the accuracy, precision, recall, and F1-score. The result indicates that the proposed algorithms give a better result as compared to the other standard Social Network Analysis (SNA) measures. We also concluded that the community partitioning algorithm is even better than the other community detection algorithms based on different parameters and computational time.

For details refer to <https://doi.org/10.1016/j.eswa.2019.113016>

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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **M. Saini** and S. Susan, “Deep transfer with minority data augmentation for imbalanced breast cancer dataset”, *Applied Soft Computing*, vol. 97, Part A, pp. 106759, 2020. Impact Factor: 5.472.

Deep transfer with minority data augmentation for imbalanced breast cancer dataset

Manisha Saini and Seba Susan

Abstract: Clinical diagnosis of breast cancer is a challenging problem in the biomedical domain. The BreakHis breast cancer histopathological image dataset consists of two classes: Benign (Minority class) and Malignant (Majority class). The imbalanced class distribution results in the degradation of performance of the classifier model due to biased classification towards the majority class. To tackle this problem, a novel learning strategy that involves a deep transfer network has been proposed in this paper, in collaboration with Deep Convolution Generative Adversarial network (DCGAN). DCGAN is used in the initial phase for data augmentation of the minority class only. The dataset, with the class distribution now balanced, is applied as input to the deep transfer network. The proposed deep transfer architecture has at its core, the initial pre-trained layers (until block 4 pool layer) of the VGG16 deep network architecture pre-trained on the ImageNet object classification dataset. The higher end of our transfer network comprises of Batch Normalization, 2D Convolutional (CONV2D) layer, Global Average Pooling 2D, Dropout and Dense layers that are added to enhance the network's performance. Experiments on the benchmark BreakHis dataset for different magnification factors: 40X, 100X, 200X and 400X validate the efficiency of the proposed deep transfer learning approach due to the high scores achieved as compared to the state-of-the-art deep networks.

For details refer to <https://doi.org/10.1016/j.asoc.2020.106759>



BIOGRAPHY

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Manpreet Kaur completed 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 pursuing her PhD. from Delhi Technological University, Delhi, India. She is currently working as Member (Senior Research Staff) at Central Research Laboratory, Ghaziabad, Bharat Electronics Limited. Her research interest includes the wireless communication and cognitive radios network etc.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **M. Kaur** and R. K. Yadav, "Performance analysis of Beaulieu-Xie fading channel with MRC diversity reception", *Transactions on Emerging Telecommunications Technologies*, vol. 31, no. 7, pp. e3949, 2020. Impact Factor: 1.594.

Performance analysis of Beaulieu-Xie fading channel with MRC diversity reception

Manpreet Kaur and Rajesh Kumar Yadav

Abstract: In this work, the performance of communication system inside the densely packed small cells or femtocells with maximum ratio combining (MRC) diversity is studied. The line of sight (LOS) and the diffused power components inside the femtocells are modeled in the form of Beaulieu-Xie fading channel and the performance metrics have been derived. The closed-form expressions for outage probability (Pout), amount of fading (AF), and average symbol error probability (ASEP) for coherent and non-coherent modulation schemes are derived for the said channel. Furthermore, the channel capacity analysis over different transmission policies is performed, and the corresponding results are plotted. The effect of diversity and the other fading parameters on the performance measures are demonstrated. Analytical results are supplemented with Monte-Carlo simulations for validating the accuracy of the proposed formulations.

For details refer to <https://doi.org/10.1002/ett.3949>



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Mr. Prashant Giridhar Shambharkar has obtained his Master Degree in Computer Science and Engineering from Samrat Ashok Technological Institute (Vidisha) and Bachelor Degree from Amravati University, Amravati (Maharashtra). He has having 15+ years of experience of teaching at Graduate and Post Graduated level. His area of interests includes Video Data Mining, Movie Trailer classification, Real Time Systems, Network Security. He has publications in reputed International Journals and International Conferences. His work is published in some book chapters of Springer. He is presently working as Assistant Professor, Department of Computing Science & Engineering, Delhi Technological University, Delhi.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **P. G. Shambharkar** and M. N. Doja, “Movie trailer classification using deer hunting optimization based deep convolutional neural network in video sequences”, *Multimedia Tools and Applications*, vol. 79, no. 29, pp. 21197–21222, 2020. Impact Factor: 2.313.

Movie trailer classification using deer hunting optimization based deep convolutional neural network in video sequences

Prashant Giridhar Shambharkar and M. N. Doja

Abstract: In current situation, video classification is one of the important research domains. Since video is a complex media with various components, classification of video is normally a complex process. This paper presented a human action based movie trailer classification using optimized deep convolutional neural network in video sequences. Initially, images are converted into the grayscale conversion. Using the adaptive median filtering process, the pre-processing stage is accomplished. Threshold based segmentation approach is utilized for subtracting the background from the video frames and to extract the fore-ground portion. In the feature extraction stage, the visual features (color and texture features) and motion features are extracted from the segmented portion. Finally, the mined features are trained and classified with the help of optimized deep convolutional neural network (DCNN) for the movie trailer classifications. Here, the deer hunting optimization (DHO) is introduced to optimize the weight values of DCNN. The proposed (DCNN-DHO) human action based movie trailer classification is executed in the MATLAB environment. The experimental results are evaluated and compared with the existing methods in terms of accuracy, false alarm rate, sensitivity, specificity, precision, F-measure and false discovery rate. The results of the proposed method are compared with filtering process and without filtering process in which 95.23% of accuracy is achieved for the suggested approach with filtering and 90.91% of accuracy is achieved for the suggested approach without filtering process.

For details refer to <https://doi.org/10.1007/s11042-020-08922-6>



BIOGRAPHY

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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 Indraprastha 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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **P. Sharma**, R. Jindal and M. D. Borah, “Blockchain Technology for Cloud Storage: A Systematic Literature Review”, *ACM Computing Surveys*, vol. 53, no. 4, pp. 1-32, 2020. Impact Factor: 7.990.

Blockchain Technology for Cloud Storage: A Systematic Literature Review

Pratima Sharma, Rajni Jindal and Malaya Dutta Borah

Abstract: The demand for Blockchain innovation and the significance of its application has inspired ever-progressing exploration in various scientific and practical areas. Even though it is still in the initial testing stage, the blockchain is being viewed as a progressive solution to address present-day technology concerns, such as decentralization, identity, trust, character, ownership of data, and information-driven choices. Simultaneously, the world is facing an increase in the diversity and quantity of digital information produced by machines and users. While effectively looking for the ideal approach to storing and processing cloud data, the blockchain innovation provides significant inputs. This article reviews the application of blockchain technology for securing cloud storage.

For details refer to <https://doi.org/10.1145/3403954>



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Dr. Rahul Katarya is working as an Associate Professor in the Department of Computer Science & Engineering, Delhi Technological University (DTU) (formerly Delhi College of Engineering), New Delhi, India. He is Associate Dean in Office of International Affairs, DTU. He was selected in World's top 2% scientist in 2019 by Stanford University, USA, as he achieved Stanford University World Ranking 3696 for research in the year 2019 in the top ranked Science-Metrix category (Artificial Intelligence & Image Processing). He is the Officer-in-charge of "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 was selected as a young scientist in International Cooperation Division, Department of Science & Technology (DST), Govt. of India, 5th BRICS Young Scientists Conclave-2020 Chelyabinsk, Russia of theme "*BRICS Partnership of Young Scientists and Innovators for Science Progress and Innovative growth*" September 21-25, 2020 Chelyabinsk.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	04

1. **R. Katarya** and Y. Arora, “Capsmf: A novel product recommender system using deep learning based text analysis model”, *Multimedia Tools and Applications*, vol. 79, no. 47, pp. 35927–35948, 2020. Impact Factor: 2.313.
2. L. Jain, **R. Katarya** and S. Sachdeva, “Recognition of opinion leaders coalitions in online social network using game theory”, *Knowledge-Based Systems*, vol. 203, pp. 106158, 2020. Impact Factor: 5.921.
3. A. Gupta and **R. Katarya**, “Social media based surveillance systems for healthcare using machine learning: A systematic review”, *Journal of Biomedical Informatics*, vol. 108, pp. 103500, 2020. Impact Factor: 3.526.
4. **L. Jain, R. Katarya**, and S. Sachdeva, “Opinion leader detection using whale optimization algorithm in online social network”, *Expert Systems with Applications*, vol. 142, pp. 113016, 2020. Impact Factor: 5.452.

Capsmf: A novel product recommender system using deep learning based text analysis model

Rahul Katarya and Yamini Arora

Abstract: Researchers and data scientists have developed different Recommender System Algorithms such as Content-Based and Collaborative-Based in order to filter a large amount of information available on the internet and hence, recommend only the relevant and essential content based on the personalized interests of users. Information acquired explicitly by collecting users' ratings for an item lead to the problem of data sparsity. Many researchers have been currently working towards the improvement of rating prediction accuracy by integrating the auxiliary information along with the ratings provided by the users. This paper proposes a novel product recommender system called as "CapsMF", it applies the advanced neural network architecture Capsule Networks (Caps) for document representation, and MF represents Matrix factorization. In the proposed approach, we have enhanced a deep neural network text analysis model by adding a newly discovered neural network architecture; Capsule Networks stacked on bi-directional Recurrent Neural Network (Bi-RNN) for the robust representation of textual descriptions of items and users. The Deep Neural Network text analysis model is integrated with the Probabilistic Matrix Factorization to generate improved recommendations. The experiment has been performed on two real amazon datasets resulting in the enhancement of rating prediction accuracy, the recall, and the precision of top-n recommendations, in comparison to the basic and hybrid Recommendation System Algorithms. Also, text analysis model involving Capsule Networks stacked with Recurrent Neural Networks (RNNs) have outperformed the baseline models that have single Convolutional Neural Networks (CNN) or CNN combined with Bi-RNN in text analysis.

For details refer to <https://doi.org/10.1007/s11042-020-09199-5>

Recognition of opinion leaders coalitions in online social network using game theory

Lokesh Jain, **Rahul Katarya** and Shelly Sachdeva

Abstract: Nowadays, human decision-making power and attitude revolutionize over time and change their viewpoint towards substantial convinced values because of the influence of social media. Social network plays a crucial role in human life with the progression of technology. In the online social network, the responsibility of opinion leaders is also vital in information diffusion and promotion purposes. In this manuscript, we proposed a different Game theory-based **Opinion Leader Detection (GOLD)** algorithm to identify the group of users having the maximum synergy declared as the coalition of opinion leaders. For implementing purpose, we used the game theory approach in which all the users behave like a player, and a trustor–trustee tree formed comprised coalitions based on trust and conditional probability. We proposed an inventive and distinctive solution to measures the individual payoff using the distance-based centrality parameter. We also computed the Shapley value for each user to identify the maximum marginal contribution and determined the maximum synergy of each coalition. The main advantage of the proposed approach is to strengthen the power of the coalition and produced the synergetic outcome. The proposed approach delivered around 90% accuracy and decreased 37% execution time. Therefore, it provides superior results regarding the accuracy, precision, time complexity, rate of convergence, and computational time with other SNA (Social Network Analysis) measures.

For details refer to <https://doi.org/10.1016/j.knosys.2020.106158>

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Social media based surveillance systems for healthcare using machine learning: A systematic review

Aakansha Gupta and Rahul Katarya*

Abstract:

Background : Real-time surveillance in the field of health informatics has emerged as a growing domain of interest among worldwide researchers. Evolution in this field has helped in the introduction of various initiatives related to public health informatics. Surveillance systems in the area of health informatics utilizing social media information have been developed for early prediction of disease outbreaks and to monitor diseases. In the past few years, the availability of social media data, particularly Twitter data, enabled real-time syndromic surveillance that provides immediate analysis and instant feedback to those who are charged with follow-ups and investigation of potential outbreaks. In this paper, we review the recent work, trends, and machine learning(ML) text classification approaches used by surveillance systems seeking social media data in the healthcare domain. We also highlight the limitations and challenges followed by possible future directions that can be taken further in this domain.

Methods : To study the landscape of research in health informatics performing surveillance of the various health-related data posted on social media or web-based platforms, we present a bibliometric analysis of the 1240 publications indexed in multiple scientific databases (IEEE, ACM Digital Library, ScienceDirect, PubMed) from the year 2010–2018. The papers were further reviewed based on the various machine learning algorithms used for analyzing health-related text posted on social media platforms.

Findings: Based on the corpus of 148 selected articles, the study finds the types of social media or web-based platforms used for surveillance in the healthcare domain, along with the health topic(s) studied by them. In the corpus of selected articles, we found 26 articles were using machine learning technique. These articles were studied to find commonly used ML techniques. The majority of studies (24%) focused on the surveillance of flu or influenza-like illness (ILI). Twitter (64%) is the most popular data source to perform surveillance research using social media text data, and Support Vector Machine (SVM) (33%) being the most used ML algorithm for text classification.

Conclusions: The inclusion of online data in surveillance systems has improved the disease prediction ability over traditional syndromic surveillance systems. However, social media based surveillance systems have many limitations and challenges, including noise, demographic bias, privacy issues, etc. Our paper mentions future directions, which can be useful for researchers working in the area. Researchers can use this paper as a library for social media based surveillance systems in the healthcare domain and can expand such systems by incorporating the future works discussed in our paper.

For details refer to <https://doi.org/10.1016/j.jbi.2020.103500>

Opinion leader detection using whale optimization algorithm in online social network⁺

Lokesh Jain*, **Rahul Katarya***, and Shelly Sachdeva

Abstract: In the current digital era, optimization is one of the most significant problems in the social network. Most of the issues related to optimization are NP-complete and not possible to solve them in polynomial time. Detection of opinion leader based on their optimized centrality measure is a critical issue. The opinion leaders have a non-trivial influence on the other user's decision-making process and can solve various problems related to the diffusion of new products and innovations in the real world. In this paper, we proposed a new Social Network-based Whale Optimization Algorithm (SNWOA) to find the top-N opinion leaders by measuring the reputation of the user using various standard optimization function in the network. The proposed algorithm is advantageous to determine the opinion leaders because it based on the bubble-net hunting behavior of humpback whales. The algorithm found the best possible solution as the number of users raises progressively in the network; therefore, the general complexity of the algorithm remains unchanged. Besides, we also proposed a new approach to categorize the communities based on the similarity index comprising neighbor similarity and clustering coefficient as the significant components. Initially, we computed the objective function of each user by using their centralities and deployed the proposed algorithm with different optimization functions to identify the local and universal opinion leaders. We implemented the proposed algorithm on the real and synthesized datasets and compared the result based on the accuracy, precision, recall, and F1-score. The result indicates that the proposed algorithms give a better result as compared to the other standard Social Network Analysis (SNA) measures. We also concluded that the community partitioning algorithm is even better than the other community detection algorithms based on different parameters and computational time.

For details refer to <https://doi.org/10.1016/j.eswa.2019.113016>

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+Eligible for Certificate only



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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **Rajesh K. Yadav** and Anubhav, “PSO-GA based hybrid with adam optimization for ANN training with application in medical diagnosis”, *Cognitive Systems Research*, vol. 64, pp. 191-199, 2020. Impact Factor: 1.902.

PSO-GA based hybrid with adam optimization for ANN training with application in medical diagnosis

Rajesh K. Yadav and Anubhav

Abstract: This paper introduces a novel PSO-GA based hybrid training algorithm with Adam Optimization and contrasts performance with the generic Gradient Descent based Backpropagation algorithm with Adam Optimization for training Artificial Neural Networks. We aim to overcome the shortcomings of the traditional algorithm, such as slower convergence rate and frequent convergence to local minima, by employing the characteristics of evolutionary algorithms. PSO has a property of faster convergence rate, which can be exploited to account for the slower pace of convergence of the traditional BP (which is due to low values of gradients). In contrast, the integration with GA complements the drawback of convergence to local minima as GA, possesses the capability of efficient global search. So by this integration of these algorithms, we propose our new hybrid algorithm for training ANNs. We compare both the algorithms for the application of medical diagnosis. Results display that the proposed hybrid training algorithm, significantly outperforms the traditional training algorithm, by enhancing the accuracies of the ANNs with an increase of 20% in the average testing accuracy and 0.7% increase in the best testing accuracy.

For details refer to <https://doi.org/10.1016/j.cogsys.2020.08.011>



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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **R. Malhotra** and K. Lata, "A systematic literature review on empirical studies towards prediction of software maintainability", *Soft Computing (Springer)*, vol. 24, pp. 16655–16677, 2020, Impact Factor: 3.050.
2. **R. Malhotra** and K. Lata, "An empirical study on predictability of software maintainability using imbalanced data", *Software Quality Journal*, vol. 28, no. 4, pp. 1581–1614, 2020. Impact Factor: 1.460.

A systematic literature review on empirical studies towards prediction of software maintainability

Ruchika Malhotra and Kusum Lata

Abstract: Software maintainability prediction in the earlier stages of software development involves the construction of models for the accurate estimation of maintenance effort. This guides the software practitioners to manage the resources optimally. This study aims at systematically reviewing the prediction models from January 1990 to October 2019 for predicting software maintainability. We analyze the effectiveness of these models according to various aspects. To meet the goal of the research, we have identified 36 research papers. On investigating these papers, we found that various machine learning (ML), statistical (ST), and hybridized (HB) techniques have been applied to develop prediction models to predict software maintainability. The significant finding of this review is that the overall performance of ML-based models is better than that of ST models. The use of HB techniques for prediction of software maintainability is limited. The results of this review revealed that software maintainability prediction (SMP) models developed using ML techniques outperformed models developed using ST techniques. Also, the prediction performance of few models developed using HB techniques is encouraging, yet no conclusive results about the performance of HB techniques could be reported because different HB techniques are applied in a few studies.

For details refer to <https://doi.org/10.1007/s00500-020-05005-4>

An empirical study on predictability of software maintainability using imbalanced data

Ruchika Malhotra and Kusum Lata

Abstract: In software engineering predictive modeling, early prediction of software modules or classes that possess high maintainability effort is a challenging task. Many prediction models are constructed to predict the maintainability of software classes or modules by applying various machine learning (ML) techniques. If the software modules or classes need high maintainability, effort would be reduced in a dataset, and there would be imbalanced data to train the model. The imbalanced datasets make ML techniques bias their predictions towards low maintainability effort or majority classes, and minority class instances get discarded as noise by the machine learning (ML) techniques. In this direction, this paper presents empirical work to improve the performance of software maintainability prediction (SMP) models developed with ML techniques using imbalanced data. For developing the models, the imbalanced data is pre-processed by applying data resampling methods. Fourteen data resampling methods, including oversampling, undersampling, and hybrid resampling, are used in the study. The study results recommend that the safe-level synthetic minority oversampling technique (Safe-Level-SMOTE) is a useful method to deal with the imbalanced datasets and to develop competent prediction models to forecast software maintainability.

For details refer to <https://doi.org/10.1007/s11219-020-09525-y>

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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Kumar**, and B. S. Panda, "Identifying influential nodes in social networks: Neighborhood coreness based voting approach", *Physica A: Statistical Mechanics and its Applications*, vol. 553, pp. 124215, 2020. Impact Factor: 2.924.

Identifying influential nodes in social networks: Neighborhood coreness based voting approach

Sanjay Kumar and B. S. Panda

Abstract: Efficient modeling of information diffusion in an online social network, like viral distribution of a market product or rumor control, can be achieved through the most influential nodes in the system. Hence, to pass the information to a maximum extent of the network or keep it confined to a lesser extent in the case of rumor, it is essential to find the influential nodes. Many classical centralities have been proposed in literature with certain limitations. Recently Vote Rank based method was introduced to find the seed nodes. It selects a set of spreaders based on a voting scheme where voting ability of each node is same and each node gets the vote from its neighbors. But we argue that the voting ability of each node should be different and should depend on its topological position in the network. In this paper, we propose a coreness based VoteRank method called **NCVoteRank** to find spreaders by taking the coreness value of neighbors into consideration for the voting. Experiments and simulations using Susceptible–Infected–Recovered (SIR) stochastic model on many real datasets show that our proposed method, NCVoteRank, outperforms some of the existing popular methods such as PageRank, K-shell, Extended Coreness, VoteRank, and WVoteRank.

For details refer to <https://doi.org/10.1016/j.physa.2020.124215>



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Ms. Sonika Dahiya has been working as Assistant Professor in the department of Computer Science and Engineering, DTU since 2016 and is pursuing PhD from Guru Gobind Singh Indraprastha University, Delhi (GGSIPU). In addition to academics, she is associated with the Office of International Affairs as IT and Database coordinator. Her research interests include Fuzzy Clustering, Data Mining, Algorithm Design and Analysis. She has published 2 International Journals and 10 International Conferences. Till now, she has supervised 4 M.Tech thesis.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. A. Gosain and **S. Dahiya**, “A new robust fuzzy clustering approach: DBKIFCM”, *Neural Processing Letters*, vol. 52, no. 3, pp. 2189–2210, 2020. Impact Factor: 2.891.

A new robust fuzzy clustering approach: DBKIFCM

Anjana Gosain and **Sonika Dahiya***

Abstract: A clustering algorithm—Distance Based Gaussian Kernelized Intuitionistic Fuzzy C Means (DBKIFCM) is proposed. This algorithm is based on Gaussian kernel, outlier identification, and intuitionist fuzzy sets. It is intended to resolve the issue of presence of outliers, problem of sensitivity to initialization (STI) and is motivated by good performance of Radial Based Kernelized Intuitionistic Fuzzy C Means (KIFCM-RBF). Experiments are performed on standard 2D data sets such as Diamond (D12 and D15), and Dunn and real-world high dimension data sets such as Fisheriris, Wisconsin breast cancer, and Wine. DBKIFCM outcomes are studied in relation to Fuzzy C Means (FCM), Intuitionistic Fuzzy C Means (IFCM), KIFCM-RBF, Density Oriented Fuzzy C Means (DOFCM). It is observed that proposed approach significantly outperforms the earlier proposed algorithms with respect to outlier identification, effect of noise, issue of STI, and clustering error.

For details refer to <https://doi.org/10.1007/s11063-020-10345-1>

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Aakash Kumar Seth received B.Tech degree in Electrical and Electronics Engineering from Bhagwan Parshuram Institute of Technology, Delhi, India in 2013. He completed his M.Tech degree in Electric Drives and Control from Institute of Engineering and Technology, Lucknow, India in 2017. He is currently pursuing Ph.D. in Electrical Engineering from Delhi Technological University, Delhi. His research interest includes Electric Vehicle Charging, Power Quality, Microgrid and Power System Protection.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. K. Seth** and M. Singh, “Resonant controller of single-stage off-board EV charger in G2V and V2G modes”, *IET Power Electronics*, vol. 13, no. 5, pp. 1086-1092, 2020. Impact Factor: 2.672.

Resonant controller of single-stage off-board EV charger in G2V and V2G modes

Aakash Kumar Seth and Mukhtiar Singh

Abstract: This study presents the control design and implementation of a three-phase single-stage off-board electric vehicle (EV) charger. The charger is controlled to perform four quadrants operation in active–reactive (P – Q) power plane. Generally, the control of the EV charger consists of two control loops, i.e. exterior (slow) loop and fast-acting interior loop. Since the signals to be regulated in outer loop are DC in nature, they can be easily handled by regular proportional plus integral regulators. The inner loop control may also be performed in the DC domain, but inaccuracy involved in determining the parameter-dependent decoupling terms and difficulty in setting the gain for fast-acting inner loops make it unfavourable. Therefore, the inner control is performed in AC domain, where the signals are periodic. The proportional plus resonant controller is found to be very useful in tracking such type of periodic signals of fixed frequency, and accordingly, it has been designed and successfully implemented for the proposed work. The proposed methodology has been tested for eight different modes in the P – Q -plane. The system is simulated in MATLAB/Simulink environment and implemented in real time with a scaled-down hardware prototype.

For details refer to <https://doi.org/10.1049/iet-pel.2019.1111>



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Ajishek Raj is currently pursuing PhD at Delhi Technological University (DTU) in Electrical Engineering Department. He received B.Tech degree in Electrical Engineering from the Dr. M. G. R Educational and Research Institute, Chennai, India and M. Tech degree in Control and Instrumentation from Delhi Technological University, Delhi, India. He has published four SCI journal papers and presented three papers in reputed international conferences. His research area is focused on the implementation of analog signal processing and generation circuits.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. Raj**, D. R. Bhaskar and P. Kumar, “Two quadrant analog voltage divider and square-root circuits using OTA and MOSFETs”, *Circuits, Systems, and Signal Processing*, vol. 39, pp. 6358–6385, 2020. Impact Factor: 1.681.

Two quadrant analog voltage divider and square-root circuits using OTA and MOSFETs

Ajishek Raj, D. R. Bhaskar and Pragati Kumar

Abstract: In this communication, two novel architectures of voltage mode analog divider circuit and square-root circuit using an operational transconductance amplifier (OTA) have been presented. The proposed divider circuit employs an OTA and two MOS-FETs, while the square-root circuit requires one OTA along with one MOSFET. The proposed divider circuit can also be configured as inverse voltage function generator. The performance of the proposed circuits has been validated through Cadence Virtuoso simulations using 0.18 μm CMOS technology parameters. The total power consumption for analog divider circuit is 821 μW , while for square-root circuit, it is 442 μW with ± 0.9 V power supply. Experimental results have also been provided to validate the theory.

For details refer to <https://doi.org/10.1007/s00034-020-01454-2>



PROF. ALKA SINGH

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Dr. Alka Singh received the B.E. degree in Electrical Engineering from Delhi College of Engineering, Delhi, India, in 1996, the M. Tech. Degree in Technology in Power Systems from the Indian Institute of Technology, New Delhi, India, in 2001, and the Ph.D. degree from Netaji Subash Institute of Technology (Delhi University), Delhi, India, in 2006. She has teaching, industry and research experience of more than twenty years. She is a Senior member of IEEE and Chair of IEEE PES-IAS Delhi Chapter. She is currently a Professor in the Department of Electrical Engineering, Delhi Technological University, Delhi. Her research interests include power systems, power quality and applications of power electronics to power systems.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. **A. Singh**, M. Badoni, B. Singh and H. Saxena, “Real-time implementation of active shunt compensator with adaptive SRLMMN control technique for power quality improvement in the distribution system”, *IET Generation, Transmission and Distribution*, vol. 14, no. 8, pp. 1598-1606, 2020. Impact Factor: 2.862.
2. H. Saxena, **A. Singh** and J. N. Rai, “Adaptive spline-based PLL for synchronisation and power quality improvement in distribution system”, *IET Generation, Transmission and Distribution*, vol. 14, no. 7, pp. 1311-1319, 2020. Impact Factor: 2.862.
3. H. Saxena, **A. Singh** and J. N. Rai, “Design and performance analysis of improved adaline technique for synchronization and load compensation of grid-tied photovoltaic system”, *International Transactions on Electrical Energy Systems*, vol. 30, no. 6, pp. e12388, 2020. Impact Factor: 1.692.

Real-time implementation of active shunt compensator with adaptive SRLMMN control technique for power quality improvement in the distribution system

Alka Singh, Manoj Badoni, Bhim Singh and Hemant Saxena

Abstract: In this work, the development of sign regressor least mean mixed norm (SRLMMN) control technique for a distribution static compensator (D-STATCOM) is presented. This control technique extracts fundamental weight components from the non-sinusoidal load currents and generates reference grid currents. D-STATCOM is developed for harmonics eradication, reactive power injection and load balancing and its performance is investigated in several operating modes. The performance of SRLMMN control is compared with recursive least square (RLS) and variable step least mean square (VSLMS) control techniques in terms of convergence, steady-state error, harmonics elimination, sample time and computation complexity. The major advantages of SRLMMN control technique, are fast convergence, less steady-state error, low total harmonic distortion (THD) and offers less computation complexity when compared with RLS and VSLMS. A laboratory-scale prototype of compensator is realised using a voltage source converter with the controller implemented in the dSPACE-MicroLabBox. Both MATLAB simulation and experimental results are included to demonstrate the performance of shunt compensator under steady-state and dynamic loadings. The developed SRLMMN control technique mitigates power quality problems and effectively suppresses THD observed in the grid current with reference to IEEE Standard 519–2014.

For details refer to <https://doi.org/10.1049/iet-gtd.2019.0929>

Adaptive spline-based PLL for synchronization and power quality improvement in distribution system

Hemant Saxena, **Alka Singh*** and Jitendra Nath Rai

Abstract: A new type of non-linear adaptive phase-locked loop (PLL) has been proposed here, which is based on spline interpolation. The study discusses the method of cubic spline, which is used to extract the fundamental voltage component, its phase angle and frequency. Test results under varying grid conditions viz. normal and distorted conditions such as the presence of harmonics, noise, phase and frequency variations etc. are presented for the developed PLL. An application of the proposed PLL to power quality improvement of grid current using shunt active power filter is further discussed here. The study demonstrates that the spline-based controller can be effectively employed as a PLL and to achieve improvement in the power quality of a three-phase, three-wire power distribution system.

For details refer to <https://doi.org/10.1049/iet-gtd.2019.0662>

Design and performance analysis of improved Adaline technique for synchronization and load compensation of grid-tied photovoltaic system

Hemant Saxena, **Alka Singh*** and Jitendra Nath Rai

Abstract: The paper discusses the design, modelling, simulation, and implementation of improved Adaline technique, which has been used for grid synchronization as well as extended further for load compensation. A simple but effective method is proposed to improve the performance of the conventional Adaline technique. The conventional Adaline controller uses a fixed learning rate while the proposed Adaline is developed using variable learning, which improves both the steady-state and dynamic response. Simulation and experimental results have been demonstrated, which confirm the feasibility of the proposed approach. Suitable performance comparisons highlight the effectiveness of the proposed approach.

For details refer to <https://doi.org/10.1002/2050-7038.12388>

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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. From September 2011 to June 2014, he served as a Project Engineer in Wipro Technologies, Greater Noida, and India. He completed Ph.D. in the Department of Electrical Engineering, Delhi Technological University and Delhi, India in 2019. On completion of his PhD degree, he served in KIET Group of Institutions, Ghaziabad, as an Assistant Professor for one year. Currently, he is working as an assistant professor in 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 papers of many reputed peer reviewed SCI journals including IEEE transactions. His research areas of interest include electric machine drives, power electronics, nonlinear control, and renewable energy.

Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01

1. **A. Devanshu**, M. Singh and N. Kumar, “An improved nonlinear flux observer based sensorless FOC IM drive with adaptive predictive current control”, *IEEE Transactions on Power Electronics*, vol. 35, no. 1, pp. 652-666, 2020. Impact Factor: 6.373.

An improved nonlinear flux observer based sensorless FOC IM drive with adaptive predictive current control

Ambrish Devanshu, Madhusudan Singh and Narendra Kumar

Abstract: This paper presents a novel adaptive predictive current controller (PCC) with improved flux estimator for a sensorless direct field oriented control (DFOC) induction motor (IM) drive. Classical PCC performance depends on the stator resistance of the motor which varies with temperature. In the proposed method, a discrete stator resistance estimator is developed to increase the robustness of the system toward stator resistance variations. An improved nonlinear discrete stator flux estimator is also developed to replace the pure integrator which reduces the initial value and dc offset problems. Sensorless operation of IM drive has advantages of reduced overall cost and increased reliability of motor operation. Dynamic and steady-state performances of the IM under different operating conditions are analyzed in MATLAB/Simulink as well as experimentally using dSPACE1104 controller and have been compared with conventional PCC. The simulation results of the classical and proposed methods are also validated experimentally. Smooth starting, reduced oscillations in speed and flux at low-speed operation, fast speed and torque dynamics, robust operation of drive against load and variation in stator resistance, fast and smooth speed reversal are the main advantages of the proposed method over classical PCC-based DFOC IM drive.

For details refer to <https://doi.org/10.1109/TPEL.2019.2912265>



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Mr. Astitva Kumar is a research scholar in Department of Electrical Engineering. He completed his Bachelor of Technology from Uttar Pradesh Technical University in 2013 and Master of Technology from Delhi Technological University in 2015. His research focuses on developing optimization strategies for renewable energy sources. His interest is not only limited to optimization but also in soft-computing techniques, hybrid energy storage systems, designing controllers and power quality analysis. He has published papers in SCI and Scopus indexed journals and presented papers in various IEEE International conferences.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. Kumar**, M. Rizwan and U. Nangia, "A hybrid intelligent approach for solar photovoltaic power forecasting: Impact of aerosol data," *Arabian Journal of Science and Engineering*, vol. 45, no. 3, pp. 1715-1732, 2020. Impact Factor:1.711

A hybrid intelligent approach for solar photovoltaic power forecasting: Impact of aerosol data

Astitva Kumar, M. Rizwan and Uma Nangia

Abstract: The penetration of solar photovoltaic (PV) power in distributed generating system is increasing rapidly. The increased level of PV penetration causes various issues like grid stability, reliable power generation and power quality; therefore, it becomes utmost important to forecast the PV power using the meteorological parameters. The proposed model is developed on the basis of meteorological data as input parameters, and the impacts of these parameters have been analyzed with respect to forecasted PV power. The main focus of this research is to explore the performance of optimization-based PV power forecasting models with varying aerosol particles and other meteorological parameters. A newly developed intelligent approach based on grey wolf optimization (GWO) using multilayer perceptron (MLP) has been used to forecast the PV power. The performance of the GWO-based MLP model is evaluated on the basis of statistical indicators such as normalized mean bias error (NMBE), normalized mean absolute error (NMAE), normalized root-mean-square error (NRMSE) and training error. The results of the developed model show the values of NMBE, NMAE and NRMSE as 2.267%, 4.681% and 6.67% respectively. To validate the results, a comparison has been made with particle swarm optimization, Levenberg–Marquardt algorithm and adaptive neuro-fuzzy approach. The performance of the model is found better as compared to other intelligent techniques. The obtained results may be used for demand response applications in smart grid environment.

For details refer to <https://doi.org/10.1007/s13369-019-04183-0>



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Mr. Dinesh Kumar Atal is presently working as Assistant Professor in the Department of Biomedical Engineering, Deenbandhu Chhotu Ram University of Science and Technology, Murthal, Sonapat Haryana since 2006. He is pursuing Ph.D. in the Department of Electrical Engineering at Delhi Technological University, Delhi, since August-2016. Mr. Dinesh has received a B.Tech. degree in Biomedical Engineering in 2005 from Guru Jambheshwar University of Science and Technology, Hisar (Haryana) India and M.Tech. Electrical Engineering with specialization in Instrumentation and Control from Deenbandhu Chhotu Ram University of Science and Technology, Sonapat (Haryana) India in 2011. Dinesh's research interests include machine learning, data compression, filtering, classification algorithms, signals, and image processing of human physiological signals. He has published several journal and conference papers on ECG and EEG signals analysis and processing. Dinesh has Biomedical Industrial experience where he has learned the hardware and software designing of ECG, EEG, EMG machines with their quality control procedures. Dinesh is a graduate student member of IEEE (membership no. 93344398) and has membership in IEEE Engineering in Medicine and Biology Society.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. **D. K. Atal** and M. Singh, "A dictionary matrix generation based compression and bitwise embedding mechanisms for ECG signal classification", *Multimedia Tools and Applications*, vol. 79, no. 19, pp. 13139–13159, 2020. Impact Factor: 2.313.
2. **D. K. Atal** and M. Singh, "A hybrid feature extraction and machine learning approaches for epileptic seizure detection", *Multidimensional Systems and Signal Processing*, vol. 31, pp. 503–525, 2020. Impact Factor: 1.810.
3. **D. K. Atal** and M. Singh, "Arrhythmia classification with ECG signals based on the optimization-enabled deep convolutional neural network", *Computer Methods and Programs in Biomedicine*, vol. 196, pp. 105607, 2020. Impact Factor: 3.632.

A dictionary matrix generation based compression and bitwise embedding mechanisms for ECG signal classification

Dinesh Kumar Atal and Mukhtiar Singh

Abstract: The Electrocardiogram (ECG) signal processing is one of the exciting research areas in recent days. Ensuring security to the patient's confidential information is a demanding critical task in many healthcare systems. So, the traditional works developed the security mechanisms for embedding the original ECG signal with the image, audio, or video. But, it does not focus on reducing the size of the original message before transmitting it to others. Also, it has significant limitations of inefficient security, increased complexity, and reduced classification accuracy. To rectify this issue, our research proposed the new embedding mechanism to improve the security of patient's health information. In this system, the original ECG signals compressed at the initial stage by using the proposed Dictionary Matrix Generation (DMG) algorithm. Then, the compressed signals embedded within the cover image by using the Bitwise Embedding (BE) mechanism. At the receiver side, the bedded goal is de-embedded and decompressed by using the DMG and BE algorithms. The features such as spectral and peak values of the signal are extracted for increasing the efficiency of classification. Classification and detection of abnormality present in ECG signal of patient is the most essential part. To achieve this, we proposed the Modified Dynamic Classification (MDC) algorithm based on the features. In this work, the novelty is implemented in the compression, embedding, and classification stages. The proposed system reduces the data loss during transmission, memory storage and time complexity. The overall process evaluated by using PTB diagnostic ECG database. In experiments, the proposed classification technique provides the accuracy of 98.39% and it proved that the proposed method had highest performances than existing methods such as PNN, SVM and RF classification.

For details refer to <https://doi.org/10.1007/s11042-020-08671-6>

A hybrid feature extraction and machine learning approaches for epileptic seizure detection

Dinesh Kumar Atal and Mukhtiar Singh

Abstract: Epileptic seizure detection from the brain EEG signals is an essential step for speeding up the diagnosis that assists researchers and medical professionals. For this, various classification signal processing techniques have been developed in the traditional works. Still, they limit with the problems of increased complexity, reduced performance and insufficient classification rate. This motivates to design an automatic system for classifying the normal and abnormal EEG signals. Thus, an efficient machine learning approaches are implemented in this work, to overcome the existing techniques limitations. Here, an enhanced curvelet transform technique is established in order to overcome the disadvantage of Gabor and Wavelet transformations data loss and indiscriminate orientations. This method has the capacity to furnish the all the signals data required with no information loss of shearlet transformation and hence implemented to preprocess the given EEG signal, which smoothen the signal by eliminating the noise. Then, a modified graph theory, fractal dimension and novel pattern transformation techniques are employed to extract the features and patterns. The extraction of features is crucial for classification and compression of huge volume of EEG signal that possess low information. This theory improves the precision and speed of the computational technique. Most of the current research, Graph theory is reflected in the area of quantitative description of the time series data. It is predominantly employed for the reduction of noise and not affected during choosing the factors. From the patterns, the statistical features are extracted by using a standard gray level co-occurrence matrix technique that comprises entropy, homogeneity, energy, correlation and maximum probability. This method calculates the linear dependency of the adjacent samples thereby effective measurement of information loss in the transmitted signal is accomplished. Then, these extracted features are fed to the classifier named as novel random forest classification for detecting and classifying the signal as healthy, ictal and interictal. During simulation, various performance measures have been used for evaluating the results of existing and proposed classification techniques and results validate the efficacy of proposed technique.

For details refer to <https://doi.org/10.1007/s11045-019-00673-4>

Arrhythmia classification with ECG signals based on the optimization-enabled deep convolutional neural network

Dinesh Kumar Atal and Mukhtiar Singh

Abstract: Arrhythmia classification is the need of the hour as the world is reporting a higher death toll as a cause of cardiac diseases. Most of the existing methods developed for arrhythmia classification face a hectic challenge of classification accuracy and they raised the challenge of automatic monitoring and classification methods. Accordingly, the paper proposes the automatic arrhythmia classification strategy using the optimization-based deep convolutional neural network (deep CNN). The optimization algorithm named, Bat-Rider optimization algorithm (BaROA) is newly developed using the multi-objective bat algorithm (MOBA) and Rider Optimization Algorithm (ROA). At first, the wave and gabor features are extracted from the ECG signals in such a way that these features represent the individual ECG features. Finally, the signals are provided to the BaROA-based DCNN classifier that identifies conditions of the individual as arrhythmia and no-arrhythmia from the ECG signals. The methods are analyzed using the MIT-BIH Arrhythmia Database and the analysis is performed based on the evaluation parameters, like accuracy, specificity, and sensitivity, which are found to be 93.19 %, 95 %, and 93.98 %, respectively.

For details refer to <https://doi.org/10.1016/j.cmpb.2020.105607>



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Mr. Hemant Saxena is currently pursuing PhD at Delhi Technological University (DTU) in Electrical Engineering Department. He received B.Tech degree in Electrical Engineering from the Maharshi Dayanand University, Rohtak, India and M.E. degree in Power Systems from NITTTR, Bhopal, India. He has published six SCI journal papers and presented three papers in reputed international conferences. His research area is focused on the application of power electronics to improve the power quality in the grid-tied PV systems.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **H. Saxena**, A. Singh and J. N. Rai, “Adaptive spline-based PLL for synchronisation and power quality improvement in distribution system”, *IET Generation, Transmission and Distribution*, vol. 14, no. 7, pp. 1311-1319, 2020. Impact Factor: 2.862.
2. **H. Saxena**, A. Singh and J. N. Rai, “Design and performance analysis of improved Adaline technique for synchronization and load compensation of grid-tied photovoltaic system”, *International Transactions on Electrical Energy Systems*, vol. 30, no. 6, pp. e12388, 2020. Impact Factor: 1.692.

Adaptive spline-based PLL for synchronization and power quality improvement in distribution system

Hemant Saxena, Alka Singh and Jitendra Nath Rai

Abstract: A new type of non-linear adaptive phase-locked loop (PLL) has been proposed here, which is based on spline interpolation. The study discusses the method of cubic spline, which is used to extract the fundamental voltage component, its phase angle and frequency. Test results under varying grid conditions viz. normal and distorted conditions such as the presence of harmonics, noise, phase and frequency variations etc. are presented for the developed PLL. An application of the proposed PLL to power quality improvement of grid current using shunt active power filter is further discussed here. The study demonstrates that the spline-based controller can be effectively employed as a PLL and to achieve improvement in the power quality of a three-phase, three-wire power distribution system.

For details refer to <https://doi.org/10.1049/iet-gtd.2019.0662>

Design and performance analysis of improved Adaline technique for synchronization and load compensation of grid-tied photovoltaic system

Hemant Saxena, Alka Singh and Jitendra Nath Rai

Abstract: The paper discusses the design, modelling, simulation, and implementation of improved Adaline technique, which has been used for grid synchronization as well as extended further for load compensation. A simple but effective method is proposed to improve the performance of the conventional Adaline technique. The conventional Adaline controller uses a fixed learning rate while the proposed Adaline is developed using variable learning, which improves both the steady-state and dynamic response. Simulation and experimental results have been demonstrated, which confirm the feasibility of the proposed approach. Suitable performance comparisons highlight the effectiveness of the proposed approach.

For details refer to <https://doi.org/10.1002/2050-7038.12388>



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Imran Ahmad Quadri received B.Tech. from Aligarh Muslim University, Aligarh in 2007, M. tech from Jamia Millia Islamia, Delhi in 2012 and PhD in Electrical Engineering from Delhi Technological University, India in 2019. He has more than six year Teaching and industrial experience. He has research publications in international reputed journals and conferences. His areas of interest are Power system analysis, Distributed generation technologies and Artificial Intelligence.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **I. A. Quadri** and S. Bhowmick, "A hybrid technique for simultaneous network reconfiguration and optimal placement of distributed generation resources," *Soft Computing*, vol. 24, pp. 11315–11336, 2020. Impact Factor: 3.050.

A hybrid technique for simultaneous network reconfiguration and optimal placement of distributed generation resources

Imran Ahmad Quadri and Suman Bhowmick

Abstract: A new meta-heuristic method, comprehensive teaching learning harmony search optimization algorithm (CTLHSO), is developed in this paper for the simultaneous reconfiguration and optimal allocation of distributed generation resources in radial distribution systems. The proposed method is a hybridization of the teaching–learning-based optimization (TLBO) and the harmony search (HS) algorithms. Primarily, eleven mathematical benchmark functions are used to test the performance of the CTLHSO algorithm. The results are then compared with that of global best artificial bee colony (GABC), particle swarm artificial bee colony (PS-ABC), TLBO and improved TLBO (I-TLBO) with identical parameters and initial conditions. The results show that the CTLHSO performance is better than the G-ABC, PS-ABC, TLBO and I-TLBO. Subsequently, CTLHSO is implemented on the IEEE 33-bus and 69-bus radial distribution systems for network reconfiguration and optimal placement of distributed generation resources to minimize the power losses and improve the voltage profiles. Five case studies at three different load levels are carried out. The results obtained are found to be better than those obtained with HS algorithm, genetic algorithm, refined genetic algorithm and fireworks algorithm.

For details refer to <https://doi.org/10.1007/s00500-019-04597-w>



DR. MAYANK KUMAR

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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–dc, dc–ac, and ac–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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **M. Kumar**, “Enhanced solar PV power generation under PSCs using shade dispersion”, *IEEE Transactions on Electron Devices*, vol. 67, no. 10, pp. 4313-4320, 2020. Impact Factor: 2.913.

Enhanced solar PV power generation under PSCs using shade dispersion

Mayank Kumar

Abstract: The solar photovoltaic (PV) array generates the power below the rated value due to the shading intensity and shading pattern losses under partial shading conditions (PSCs). The different levels of solar irradiance are received by the modules of PV array under PSCs; it causes the mismatch between the generated module currents, leading unfortunate impacts such as hot-spot and therefore total PV power generation reduces. Resulting, the efficiency of solar PV array decreases. This article presents the optimal energy harvesting using physical relocation and fixed column position of modules with fixed electrical connection (PRFCPMFEC) under different shading conditions. The proposed algorithm is presented for $m \times n$ modules under different shading conditions. The locations of modules are changed according to the proposed configuration without removing the electrical connections. A comparative analysis has also been presented between proposed pattern configuration, total cross tied (TCT), and physical relocation of the modules with a fixed electrical connection (PRM-FEC) configuration. The results demonstrated that the proposed array configuration produced the improved performance under PSCs.

For details refer to <https://doi.org/10.1109/TED.2020.3015171>



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Prof. Narendra Kumar obtained his B.Sc. Engineering and M.Sc. Engineering from Aligarh Muslim University, Aligarh during the year 1984 and 1987 respectively. He completed his Ph.D. degree from University of Roorkee, Roorkee, India in 1995. Presently he is Professor, Department of Electrical Engineering, Delhi Technological University, Delhi, India. He has published more than 250 research papers in reputed journals and conference proceedings. He has been awarded Pandit Madan Mohan Malviya Memorial Prize during the years 1995 and 2018. Prof. Narendra has supervised 14 Ph. D. thesis. He has also been awarded K.F. Antia Memorial Medal during the year 2001. His area of interest are Power System Operation & Control, Flexible AC Transmission Systems, AGC, and Voltage Stability etc.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. I. Singh, **N. Kumar**, S. K.G., T. Sharma, V. Kumar and S. Singhal, "Database intrusion detection using role and user behavior based risk assessment", *Journal of Information Security and Applications*, vol. 55, pp. 102654, 2020. Impact Factor: 2.327.

Database intrusion detection using role and user behavior based risk assessment

Indu Singh, **Narendra Kumar***, Srinivasa K.G., Tript Sharma, Vaibhav Kumar and Siddharth Singhal

Abstract: Present-day organizations continue to expose their critical information infrastructures over the Internet for facilitating accessibility; substantially raising concerns about the security of data from both outsiders and insiders. In this paper, we propose a novel approach for detecting intrusive attacks on databases by assessing the risk for incoming transaction based upon the conflation of multiple behavior-based components for the user. In a database intrusion detection system for a role-based access (RBAC) environment, it is not sufficient to focus on role-based features as every user within the same role has a degree of uniqueness. Moreover, traditional database intrusion detection systems classify the incoming transactions into two classes (Malicious or Non-malicious), taking the same action for all transactions that are labeled as malicious irrespective of the damage it can cause to the system. Our approach, Role and User Behavior-based Risk Assessment (RUBRA) uses both role-behavior and user-behavior based features for detecting an intrusive attack. Further, we also quantify the risk associated with the incoming transaction, streamlining the countermeasure process. Experiments on stochastic datasets show promising results on both detection and labeling of malicious transactions.

For details refer to <https://doi.org/10.1016/j.jisa.2020.102654>

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Pallavi Verma completed her M.E. degree in Instrumentation & Control from National Institute of Technical Teachers Training & Research, Chandigarh, India in 2015. Presently, she is pursuing her Ph.D. in Department of Electrical Engineering at Delhi Technological University, Delhi. Her are of research interest are renewable energy and power electronics.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **P. Verma**, R. Garg and P. Mahajan, “Smooth LMS-based adaptive control of SPV system tied to grid for enhanced power quality”, *IET Power Electronics*, vol. 13, no. 15, pp. 3456 – 3466, 2020. Impact Factor: 2.672.
2. **P. Verma**, R. Garg and P. Mahajan, “Asymmetrical interval type-2 fuzzy logic control based MPPT tuning for PV system under partial shading condition”, *ISA Transactions*, vol. 100, pp. 251-263, 2020. Impact Factor: 4.305.

Smooth LMS-based adaptive control of SPV system tied to grid for enhanced power quality

Pallavi Verma, Rachana Garg and Priya Mahajan

Abstract: In this study, a novel smooth least mean square (LMS) algorithm for controlling PV inverter has been proposed to estimate the reference current for synchronisation of solar photovoltaic (SPV) to the grid. The proposed control extracts both active and reactive fundamental components of the load current with improved convergence rate. These currents are compared with sensed grid currents to generate gating pulses for a voltage source converter. It also compensates the load harmonics, reduces voltage fluctuation at point of common coupling and supplies the reactive power demand of the local load. The algorithm has been tested under steady state and transient conditions for input variation as well as load variation under the power factor correction mode of operation. The algorithm has been developed in MATLAB/Simulink. Further, the efficacy of the proposed control algorithm has been tested on prototype hardware setup developed in the laboratory using dSPACE1104. The total harmonic distortion at the grid side, obtained from simulated and hardware results are well within the IEEE standards.

For details refer to <https://doi.org/10.1049/iet-pel.2020.0134>

Asymmetrical interval type-2 fuzzy logic control based MPPT tuning for PV system under partial shading condition

Pallavi Verma, Rachana Garg and Priya Mahajan

Abstract: The conventional maximum power point tracking (MPPT) algorithm shows best performance under uniform insolation but when photovoltaic (PV) array is partially irradiated, the Power vs Voltage (P-V) plot consists of multiple local maxima power point (LMPP) and one global maxima power point (GMPP). The conventional MPPT algorithm may track local peak and fluctuate around it, resulting in lower power tracking. To eradicate this drawback of conventional algorithm, the solar PV system requires the synthesis of modified controller which is able to discriminate between local and global peak point. Along with implementing modified MPPT controller, to minimise the adverse effect of partial shading on PV system, different PV array arrangements like series-parallel (SP), honey comb (HC), total cross tied (TCT) etc. may be used. Author(s) in the present study, has proposed asymmetrical interval type-2 fuzzy logic control (IT-2 AFLC) based MPP algorithm for tracking global peak in partial shading condition (PSC) with different PV array arrangements. The presented algorithm has been compared with other approaches viz. perturb & observe (P&O) and type-1(T-1) FLC for GMPP tracking, fill factor, shading losses, mismatch loss and efficiency to establish its superiority. For evaluating the efficiency of different algorithms, the EN50530 MPPT efficiency test has been performed under dynamic condition. The proposed algorithm has been developed under MATLAB/Simulink environment.

For details refer to <https://doi.org/10.1016/j.isatra.2020.01.009>



BIOGRAPHY

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Poras Khetarpal is currently pursuing PhD in Electrical engineering department of DTU. His research area includes deep learning, power quality events classification, convolutional neural networks.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **P. Khetarpal** and M. M. Tripathi, “A critical and comprehensive review on power quality disturbance detection and classification”, *Sustainable Computing: Informatics and Systems*, vol. 28, pp. 100417, 202. Impact Factor: 2.798.

A critical and comprehensive review on power quality disturbance detection and classification

Poras Khetarpal and Madan Mohan Tripathi

Abstract: With an elevating demand and use of power electronics equipment, green energy and the development of smart grids, power quality disturbance detection and classification holds great importance. It is important not only from the technical point of view but from an economic perspective also. This paper presents a comprehensive review of the work done until now in the field of power quality disturbance detection and classification. In this paper, signal processing techniques such as Fourier transform (FT) and its variants (STFT, DFT, FFT), S transform (ST), Hilbert Huang transform (HHT), Wavelet transform (WT) along with machine learning techniques for classification such as Neural Networks (NN), Support Vector Machine (SVM), Fuzzy Logic (FL), Neuro Fuzzy (NF) techniques, Deep Learning methods etc. have been extensively reviewed. Different combinations of signal processing techniques with machine learning techniques have also been reviewed. Comparison and proper analysis of different techniques are given in tabular form along with the bona-fide review of the major work done hitherto in this domain. This paper may prove to be a good help for researchers working in the field of power quality disturbance detection and classification.

For details refer to <https://doi.org/10.1016/j.suscom.2020.100417>



BIOGRAPHY

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Rupam Singh (SM'18) received the B.Tech. degree in Electrical and Electronics Engineering from Hindustan College of Science and Technology, Mathura, India in 2013, and the M.Tech. degree in Control System from Amity University, Noida, India, in 2016. She is currently pursuing the Ph.D. degree with the Department of Electrical Engineering, Delhi Technological University, New Delhi, India. She has many publications in peer-reviewed journals like IEEE Transactions, Springer, Wiley, Elsevier and presented her work in several International Conferences as well. Her area of research is artificial intelligence, control system, fault diagnosis and their application in robotics and unmanned vehicles.

Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01
Commendable Research Award	02

1. **R. Singh** and B. Bhushan, "A novel fault classification-based fault-tolerant control for two degree of freedom helicopter systems", *International Journal of Adaptive Control and Signal Processing*, vol. 34, no. 8, pp. 1080-1104, 2020. Impact Factor: 2.116.
2. **R. Singh** and B. Bhushan, "Data-driven technique-based fault-tolerant control for pitch and yaw motion in unmanned helicopters". *IEEE Transactions on Instrumentation and Measurement*, vol. 70, pp. 1-11, 2020. Impact Factor: 3.658.
3. **R. Singh** and B. Bhushan, "Real-time control of ball balancer using neural integrated fuzzy controller", *Artificial Intelligence Review*, vol. 53, no. 1, pp. 351-368, 2020. Impact Factor: 5.747.

A novel fault classification-based fault-tolerant control for two degree of freedom helicopter systems

Rupam Singh and Bharat Bhushan

Abstract: Fault detection and diagnosis (FDD) plays an essential role in identifying and isolating various faults in a system. In general, fault detection is attained by monitoring the extent of matching between the actual operating condition and an analytical model prediction. This process aids in achieving enhanced performance, and for operating the system within the acceptable bounds. In this article, a neural network-based classification method and fuzzy-based control strategy are adapted to perform FDD on a two degree of freedom (2DoF) helicopter system. The operating voltage, pitch, and yaw outputs of the 2DoF helicopter system were considered for developing the algorithm. The signal processing properties of the discrete wavelet transform and pattern recognition properties of a multilayer perceptron neural network are adapted to design the classification algorithm. The developed algorithm improves training and testing efficiency. In order to reinstate the normal operation of the system, the classifier output is integrated with a hybrid fuzzy-proportional integral derivative controller. This control technique enhances the 2DoF helicopter response as the time taken by the pitch and yaw angle to settle trajectory is reduced. The results depicted validate the efficiency of the projected approach.

For details refer <https://doi.org/10.1002/acs.3121>

Data-driven technique-based fault-tolerant control for pitch and yaw motion in unmanned helicopters

Rupam Singh and Bharat Bhushan

Abstract: This article proposes a fault-tolerant control (FTC) algorithm to monitor the anomalies and control them for unmanned helicopters. This overcomes the drawbacks due to heteroscedasticity and restrictions on the input variables in conventional FTCs and improves the training and testing efficiencies with enhanced control. This is achieved by adopting the support vector data descriptor (SVDD) to learn the operating states of the unmanned helicopter during normal and motor fault operations. Furthermore, a neural integrated fuzzy (NiF) controller is trained to cope up with the states classified by the developed classifier. To realize the development of the proposed control algorithm, the motor faults in the unmanned helicopter are developed by observing the pitch and yaw motor operation of unmanned helicopters. A two-class classification is developed using SVDD for identifying the motor faults and the NiF is trained for controlling the plant during the anomaly. The results depicted 98.6% training accuracy and 98.96% prediction accuracy along with efficient control when tested for a faulty condition on a helicopter test rig.

For details refer to <https://doi.org/10.1109/TIM.2020.3025656>

Real-time control of ball balancer using neural integrated fuzzy controller

Rupam Singh and Bharat Bhushan

Abstract: This paper presents the design, control, and validation of two degrees of freedom Ball Balancer system. The ball and plate system is a nonlinear, electromechanical, multivariable, closed-loop unstable system on which study is carried out to control the position of ball and plate angle. The model of the system is developed using MATLAB/Simulink, and neural integrated fuzzy and its hybridization with PID have been implemented. The performance of each controller is evaluated in terms of time response analysis and steady-state error. Comparative study of simulation and real-time control results show that by using the neural integrated fuzzy controller and neural integrated fuzzy with proportional-integral-derivative Controller, the peak overshoot is reduced as compared with the PID controller and lead the system prone to appropriate balancing. These control techniques provide a stable and controlled output to the system for ball balancing and plate angle control.

For details refer <https://doi.org/10.1007/s10462-018-9658-7>



DR. VINOD KUMAR YADAV
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Dr. 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 Associate Professor of Electrical Engineering Department, Delhi Technological University (Previously Delhi College of Engineering), Delhi, India. Dr. Yadav has received Commendable Research Award from Delhi Technological University, Delhi, 13 March 2020 and also received Best Teacher Award from National Education Association, Uttar Pradesh, October 1, 2016. Dr. Yadav has received best paper awards from ICEEE 2020, NPTI, Faridabad and he is also active member of Professional bodies like IEEE and Member, International Association of Engineers. Dr. Yadav has guided 04 Ph.D scholars and 30 M.Tech students. He has published around 100 papers in reputed Journals and conferences. His research interests include optimization of renewable energy systems, power system planning & optimization, distributed generation and smart grid.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. S. Ghosh, **V. K. Yadav** and V. Mukherjee, "A novel hot spot mitigation circuit for improved reliability of PV module", *IEEE Transactions on Device and Materials Reliability*, vol. 20, no. 1, pp. 191-198, 2020. Impact Factor: 1.407.
2. K. D. Bodha, **V. K. Yadav** and V. Mukherjee, "Formulation and application of quantum-inspired tidal firefly technique for multiple-objective mixed cost-effective emission dispatch", *Neural Computing and Applications*, vol. 32, pp. 9217-9232, 2020. Impact Factor: 4.774.

A novel hot spot mitigation circuit for improved reliability of PV module

Santosh Ghosh, **Vinod K. Yadav*** and Vivekananda Mukherjee

Abstract: Generation of hot spot in photovoltaic (PV) cells, under mismatch condition, is a reliability and safety issue associated with PV systems since its very early applications in satellites. Some of the solutions to this long-standing problem, proposed by the researchers in the past, were though effective in reducing the hot spot temperature, but were not accepted widely in commercial scale, because of design complexity and significant cost implications. The main aim of this paper is to present a novel hot spot mitigation circuit (HSMC), which effectively reduces temperature of the cells under mismatch conditions through a modified bypass arrangement, and thereby increase the reliability of the complete PV system. Special attention is paid to ensure that the proposed solution does not increase complexity of the bypass circuit to restrict its impact on the project cost and system reliability. Experimental investigation is carried out to quantify the comparative performance of the proposed HSMC vis-à-vis standard bypass circuit (SBC). Thermographic images revealed that temperature of the cells, under mismatch condition, reduced by up to 10.3 °C when protected by the proposed HSMC, while the temperature increased by 6 °C under protection of the SBC under same ambient and operating conditions.

For details refer to <https://doi.org/10.1109/TDMR.2020.2970163>

**Corresponding Author*

Formulation and application of quantum-inspired tidal firefly technique for multiple-objective mixed cost-effective emission dispatch

Kapil Deo Bodha, **Vinod Kumar Yadav*** and Vivekananda Mukherjee

Abstract: In this manuscript, a new quantum computing-based optimization algorithm is proposed to solve multiple-objective mixed cost-effective emission dispatch (MEED) problem of electrical power system. The MEED problem aims at maintaining proper balance between emission of pollutants and generation of power. The problem has been formulated here using cubic equation to reduce the nonlinearities of the system. It is transformed to single-objective problem by considering max to max penalty factor. The proposed optimization technique is inspired by the concept of quantum mechanics, gravitational force and firefly algorithm (FA) and is termed as quantum-inspired tidal FA (QITFA). The proposed QITFA is tested on IEEE 14-bus and IEEE 30-bus test system for four different load conditions. The obtained results are compared with the results yielded by some other state-of-the-art methods like Lagrangian relaxation method, particle swarm optimization (PSO), simulated annealing, quantum-behaved bat algorithm and quantum PSO. This paper proves the superiority of the proposed QITFA over all these methods. Further, the obtained results also suggest its effective and efficient implementation in MEED problem.

For details refer to <https://doi.org/10.1007/s00521-019-04433-0>

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PROF. VISHAL VERMA

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Prof. Vishal Verma is currently serving as a Full Professor with the Department of Electrical Engineering and is the Dean of international affairs. Prof. Vishal Verma received M.Tech. and Ph.D. degrees in power electronics from the Indian Institute of Technology, New Delhi, India. He joined the Delhi College of Engineering (now Delhi Technological University) in 2004, and became a Professor in May 2009. His fields of research interests include power electronics converters, power-quality issues, grid integration of renewable energy sources, hybrid ac–dc microgrids, charging infrastructure, and electric vehicles. Prof. Vishal Verma has successfully completed a Indo-UK sponsored research project “Reliable and Efficient System for Community Energy Solutions (RESCUES)” in collaboration with Imperial College London. He has also successfully completed an industrial research project in collaboration with Tangent, Canada. Prof. Verma is presently working on 3 International research projects in collaboration with esteemed universities like Norwegian University of Science and Technology, ENEA (Italy), CeaTech (France), Indian Institute of Technology, Delhi worth 10cr rupees. Prof. Verma is a technical expert to Department of Science and Technology (DST), Ministry of new and renewable energy. Prof. Verma has a patent and more than 100 research publications including more than 10 IEEE transactions to his credit.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **V. Verma**, R. Singh and R. Gour, “ADSIG as gen-former providing three port network for soft coupling of distribution feeders in addition to wind energy harvesting”, *International Journal of Electrical Power and Energy Systems*, vol. 117, pp. 105573, 2020. Impact Factor: 3.588.

ADSIG as gen-former providing three port network for soft coupling of distribution feeders in addition to wind energy harvesting

Vishal Verma, Ramesh Singh and Ritika Gour

Abstract: With increase in the Electric Vehicle (EV) load the coupling of feeder in the distribution has become essential. The paper prescribes the use of multiple Asymmetrical Dual Stator Induction Generator (ADSIG) acting as ‘Gen-Former’ to draw out coupling of feeders for bidirectional power transfer in addition to energy harvesting from the feed on its rotor from wind energy source. The paper presents an analysis of soft coupling for two feeders by providing route for power to flow from one power feeder to other power feeder region in addition to harvesting power from wind energy turbine. Asymmetrical Dual Stator Induction Generator (ADSIG) is modeled and analyzed for enacting as soft coupler for power transaction between two feeders together with wind energy harnessing. An experimental study is also done on a scaled down 3.75 kW developed prototype in the laboratory. The performance of the proposed system is analyzed and results show effective coupling between the feeders with power injection and effective power distribution by ADSIG under perturbing load conditions on either of the connected feeders.

For details refer to <https://doi.org/10.1016/j.ijepes.2019.105573>



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Akanksha Srivastava is a doctoral research scholar in the Electronics and Communication Engineering Department at Delhi Technological University, Delhi, India. She is also working as a Principal Investigator 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 Department of Science and Technology, Government of India at DTU Delhi. She studies Green communication technologies to minimize the effects of harmful radiation in the environment and how to save energy. She also served as an Assistant Professor in the Department of Electronics and Communication Engineering at PSIT- College of Engineering, Kanpur, India. She is an active member of various professional bodies like IEEE, IEEE Communications Society (ComSoc), and IEEE Women in Engineering (WIE).

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. Srivastava**, M. S. Gupta, and G. Kaur, “Energy efficient transmission trends towards future green cognitive radio networks (5G): Progress, taxonomy and open challenges”, *Journal of Network and Computer Applications*, vol. 168, pp. 102760, 2020. Impact Factor: 5.570.

Energy efficient transmission trends towards future green cognitive radio networks (5G): Progress, taxonomy and open challenges

Akanksha Srivastava, Mani Shekhar Gupta and Gurjit Kaur

Abstract:- With the growing cognizance about environmental concern and global warming-related to communication technologies, the researchers have been seeking some solutions to diminish the consumption of energy in the telecommunication industry. There is a remarkable advancement in mobile communication from simple voice-based devices to ubiquitous data-hungry smartphones. Nearly, 8 billion mobile subscribers are expected to be added by 2030 and also required an extra spectrum to serve. The existing static spectrum allocation-based technologies are not in a position to fulfill this extra spectrum requirement and handle this future traffic load. This volatile evolution of global traffic data urges research attention globally and can be handled by future cognitive radio networks. There is also a demand for providing fast speed and seamless services for which operators need to deploy more base stations continuously and increase the transmitting antenna power. As a result, a drastic hike in emissions of carbon dioxide into the environment, and exposure to harmful radiations in large amounts which is also authentically harmful to humans, animals, and birds. This increased energy consumption and scarcity of resources have made the energy as a geopolitical issue for 21 centuries. In this direction, this work contributes by introducing cognitive-based green communication technology to ensure the environmental and health concerns caused due to hike in the CO₂ level. In the second phase, an enlightening survey on futuristic approaches for making the future wireless networks green is covered with pros and cons. In the third phase, this paper provides a framework of research challenges with ongoing project activities on green communication which further requires attention from the research community.

For details refer to <https://doi.org/10.1016/j.jnca.2020.102760>

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Avinash Ratre is an Assistant Professor in Department of Electronics and Communication Engineering at Delhi Technological University (DTU), Delhi, India since 2010. He is currently pursuing the Ph.D. (Part-Time) degree at the Department of Electronics and Communication Engineering, Indian Institute of Technology (IIT), Roorkee, Uttarakhand, India. His research interests include signal processing, computer vision, machine learning, and digital communication.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. Ratre**, “Stochastic gradient descent–whale optimization algorithm-based deep convolutional neural network to crowd emotion understanding”, *The Computer Journal*, vol. 63, no. 2, pp. 267-282, 2020. Impact Factor: 1.077.

Stochastic gradient descent-whale optimization algorithm-based deep convolutional neural network to crowd emotion understanding

Avinash Ratre

Abstract: Crowd emotion understanding is an interesting research area that assists the security personnel to read the emotion/activity of the crowd in the locality. Most of the traditional methods utilize the low-level visual features to understand the crowd emotions that extend the gap between the low- and the high-level features. With the aim to develop an automatic method for emotion recognition, this paper utilizes the deep convolutional neural network (deep CNN). For the effective emotion recognition, it is essential to select the key frames of the video using the wavelet-based Bhattacharya distance. The key frames are fed to the space-time interest points descriptor that extracts the features and forms the input vector to the classifier. Deep CNN is trained using the proposed Stochastic Gradient Descent-Whale Optimization Algorithm, which is the unification of the standard stochastic gradient descent algorithm with whale optimization algorithm. The proposed classifier recognizes the emotions of the crowd, such as angry, escape, fight, happy, normal, running/walking and violence. The analysis of the method proved that the proposed approaches acquired a maximal accuracy, specificity, and sensitivity of 0.9693, 0.9936 and 0.9675, respectively.

For details refer to <https://doi.org/10.1093/comjnl/bxz103>



DR. CHHAVI DHIMAN

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Dr. Chhavi Dhiman has received the B.Tech. from Indira Gandhi Delhi Technical University for Women (IGDTUW), 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, Delhi, India. Her current research interest includes Machine Learning, Deep Learning, Pattern Recognition, Human Action Identification and Classification. She has received Commendable Research Award in 2019.

Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01

1. **C. Dhiman** and D. K. Vishwakarma, “View-invariant deep architecture for human action recognition using two-stream motion and shape temporal dynamics”, *IEEE Transactions on Image Processing*, vol. 29, pp. 3835-3844, 2020. Impact Factor: 9.369.

View-invariant deep architecture for human action recognition using two-stream motion and shape temporal dynamics

Chhavi Dhiman and Dinesh Kumar Vishwakarma

Abstract: Human action Recognition for unknown views, is a challenging task. We propose a deep view-invariant human action recognition framework, which is a novel integration of two important action cues: motion and shape temporal dynamics (STD). The motion stream encapsulates the motion content of action as RGB Dynamic Images (RGB-DIs), which are generated by Approximate Rank Pooling (ARP) and processed by using fine-tuned InceptionV3 model. The STD stream learns long-term view-invariant shape dynamics of action using a sequence of LSTM and Bi-LSTM learning models. Human Pose Model (HPM) generates view-invariant features of structural similarity index matrix (SSIM) based key depth human pose frames. The final prediction of the action is made on the basis of three types of late fusion techniques i.e. maximum (max), average (avg) and multiply (mul), applied on individual stream scores. To validate the performance of the proposed novel framework, the experiments are performed using both cross-subject and cross-view validation schemes on three publically available benchmarks-NUCLA multi-view dataset, UWA3D-II Activity dataset and NTU RGB-D Activity dataset. Our algorithm outperforms existing state-of-the-arts significantly, which is measured in terms of recognition accuracy, receiver operating characteristic (ROC) curve and area under the curve (AUC).

For details refer to <https://doi.org/10.1109/TIP.2020.2965299>



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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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **D. Pandey** and K. C. Tiwari, “Extraction of urban built-up surfaces and its subclasses using existing built-up indices with separability analysis of spectrally mixed classes in AVIRIS-NG imagery”, *Advances in Space Research*, vol. 66, no. 8, pp. 1829-1845, 2020. Impact Factor: 2.178.

Extraction of urban built-up surfaces and its subclasses using existing built-up indices with separability analysis of spectrally mixed classes in AVIRIS-NG imagery

Dwijendra Pandey and K. C. Tiwari

Abstract: Understanding the urban environments and their spatio-temporal behavior is necessary for local and regional planning along with environmental management. For monitoring and analyzing the urban environment, remote sensing imagery has been widely used due to its ability for repetitive coverage over large geographical areas. Compared with conventional per-pixel and sub-pixel analysis of remote sensing imagery, spectral indices have noticeable advantages because of their easy implementation and fast execution. However, most of the spectral indices are designed for multispectral imagery to extract only one land cover class, and confusion between other land cover classes still persists. This research explores the most significant spectral bands in AVIRIS-NG hyperspectral imagery for detection of built-up surfaces and its subclasses i.e. roads and roofs. Further, this study utilizes existing built-up indices for detection of urban built-up surfaces in the first level followed by its subcategories in the second level. Finally, a separability analysis between spectrally mixed urban land cover classes using various measures is also addressed. Results of the analysis indicate that BSI, NBI, and BAEI can prove to be effective for extraction of built-up surfaces with an overall accuracy (OA) of 93.89%, 90.11%, and 85.15%, respectively. Further, REI with OA of 94.40% appears to be suitable for extraction of road surfaces while NBAI with 95% OA can prove its efficacy for extraction of rooftops in AVIRIS-NG imagery. It also concludes that, for aforesaid indices, built-up surfaces (Level-1 and 2) can be effectively separated from the bare soil in hyperspectral imagery with slight confusion between road and roof surfaces.

For details refer to <https://doi.org/10.1016/j.asr.2020.06.038>



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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, in 2012 and completed Ph.D. from Delhi Technological University, Delhi, India, in Dec.2020. He has 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 given by Mr. P S Negi (Senior Principal Scientist). Currently, he is working as an Associate Professor in Galgotia College of Engineering and Technology, Greater Noida, Uttar Pradesh. 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 receiver/transmitter, THz MIMO antenna , absorbers and LNA etc.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. **G. Saxena**, P. Jain and Y. K. Awasthi, “High diversity gain MIMO-antenna for UWB applications with WLAN notch band characteristic including human interface devices”, *Wireless Personal Communications*, vol. 112, pp. 105–121, 2020. Impact Factor: 1.061.
2. **G. Saxena**, Y. K. Awasthi and P. Jain, “High isolation and high gain super-wideband (0.33-10 THz) MIMO antenna for THz applications”, *Optik*, vol. 223, pp. 165335, 2020. Impact Factor: 2.187.
3. **G. Saxena**, P. Jain and Y. K. Awasthi, “High diversity gain super -wideband single notch circularly polarized MIMO antenna for multiple wireless applications”, *IET Microwaves, Antennas and Propagation*, vol. 14, no. 1, pp. 109-119, 2020, Impact Factor: 1.972.

High diversity gain MIMO-antenna for UWB applications with WLAN notch band characteristic including human interface devices

Gaurav Saxena, Priyanka Jain and Y. K. Awasthi

Abstract: In this paper, a UWB–MIMO antenna with the WLAN band-notch (5.1–5.85 GHz) characteristic is offered. This antenna consists of two radiated patch feeding with a tapered line and fabricated on abundantly available FR-4 substrate having the size of $36 \times 22 \times 1.6$ mm³. A notched-band response is achieved by introducing an open-ended stub on the ground plane. Results illustrate that the designed antenna has an impedance bandwidth from 3.1 to 11.2 GHz as well as good isolation i.e. $S_{21} \leq -30$ dB. Radiation efficiency is greater than 0.75 except the notched band is < 0.5 . Diversity performance is also set the new paradigm in terms of ECC (≤ 0.008), TARC (≤ -25 dB), CCL (≤ 0.3 bits/s/Hz), Mean effective gain ratio (MEGi) $\cong 1$ and directive gain (≥ 9.95 dB) except the notched band. Proposed antenna characteristics are also found suitable for a human interface device, low-cost, and easily fabricated. Simulated results of the proposed antenna are tested and verified by the experimental results.

For details refer to <https://doi.org/10.1007/s11277-019-07018-1>

High isolation and high gain super-wideband (0.33-10 THz) mimo antenna for THz applications

Gaurav Saxena, Priyanka Jain and Y. K. Awasthi

Abstract: In this paper, an elliptical-shaped microstrip feed super-wideband (SWB) 2-elements MIMO antenna is proposed for high-speed terahertz (THz) applications. It has 2:1 VSWR operating bandwidth from 0.33-10THz (187%) with 19dBi peak realized gain. Radiation Efficiency is also greater than 70% throughout SWB bandwidth. The 2-element MIMO antenna is designed with a compact size of $1000 \times 1400 \times 101.29$ μm^3 on RT5880 substrate having relative permittivity of 2.2. Simulated results of antenna-like return loss, isolation, and diversity performance parameters (ECC, DG, TARC, etc.) are in an acceptable range. Therefore this antenna is useful for B5G, vehicular communications, Imaging, 3D printing, Terahertz wave Radar, Health care, and Astronomical radiometric application.

For details refer to <https://doi.org/10.1016/j.ijleo.2020.165335>

High diversity gain super-wideband single band-notch MIMO antenna for multiple wireless applications

Gaurav Saxena, Priyanka Jain and Y. K. Awasthi

Abstract: A two-element super-wideband (SWB) MIMO antenna is proposed in this study. A step impedance microstrip feed line structure is introduced to achieve an SWB impedance bandwidth of 185%. This antenna is designed to be circularly polarised at 1.575 GHz (L1-band) and 26.0 GHz (K-band) by using closed ring resonator on the radiating patch. The EBG structures are used to improve FBR in lower (1.5–5 GHz) and higher bands (25–35 GHz). The proposed antenna is designed with compact size $55.6 \times 50.5 \times 1.6$ mm³ on FR-4 substrate including exotic diversity performance. This MIMO antenna is suitable for defence and handheld devices covering GPS/DCS/PCS/UMTS/Wi BRO/ISM/IRNSS/LTE (M/HB)/BLUETOOTH/IoT/ WiMAX/X/Ku/K/Ka-band and it is also suitable for 5G (sub-6 GHz/mm) applications with channel capacity of 11.34 bps/Hz. Simulated results of MIMO antenna like radiated power-based ECC and diversity parameters are also verified experimentally, which are in the acceptable range. Finally, this antenna is tested in a realistic environment for SAR application.

For details refer to [10.1049/iet-map.2019.0450](https://doi.org/10.1049/iet-map.2019.0450)



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Karteeek Viswanadha pursued B.Tech in Electronics and Communication Engineering from Gayatri Vidya Parishad College of Engineering (Autonomous)(Jawaharlal Nehru Technological University, Hyderabad) in 2007 and M.E with the specialization in Communication Systems from Birla Institute of Technology and Science, Pilani in 2009 respectively. He is pursuing PhD in the area of millimetre microwave devices from Delhi Technological University.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

- K. Viswanadha** and N. S. Raghava, “Design and analysis of a multi-band flower shaped patch antenna for WLAN /WiMAX/ISM band applications”, *Wireless Personal Communications*, vol. 112, pp. 863–887, 2020. Impact Factor: 1.061.

Design and analysis of a multi-band flower shaped patch antenna for WLAN/WiMAX/ISM band applications

KartEEK Viswanadha and Nallanthighal Srinivasa Raghava

Abstract: This paper presents the design and parametric analysis of a flower-shaped patch antenna. The proposed patch antenna is designed using FR-4 substrate mounted on the Jerusalem cross-shaped DGS structure. A Double Negative (DNG) triple Complementary Split Ring Resonator is embedded inside the substrate. A circular foam substrate with the dimensions of $10 \times 4 \times 10 \times 2 \text{ mm}^3$ is sandwiched between the patch and the FR-4 substrate. The overall dimensions of the patch are $23.5 \times 16 \text{ mm}^2$. The proposed antenna resonates at 5.2 GHz and 8.25 GHz respectively. This also possesses wide bandwidth of 1.2 GHz (24.1%) in the range of 4.95–6.15 GHz and 2.2 GHz (26.5%) in the range of 7.1–9.3 GHz. The gains in these bands are observed to be 3.93 dBi and 5.02 dBi respectively. The whole design is carried out in CST-microwave studio 2016 utilizing Finite Integration Technique. The developed multiband antenna can be useful for several wireless communication applications, such as WLAN, WiMAX, and ISM band. The proposed antenna is fabricated and its performance parameters are measured. The simulated and measured results are in good agreement.

For details refer to <https://doi.org/10.1007/s11277-020-07078-8>



BIOGRAPHY

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Dr. Lalit Goswami received his Diploma in Engineering (Instrumentation & Control) from Board of Technical Education Delhi, B.Tech degree (Instrumentation & Control) from Guru Gobind Singh Indraprastha University, New Delhi, M.Tech degree (Electronics & Communication) from Maharshi Dayanand University, Rohtak, Haryana and PhD from Department of Electronics & Communication Engineering, Delhi Technological University, New Delhi in the area of fabrication of III-Nitride based Energy Efficient Ultraviolet Photodetectors. He has more than ten years of hands on experience to operate highly sophisticated ultra high vacuum systems well supported by number of sensors, transducers, actuators and various process control loops. He has published various papers in International journals. He is now working as Technical Officer in CSIR - National Physical Laboratory, New Delhi (India).

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **L. Goswami**, N. Aggarwal, R. Verma, S. Bishnoi, S. Husale, **R. Pandey** and G. Gupta, “Graphene quantum dots functionalized ZnO-nanorods / GaN- nanotowers heterostructure based high-performance UV photodetector”, *ACS applied materials and interfaces*, vol. 12, no. 41, pp. 47038-47047, 2020, Impact Factor: 8.758.
2. **L. Goswami**, R. Pandey and G. Gupta, “Ultra-thin GaN nanostructures based self-powered ultraviolet photodetector via non-homogeneous Au-GaN interfaces”, *Optical Materials*, vol. 102, pp. 109820, 2020. Impact Factor: 2.779.

Graphene quantum dots functionalized ZnO-nanorods / GaN- nanotowers heterostructure based high-performance UV photodetector

Lalit Goswami, Neha Aggarwal, Rajni Verma, Swati Bishnoi, Sudhir Husale, Rajeshwari Pandey, and Govind Gupta

Abstract: The fabrication of a superior-performance ultraviolet (UV) photodetector utilizing graphene quantum dots (GQDs) as a sensitization agent on a ZnO-nanorod/GaN-nanotower heterostructure has been realized. GQD sensitization displays substantial impact on the electrical as well as the optical performance of a heterojunction UV photodetector. The GQD sensitization stimulates charge carriers in both ZnO and GaN and allows energy band alignment, which is realized by a spontaneous time-correlated transient response. The fabricated device demonstrates an excellent responsivity of 3.2×10^3 A/W at -6 V and displays an enhancement of $\sim 265\%$ compared to its bare counterpart. In addition, the fabricated heterostructure UV photodetector exhibits a very high external quantum efficiency of $1.2 \times 10^{6\%}$, better switching speed, and signal detection capability as low as ~ 50 fW.

For details refer to <https://dx.doi.org/10.1021/acsami.0c14246>

Ultra-thin GaN nanostructures based self-powered ultraviolet photodetector via non-homogeneous Au-GaN interfaces

Lalit Goswami, Rajeshwari Pandey and Govind Gupta

Abstract: We report the fabrication of ultra-thin GaN (0002) nanostructures based self-powered ultraviolet photodetector on Si (111) substrate. Non-homogeneous GaN nano-islands were perceived on Si surface with a thickness of ~ 30 nm and an average distribution density of 2×10^{10} cm⁻². Even at low dimension GaN-nanostructures film, the capability of ultraviolet detection of fabricated photodetector added novelty to this work, where performance parameters such as photosensitivity ($\sim 10^2$), detectivity ($\sim 10^9$ Jones), responsivity (1.76mA/W) and noise equivalent power (3.5×10^{-11} WHz^{-1/2}) under self-powered mode were observed. The transient photo-response measurement revealed a rapid rise and decay time constants of ~ 18 ms and ~ 27 ms respectively. Under varying optical power (1 mW⁻¹³ mW), the GaN photodetector displayed significant enhancement in photocurrent with increasing optical power. The performance of the fabricated detector has been also analysed under varying bias voltage where it revealed significantly enhanced responsivity (23 fold) and detectivity (~ 1000 fold). Such nanostructured self-powered GaN-based ultraviolet photodetector paves the way towards the fabrication of energy-efficient optoelectronic devices.

For details refer to <https://doi.org/10.1016/j.optmat.2020.109820>



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Dr. N. Jayanthi is an Assistant Professor in the department of Electronics and Communication Engineering at Delhi Technological University, since 2007. She has done B.E. in Electronics and Communication Engineering from Bharathidasan University, Trichy, Tamil Nadu, M.Tech. in Communication Systems from National Institute of Technology, Trichy, Tamilnadu and PhD in Delhi Technological University. She has involved in the 2 DST projects as Co-Principal Investigator. Her area of research interest includes image processing, machine learning and Communication systems. She has published a number of technical papers in International Conferences and reputed Journals.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **N. Jayanthi**, V. Rajput and S. Indu, “Underwater haze removal using contrast boosted grayscale image”, *Multimedia Tools and Applications*, vol. 79, no. 41, pp. 31007–31026, 2020. Impact Factor: 2.313.

Underwater haze removal using contrast boosted grayscale image

N. Jayanthi, Vishal Rajput and S. Indu

Abstract: Underwater images generally experience the ill effects of color shift, haze and contrast deterioration because of scattering and absorption of light in water. There are several techniques that can increase the contrast of an image but most of the techniques lose the originality of the image while increasing the contrast, making these techniques highly inefficient and undesirable. The main goal of the proposed work is to increase the contrast of an image along with the haze removal while keeping the original color intact. A two-step decolorization process is employed for the contrast boosting of the grayscale image, which is later used for reproducing the enhanced color image. Mean and standard deviation-based contrast mapping is used to increase the global contrast and Laplacian pyramids are used for enhancing the local contrast adaptively by identifying the edges in an image. Finally, by combining both the local and global approach a contrast boosted image is produced and the color image is retrieved by changing the L component in CIE Lab color space.

For details refer to <https://doi.org/10.1007/s11042-020-09429-w>



BIOGRAPHY

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Dr. 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 Vidyapeeth'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 Affinity Group.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. R. Sivaram, K. Gupta and N. **Pandey**, "A new realization scheme for dynamic PFSCCL style", *Integration*, vol. 75, pp. 169-177, 2020. Impact Factor: 1.214.

A new realization scheme for dynamic PFSCCL style

Ranjana Sivaram, Kirti Gupta and **Neeta Pandey***

Abstract: In this paper, a new scheme of logic function realization in dynamic positive feedback source-coupled logic (D-PFSCCL) style is proposed. The existing scheme implements only NOR/OR based realization of a logic function. Thus, a complex function in D-PFSCCL has high gate count which degrades the overall circuit performance measured in terms of power and delay. This paper therefore aims to resolve the issue by proposing a scheme which modifies the structure of a D-PFSCCL gate. The modified gate exhibits AND/OR functionality and is used to realize various functions. Simulations have been carried out by implementing various functions and comparing their performance with the existing schemes at 1 GHz. The results of performance comparison with existing schemes indicates significant reduction in gate count resulting in overall performance improvement.

For details refer to <https://doi.org/10.1016/j.vlsi.2020.05.004>

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Neha Sharma has completed B.Tech in Electronics and Communication Engineering from Indira Gandhi Delhi Technical University for Women in 2017. She has completed her M.Tech in Signal Processing and Digital Design from Delhi Technological University in 2019. She is pursuing Ph.D. in the Department of Electronics and Communication Engineering at Delhi Technological University.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **N. Sharma** and J. Panda, “Statistical watermarking approach for 3D mesh using local curvature estimation”, *IET Information Security*, vol. 14, no. 6, pp.745-753, 2020. Impact Factor: 1.068.

Statistical watermarking approach for 3D mesh using local curvature estimation

Neha Sharma and Jeebananda Panda

Abstract: In this study, an oblivious 3D mesh watermarking scheme is represented utilising local curvature estimation and statistical characteristics of 3D mesh to provide robustness as well as retaining the imperceptibility of the 3D model. The proposed method estimates the local curvature of 3D model by finding the difference between the average normal and the surface normal of all the faces in a 1-ring neighbourhood of a vertex under consideration. Feature vector of all vertices is then measured and used to select vertices for watermark insertion. Distributions of vertex norms are transformed statistically to hide the watermark as statistical parameters are more robust and less prone to attacks. The robustness and imperceptibility of the proposed method against various attacks are analysed through simulations.

For details refer to <https://doi.org/10.1049/iet-ifs.2019.0601>



PROF. O. P. VERMA

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Prof. O. P. Verma is presently holding a charge of Principal, G B Pant Govt. Engineering College Okhla Delhi on diverted capacity from DTU since April 20, 2017. Prior to joining the G B Pant Engineering College, he was Professor and Head, Department of Computer Science & Engineering (Aug 2014-April 2017). He has been Head of Department of Information Technology (Nov 2007- April 2017), Head, Computer Centre (Aug 2014- April 2017), and served as Dean, Continuing Education (Feb 2013- Dec 2015) as well at DTU. He was Chief Investigator of ISEA Project Phase-I and Phase-II, sponsored by Department of Electronics and Information Technology, Government of India at DTU. He has guided 07 PhD and presently 8 students are pursuing PhD under his supervision. He is an editor of two books. He has published more than 90 papers in reputed Journal and Conferences. He is having a Google Scholar H-index of 22 and i-10 index of 39. He was the Organizing Chair of IEEE India International Conference on Information Processing, 12-14 August 2016 and General chair, 4th International Conference on Computers and Management, 22-23 December 2018.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **O. P. Verma**, N. Jain and S. K. Pal, "A hybrid-based verifiable secret sharing scheme using chinese remainder theorem", *Arabian Journal for Science and Engineering*, vol. 45, no. 4, pp. 2395–2406, 2020. Impact Factor: 1.711.
2. **O. P. Verma**, N. Jain and S. K. Pal, "Design and analysis of an optimal ECC algorithm with effective access control mechanism for big data", *Multimedia Tools and Applications*, vol. 79, pp. 9757–9783, 2020. Impact Factor: 2.313.

A hybrid-based verifiable secret sharing scheme using chinese remainder theorem

Om Prakash Verma, Nitin Jain and S. K. Pal

Abstract: It is not always in the best interests to rely on an individual to have control of entire sensitive information. This has led to the need for secret sharing schemes, which divide secret (key) among many participants or shareholders. To avoid any cheating by any of the shareholders, the need for verifiable secret sharing (VSS) has emerged. In this context, a hybrid approach for VSS scheme is suggested in this paper. The proposed algorithm shares multiple secrets among shareholders, where shareholders are also divided/classified into different levels. Hence, it includes multiple as well as multilevel secret sharing. Secrets can be recovered at intra- or inter-level, where shareholders of higher level can contribute their shares to lower levels. To reduce the complexity, the one-way hash function is used instead of the hard number-theoretic problems. The proposed scheme stands against the dishonest dealer and shareholders. To rule out a typical dishonest strategy of leaking secret information in the valid shares, the concept of dealer leakage resilience is used by reducing the dealer's powers of selecting random values on his own. The execution is also done using cryptographic libraries. Finally, it is demonstrated that the scheme satisfies the security requirements of VSS.

For details refer to <https://doi.org/10.1007/s13369-019-03992-7>

Design and analysis of an optimal ECC algorithm with effective access control mechanism for big data

Om Prakash Verma, Nitin Jain and Saibal Kumar Pal

Abstract: Big data is a high volume data, as it comprises complex and large volume of information. A successful solution is to redistribute the data to a cloud server that has the capacity of storing and processing big data in an effective manner. The main intention of the research is to secure storage of big data and effective access control mechanism. The main stages of the proposed method are map reduce framework, secure storage process and access control mechanism process. Map Reduce is a distributed programming framework used to process big data. In mapper, the input dataset is grouped using hybrid kernel fuzzy c means (HKFCM) clustering algorithm. Finally, the reduced output is fed to the data owner for secure storage. In secure storage process, the suggested method utilizes optimal elliptic curve cryptography (OECC). Here the fundamental values are optimally selected by Modified grasshopper optimization algorithm (MGOA). In the access control mechanism, the effective policy update is proposed along with data storage construction and data deconstruction stage. The routine of the recommended method is assessed using memory and execution time by differentiating the number data size, number cluster size and the number of mapper. The proposed method attains the minimum time and memory utilization when compared to the existing method. The suggested method is implemented in cloud sim with Hadoop Map-reduce framework.

For details refer to <https://doi.org/10.1007/s11042-019-7677-2>



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Dr. Poornima Mittal (Ph.D, M.Tech(H), B.Tech), Member IEEE has published 100+ 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 and 2020 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 15 years of academic and research experience. Presently, she is working as Associate Professor in the Department of Electronics and Communication Engineering at Delhi Technological University, Delhi, India.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. P. Chamola and **P. Mittal**, “Impact of ZnTe, SbZnTe and SnZnTe absorber materials for multi-layered solar cell: Parametric extraction and layer wise internal analysis”, *Optik*, vol. 224, pp. 165626, 2020. Impact Factor: 2.187.
2. S. Negi, **P. Mittal** and B. Kumar, “In-depth analysis of structures, materials, models, parameters, and applications of organic light-emitting diodes”, *Journal of Electronic Materials*, vol. 49, no. 8, pp. 4610–4636, 2020. Impact Factor: 1.774.
3. S. Negi, **P. Mittal** and B. Kumar, “Numerical modeling and parameters extraction of novel triple hole block layer-based organic light-emitting diode for display”, *Journal of the Society for Information Display*, vol. 28, no. 12, pp. 956-964, 2020. Impact Factor: 1.645.

Impact of ZnTe, SbZnTe and SnZnTe absorber materials for multi-layered solar cell: Parametric extraction and layer wise internal analysis

Paritosh Chamola and **Poornima Mittal***

Abstract: In this research paper, Sb and Sn doped Zinc Telluride (ZnTe) thin films are prepared on the glass substrate through low-cost melt-quenching technique. These films are characterized to observe the nature of materials through XRD patterns. Subsequently, these materials are explored as the absorber-layer in the multi-layered solar cell. At 1.5 μm absorber thickness, the current density for SbZnTe and SnZnTe cells is improved by 1.1x and 2.6x respectively, as compared to ZnTe cell. This current density is augmented by 26 % and 31 % when thickness is incremented from 0.5 to 2.5 μm for SbZnTe and SnZnTe layers, respectively. The Fill Factor improves by 5.3 % for SbZnTe and 49 % for SnZnTe than ZnTe cell. Further, these cells are examined through horizontal-cut-line within the absorber layer and vertical-cut-line along the device thickness to explore layer-wise internal processes. Subsequently, potential distribution, Valance/Conduction band energy, charge carrier concentration, hole/electron current density, electric field and recombination rate are analyzed. The holes and electrons concentration are higher by 9.84 % and 8.96 % respectively for SnZnTe than SbZnTe cell. The conversion efficiency of SbZnTe and SnZnTe is achieved as 10.6 % and 17.8 % at 2.5 μm , which is higher by 1.15x and 1.93x in comparison to the ZnTe based solar cell. The SnZnTe cell shows holistic performance owing to its lowest band-gap of 1.39 eV. Moreover, this absorber material leads to highest charge carrier generation, thereby hole and electron current densities are improved by 11.86 % and 35.50 % than the SbZnTe cell.

For details refer to <https://doi.org/10.1016/j.ijleo.2020.165626>

**Corresponding Author*



In-depth analysis of structures, materials, models, parameters, and applications of organic light-emitting diodes

Shubham Negi, **Poornima Mittal*** and Brijesh Kumar

Abstract: Organic electronics and specifically organic light-emitting diode (OLED) devices based on organic semiconductor materials enable economically viable large-area flexible applications. This review presents a comprehensive and detailed assessment of different aspects related to OLEDs, focusing on the impact of multilayered architectures on device performance, in particular the impact of different layers and architectures to enhance the output from such devices. Furthermore, characteristic parameters, materials, and fabrication methodologies are reviewed in depth to highlight the major advancements related to OLEDs over the years. Mathematical models are important for predicting the internal operation and characteristics of such devices; thus, these are also discussed, focusing on methods to improve the performance parameters of OLEDs. Applications of OLEDs are also discussed, with a primary focus on research related to their improvement and enhancement for use in displays, sensors, and visual light communications. Although OLEDs show great promise for a bright future, several challenges such as the development of blue light-emitting materials, lifetime improvement, and application specific architectures must be addressed to achieve more dynamic devices for emerging commercial applications.

For details refer to <https://doi.org/10.1007/s11664-020-08178-8>

Numerical modeling and parameters extraction of novel triple hole block layer-based organic light emitting diode for display

Shubham Negi, **Poornima Mittal*** and Brijesh Kumar

Abstract: Depth knowledge regarding device internal physics is very essential, and its application aids to develop innovative methods for device performance enhancement. Taking this point into cognizance, the present article introduced a novel triple hole block layer (HBL) organic light-emitting diode (OLED) architecture and its analytical modeling based on Poisson's equation and drift diffusion equation. Compared with multilayered OLED and double HBL structure, the novel device depicted improvement of luminescence performance by 47% and 30% correspondingly, at a driving voltage of 18 V. Analytical analysis is undertaken to extract internal device parameters such as electron and hole concentration, their mobility, and current density. Analysis results revealed the reason for improved performance is higher electron concentration (2.53×10^{18}), 5% increase over multilayered OLED. Additionally, it is observed that mismatch in electron and hole concentration is small in novel triple HBL OLED and compared with multilayered OLED, the mismatch is lower by 63%. Therefore, objective to achieve a balanced electron and hole concentration is achieved by utilization of triple HBL OLED without increasing the overall device dimension.

For details refer to <https://onlinelibrary.wiley.com/doi/10.1002/jsid.952>

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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 11 papers during her doctoral degree in various reputed journals, international and national conferences.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **P. Garg** and P. Jain, "Isolation improvement of MIMO antenna using a novel flower shaped metamaterial absorber at 5.5 GHz WiMAX band", *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 67, no. 4, pp. 675-679, 2020. Impact Factor: 2.814.
2. **P. Garg** and P. Jain, "Novel ultrathin penta-band metamaterial absorber", *AEU-International Journal of Electronics and Communications*, vol. 116, pp. 153063, 2020. Impact factor: 2.924.

Isolation improvement of MIMO antenna using a novel flower shaped metamaterial absorber at 5.5 GHz WiMAX band

Priyanka Garg and Priyanka Jain

Abstract: This article demonstrates the use of metamaterial absorber (MA) to achieve high isolation between two patch antennas in a 2-element MIMO system operating at 5.5 GHz resonant frequency useful for WiMAX application. The proposed flower shaped MA, designed on a $9 \times 9 \text{ mm}^2$ FR-4 substrate with 1 mm thickness, exhibits near unity normalized impedance at 5.5 GHz with an absorptivity of 98.7%. A 4 element array of the MA is arranged in the form of a line in the middle of the two radiating patches in order to suppress the propagation of surface current between them at the operating frequency. Using the proposed flower shaped MA, an isolation of nearly 35 dB is achieved. The MIMO structure is studied in terms of return loss, isolation, overall gain, radiation pattern, Envelope Correlation Coefficient (ECC), Diversity Gain (DG), and Total Active Reflection Coefficient (TARC) etc. The structure is finally fabricated and measured to show good agreement with the simulated results.

For details refer to <https://doi.org/10.1109/TCSII.2019.2925148>

Novel ultrathin penta-band metamaterial absorber

Priyanka Garg and Priyanka Jain

Abstract: This paper presents a novel resonant metamaterial absorber exhibiting five resonant peaks with absorptivity more than 90% in the range from S band to Ku band for radar cross-section reduction and other FCC-airborne applications. The structure is designed on a low cost FR-4 substrate with 1 mm thickness which is equivalent to $\lambda/17.75$ where λ is the wavelength corresponding to maximum resonant frequency of absorption, showing its ultrathin nature. The fourfold symmetry of the design results in polarization insensitivity and provides an angular stability up to 60° of incident angle. The multiband characteristics are obtained by combining three different geometries in a single structure. Performance of the absorber is studied in terms of absorptivity, material parameters, normalized impedance, polarization insensitivity and oblique incidence. Finally, the design is fabricated on a $200 \times 200 \text{ mm}^2$ FR-4 substrate and measurements are performed.

For details refer to <https://doi.org/10.1016/j.aeue.2020.153063>



BIOGRAPHY

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Dr. Priyanka Jain is an Associate Professor in the Department of Electronics & Communications Engineering at Delhi Technological University, Delhi, India, where she has been a faculty member since 2011 with overall teaching and research experience of 20 years. She completed her Ph.D. at G.G.S.I.P. University, Delhi. Her research interests lie in the area of Signal Processing, Analog Electronics and Microwave Engineering. Dr. Priyanka Jain is (co-) author of more than 30 National and International journal papers and more than 40 publications in National and International conference proceedings. Three students have already been awarded PhD degree under her guidance, and another three are pursuing PhD under her. She has received Commendable Researcher Excellence Award in 2019 as well as 2020.}

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	06

1. P. Dahiya and **P. Jain**, “Efficient MDCT recursive structure for VLSI implementation”, *Circuits, Systems, and Signal Processing*, vol. 39, no. 3, pp. 1372–1386, 2020, Impact Factor: 1.681.
2. G. Saxena, **P. Jain** and Y. K. Awasthi, “High diversity gain super -wideband single notch circularly polarized MIMO antenna for multiple wireless applications”, *IET Microwaves, Antennas and Propagation*, vol. 14, no. 1, pp. 109-119, 2020. Impact Factor: 1.972.
3. P. Garg and **P. Jain**, “Isolation improvement of MIMO antenna using a novel flower shaped metamaterial absorber at 5.5 GHz WiMAX band”, *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 67, no. 4, pp. 675-679, 2020. Impact Factor: 2.814.
4. G. Saxena, **P. Jain** and Y. K. Awasthi, “High diversity gain MIMO-antenna for UWB applications with WLAN notch band characteristic including human interface devices”, *Wireless Personal Communications*, vol. 112, pp. 105–121, 2020. Impact Factor: 1.061.
5. G. Saxena, Y. K. Awasthi and **P. Jain**, “High isolation and high gain super-wideband (0.33-10 THz) MIMO antenna for THz applications”, *Optik*, vol. 223, pp. 165335, 2020. Impact Factor: 2.187.
6. P. Garg and **P. Jain**, “Novel ultrathin penta-band metamaterial absorber”, *AEU-International Journal of Electronics and Communications*, vol. 116, pp. 153063, 2020. Impact factor: 2.924.

Efficient MDCT recursive structure for VLSI implementation

Pragati Dahiya and **Priyanka Jain***

Abstract: Modified discrete cosine transform (MDCT) is a computationally intensive fundamental processing block for mapping time into frequency in various versions of MPEG audio coding. An efficient algorithm for MDCT computation is a basic requirement to realize low-cost audio codec. This paper introduces a new recursive algorithm and architecture for MDCT. The proposed architecture requires minimum hardware and execution time. Folding of the input sequence is performed multiple times in the subsequent groups which results in a significant reduction in real multiplication and real addition operations. Also, fewer number of execution cycles are required to generate the output through this algorithm. The proposed structure is suitable for parallel VLSI implementation as it is simple, regular and modular.

For details refer to <https://doi.org/10.1007/s00034-019-01195-x>

High diversity gain super -wideband single notch circularly polarized MIMO antenna for multiple wireless applications

Gaurav Saxena, **Priyanka Jain*** and Y. K. Awasthi

Abstract: A two-element super-wideband (SWB) MIMO antenna is proposed in this study. A step impedance microstrip feed line structure is introduced to achieve an SWB impedance bandwidth of 185%. This antenna is designed to be circularly polarised at 1.575 GHz (L₁-band) and 26.0 GHz (K-band) by using closed ring resonator on the radiating patch. The EBG structures are used to improve FBR in lower (1.5–5 GHz) and higher bands (25–35 GHz). The proposed antenna is designed with compact size $55.6 \times 50.5 \times 1.6 \text{ mm}^3$ on FR-4 substrate including exotic diversity performance. This MIMO antenna is suitable for defence and handheld devices covering GPS/DCS/PCS/UMTS/Wi-BRO/ISM/IRNSS/LTE (M/HB)/BLUETOOTH/IoT/WiMAX/X/Ku/K/Ka-band and it is also suitable for 5G (sub-6 GHz/mm) applications with channel capacity of 11.34 bps/Hz. Simulated results of MIMO antenna like radiated power-based ECC and diversity parameters are also verified experimentally, which are in the acceptable range. Finally, this antenna is tested in a realistic environment for SAR application.

For details refer to <https://doi.org/10.1049/iet-map.2019.0450>

**Corresponding Author*

Isolation improvement of MIMO antenna using a novel flower shaped metamaterial absorber at 5.5 GHz WiMAX band

Priyanka Garg and **Priyanka Jain***

Abstract: This article demonstrates the use of metamaterial absorber (MA) to achieve high isolation between two patch antennas in a 2-element MIMO system operating at 5.5 GHz resonant frequency useful for WiMAX application. The proposed flower shaped MA, designed on a $9 \times 9 \text{ mm}^2$ FR-4 substrate with 1 mm thickness, exhibits near unity normalized impedance at 5.5 GHz with an absorptivity of 98.7%. A 4 element array of the MA is arranged in the form of a line in the middle of the two radiating patches in order to suppress the propagation of surface current between them at the operating frequency. Using the proposed flower shaped MA, an isolation of nearly 35 dB is achieved. The MIMO structure is studied in terms of return loss, isolation, overall gain, radiation pattern, Envelope Correlation Coefficient (ECC), Diversity Gain (DG), and Total Active Reflection Coefficient

(TARC) etc. The structure is finally fabricated and measured to show good agreement with the simulated results.

For details refer to <https://doi.org/10.1109/TCSII.2019.2925148>

High diversity gain MIMO-antenna for UWB applications with WLAN notch band characteristic including human interface devices+

Gaurav Saxena, **Priyanka Jain*** and Y. K. Awasthi

Abstract: In this paper, a UWB-MIMO antenna with the WLAN band-notch (5.1–5.85 GHz) characteristic is offered. This antenna consists of two radiated patch feeding with a tapered line and fabricated on abundantly available FR-4 substrate having the size of $36 \times 22 \times 1.6 \text{ mm}^3$. A notched-band response is achieved by introducing an open-ended stub on the ground plane. Results illustrate that the designed antenna has an impedance bandwidth from 3.1 to 11.2 GHz as well as good isolation i.e. $S_{21} \leq -30 \text{ dB}$. Radiation efficiency is greater than 0.75 except the notched band is < 0.5 . Diversity performance is also set the new paradigm in terms of ECC (≤ 0.008), TARC ($\leq -25 \text{ dB}$), CCL ($\leq 0.3 \text{ bits/s/Hz}$), Mean effective gain ratio (MEGi) $\cong 1$ and directive gain ($\geq 9.95 \text{ dB}$) except the notched band. Proposed antenna characteristics are also found suitable for a human interface device, low-cost, and easily fabricated. Simulated results of the proposed antenna are tested and verified by the experimental results.

For details refer to <https://doi.org/10.1007/s11277-019-07018-1>

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+Eligible for Certificate only

High isolation and high gain super-wideband (0.33-10 THz) MIMO antenna for THz applications+

Gaurav Saxena, **Priyanka Jain*** and Y. K. Awasthi

Abstract: In this paper, an elliptical-shaped microstrip feed super-wideband (SWB) 2-elements MIMO antenna is proposed for high-speed terahertz (THz) applications. It has 2:1 VSWR operating bandwidth from 0.33-10THz (187%) with 19dBi peak realized gain. Radiation Efficiency is also greater than 70% throughout SWB bandwidth. The 2-element MIMO antenna is designed with a compact size of $1000 \times 1400 \times 101.29 \mu\text{m}^3$ on RT5880 substrate having relative permittivity of 2.2. Simulated results of antenna-like return loss, isolation, and diversity performance parameters (ECC, DG, TARC, etc.) are in an acceptable range. Therefore this antenna is useful for B5G, vehicular communications, Imaging, 3D printing, Terahertz wave Radar, Health care, and Astronomical radiometric application.

For details refer to <https://doi.org/10.1016/j.ijleo.2020.165335>

Novel ultrathin penta-band metamaterial absorber+

Priyanka Garg and **Priyanka Jain***

Abstract: This paper presents a novel resonant metamaterial absorber exhibiting five resonant peaks with absorptivity more than 90% in the range from S band to Ku band for radar cross-section reduction and other FCC-airborne applications. The structure is designed on a low cost FR-4 substrate with 1 mm thickness which is equivalent to $\lambda/17.75$ where λ is the wavelength corresponding to maximum resonant frequency of absorption, showing its ultrathin nature. The fourfold symmetry of the design results in polarization insensitivity and provides an angular stability up to 60° of incident angle. The multiband characteristics are obtained by combining three different geometries in a single structure. Performance of the absorber is studied in terms of absorptivity, material parameters, normalized impedance, polarization insensitivity and oblique incidence. Finally, the design is fabricated on a $200 \times 200 \text{ mm}^2$ FR-4 substrate and measurements are performed.

For details refer to <https://doi.org/10.1016/j.aeu.2020.153063>

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Rahul Thakur (Member, IEEE) pursuing Ph.D. under the supervision of Prof. Rajesh Rohilla in the Department of Electronics and Communication Engineering, Delhi Technological University, New Delhi, India. He is currently an Assistant Professor with the Electronics and Communication Engineering, Delhi Technological University. His current research interest includes machine learning, digital image processing, deep learning, image forensics, and computer vision.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **R. Thakur** and R. Rohilla, “Recent advances in digital image manipulation detection techniques: A brief review”, *Forensic Science International*, vol. 312, pp. 110311, 2020. Impact Factor: 2.108.

Recent advances in digital image manipulation detection techniques: A brief review

Rahul Thakur and Rajesh Rohilla

Abstract: A large number of digital photos are being generated and with the help of advanced image editing software and image altering tools, it is very easy to manipulate a digital image nowadays. These manipulated or tampered images can be used to delude the public, defame a person's personality and business as well, change political views, or affect the criminal investigation. The raw image can be mutilated in parts or as a whole image so there is a need for detection of what type of image tampering is performed and then localize the tampered region. Initially, single handcrafted manipulated images were used to detect the only image tampering present in the image but in a real-world scenario, a single image can be mutilated by numerous image manipulation techniques. Nowadays, multiple tampering operations are performed on the image and post-processing is done to erase the traces left behind by the tampering operation, making it more difficult for the detector to detect the tampering. It is seen that the recent techniques that are used to detect image manipulation are based on deep learning methods. In this paper, more focus is on the study of various recent image manipulation detection techniques. We have examined various image forgeries that can be performed on the image and various image manipulation detection and localization methods.

For details refer to <https://doi.org/10.1016/j.forsciint.2020.110311>



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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) 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. There are 8 PhD students pursuing PhD under her. Under her guidance 6 candidates completed PhD successfully. 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 was Technical Chair Person of International Conference IICIP 2016 organized by CSE Department of DTU during Aug 2016.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. A. Kaushik, M. Goswami, M. Manuja, **S. Indu** and D Gupta, “A binary PSO approach for improving the performance of wireless sensor networks”, *Wireless Personal Communications*, vol. 113, no. 1, pp. 263–297, 2020. Impact Factor: 1.061.

A binary PSO approach for improving the performance of wireless sensor networks

Ajay Kaushik, Mononito Goswami, Minkush Manuja, **S. Indu*** and Daya Gupta

Abstract: Wireless sensor networks are used for low-cost unsupervised observation in a wide-range of environments and their application is largely constrained by the limited power sources of their constituent sensor nodes. Techniques such as routing and clustering are promising and can extend network lifetime significantly, however finding an optimal routing and clustering configuration is a NP-hard problem. In this paper, we present an energy efficient binary particle swarm optimization based routing and clustering algorithm using an intuitive matrix-like particle representation. We propose a novel particle update strategy and an efficient linear transfer function which outperform previously employed particle update strategies and some traditional transfer functions. Detailed experiments confirmed that our routing and clustering algorithm yields significantly higher network lifetime in comparison to existing algorithms. Furthermore, our results suggest that Binary PSO is better equipped to solve discrete problems of routing and clustering than its continuous counterpart, PSO.

For details refer to <https://doi.org/10.1007/s11277-020-07188-3>

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Dr. Sachin Taran working as an Assistant Professor at Delhi Technological University Delhi, India, Since July 2020. He worked as a Research Fellow at the School of Electrical and Electronics Engineering, Nanyang Technological University (NTU) Singapore, From 2019 to June 2020. He 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 received B.E. degree in Electronics and Communication Engineering from SATI Vidisha, India, in 2008, and the M.E. degree from the Institute of Engineering and Technology, DAVV, Indore, India, in 2015. He received Ph.D. degree from the Indian Institute of Information Technology, Design and Manufacturing, Jabalpur, India. He has authored/co-authored 32 research papers in various reputed international publishers' journals/conferences, such as IEEE, Elsevier, Springer, IET, and IOP. His research interests include artificial intelligence, biomedical signal processing, and time-frequency analysis. He is a technical reviewer of leading international journals of IEEE and IET etc.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. A. Dutta, S. Kour and **S. Taran**, "Automatic drowsiness detection using electroencephalogram signal", *Electronics Letters*, vol. 56, no. 25, pp. 1383 – 1386, 2020. Impact Factor: 1.316.

Automatic drowsiness detection using electroencephalogram signal

A. Dutta, S. Kour and **S. Taran***

Abstract: Drowsiness refers to the state of being sleepy or the state of minimal concentration. It is characterised by a decrease in a person's memory capacity and brain information processing speed. These conditions cause hazards in the real-time working environment such as driving, monitoring power generation and patient health etc. These hazards can be sidestepped by introducing the automatic drowsiness detection system. This Letter suggested the electroencephalogram (EEG)-based automatic drowsiness detection method. The clustering variational mode decomposition (CVMD) explores the non-stationary behaviour of EEG for drowsiness detection. In CVMD optimum allocation sampling analyses non-homogenous EEG signals and converts those into homogeneous EEG clusters. These clusters are then decomposed into band-limited modes. The oscillatory mode characteristics are extracted in terms of several features. These features are fed as input into the least-squares support vector machine classifier. The proposed method provides better drowsiness detection performance in comparison with the different methods using the same data set.

For details refer to <https://doi.org/10.1049/el.2020.2697>

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Sandeep Kumar completed B.Tech. in Electronics and Communication from Kurukshetra University, India in 2004 and Master of Engineering in Electronics and Communication from Thapar University, Patiala, India in 2007. He received his PhD. from Delhi Technological University, Delhi, India. He is currently working as Member (Senior Research Staff) at Central Research Laboratory, Bharat Electronics Limited Ghaziabad, India. His research interests include the study of wireless channels, performance modeling of fading channels and cognitive radio networks. He is also serving as a reviewer for several international journals of IEEE, Springer, Elsevier etc.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. K. Singh, S. Rajora, G. Tripathi, D. K. Vishwakarma, **S. Kumar** and G. S. Walia, "Crowd anomaly detection using aggregation of ensembles of fine-tuned convNets", *Neurocomputing*, vol. 371, pp. 188–198, 2020. Impact Factor: 4.438.

Crowd anomaly detection using aggregation of ensembles of fine-tuned convNets

Kuldeep Singh, Shantanu Rajora, Dinesh Kumar Vishwakarma, Gaurav Tripathi, **Sandeep Kumar*** and Gurjit SinghWalia

Abstract: Anomaly detection in crowded scenes plays a crucial role in automatic video surveillance to avert any casualty in the areas witnessing the high amount of footfalls. The key challenge for automatically classifying the anomalies in crowd image is the usage of feature set and techniques which can be replicated in every crowded scenario. In this paper, we propose a novel concept of Aggregation of Ensembles (AOE) for detecting an anomaly in video data showing crowded scenes, which leverage the existing capability of pre-trained ConvNets and a pool of classifiers. The proposed approach uses an ensemble of different fine-tuned Convolutional Neural Networks (CNN) based on the hypothesis that different CNN architectures learn different levels of semantic representation from crowd videos and thus an ensemble of CNNs will enable enriched feature sets to be extracted. The proposed AOE concept utilizes the fine-tuned ConvNets as fixed feature extractors to train variants of SVM classifier and then the posterior probabilities are fused to predict the anomaly in the crowd frame sequences. The experimental results show that the proposed Aggregation of Ensembles fine-tuned CNNs of various architectures achieve a higher accuracy in comparison with other established methods on benchmark datasets.

For details refer to <https://doi.org/10.1016/j.neucom.2019.08.059>

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BIOGRAPHY

DR. A. K. HARITASH

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Dr. A. K. Haritash is Associate Professor in the Department of Environmental Engineering, Delhi Technological University. He has about 13 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. He has been conferred state level Outstanding Faculty Award for his contribution in academics and research. 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. He has participated in several national and international seminars, conferences, and workshops.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. Sakshi and **A. K. Haritash**, “A comprehensive review of metabolic and genomic aspects of PAH-degradation”, *Archives of Microbiology*, vol. 202, pp. 2033–2058, 2020. Impact Factor: 1.884.
2. M. Verma and **A. K. Haritash**, “Photocatalytic degradation of amoxicillin in pharmaceutical wastewater: A potential tool to manage residual antibiotics”, *Environmental Technology and Innovation*, vol. 20, pp. 101072, 2020. Impact Factor: 3.356.

A comprehensive review of metabolic and genomic aspects of PAH-degradation

Sakshi and **A. K. Haritash***

Abstract: Polyaromatic hydrocarbons (PAHs) are considered as hazardous organic priority pollutants. PAHs have immense public concern and critical environmental challenge around the globe due to their toxic, carcinogenic, and mutagenic properties, and their ubiquitous distribution, recalcitrance as well as persistence in environment. The knowledge about harmful effects of PAHs on ecosystem along with human health has resulted in an interest of researchers on degradation of these compounds. Whereas physico-chemical treatment of PAHs is cost and energy prohibitive, bioremediation i.e. degradation of PAHs using microbes is becoming an efficient and sustainable approach. Broad range of microbes including bacteria, fungi, and algae have been found to have capability to use PAHs as carbon and energy source under both aerobic and anaerobic conditions resulting in their transformation/degradation. Microbial genetic makeup containing genes encoding catabolic enzymes is responsible for PAH-degradation mechanism. The degradation capacity of microbes may be induced by exposing them to higher PAH-concentration, resulting in genetic adaptation or changes responsible for high efficiency towards removal/degradation. In last few decades, mechanism of PAH-biodegradation, catabolic gene system encoding catabolic enzymes, and genetic adaptation and regulation have been investigated in detail. This review is an attempt to overview current knowledge of microbial degradation mechanism of PAHs, its genetic regulation with application of genetic engineering to construct genetically engineered microorganisms, specific catabolic enzyme activity, and application of bioremediation for reclamation of PAH-contaminated sites. In addition, advanced molecular techniques i.e. genomic, proteomic, and metabolomic techniques are also discussed as powerful tools for elucidation of PAH-biodegradation/biotransformation mechanism in an environmental matrix.

For details refer to <https://doi.org/10.1007/s00203-020-01929-5>

**Corresponding Author*

Photocatalytic degradation of amoxicillin in pharmaceutical wastewater: A potential tool to manage residual antibiotics

Manisha Verma and **A. K. Haritash***

Abstract: The present study investigates the degradation of amoxicillin (AMX) using TiO₂ photocatalysis and sono-photocatalysis in aqueous solution under UV-A (365 nm) and sunlight exposure. The photocatalysis, as well as sono-photocatalysis, were coupled with H₂O₂ as well to assess the improvement in the degradation of AMX. Response surface methodology (RSM) based on three-level and four variable Box–Behnken experiment design was used to analyse and validate the degradation of AMX. Upon comparison of observed values with predicted, the value of the coefficient of regression (R) was 0.87 which indicate the good fit of the model. The optimum conditions for maximum degradation (80%) of AMX were AMX - 30mg/l, TiO₂ dosage - 450mg/l, H₂O₂ concentration -150 mg/l and pH - 7.0 under UV irradiation (672 W/m²). Significant improvement in rate kinetics of degradation was observed when photocatalysis was complemented with H₂O₂ and sonication (40 KHz) under optimized condition, but the maximal removal remained almost unaffected. The method proved efficient towards degradation of AMX in real pharmaceutical wastewater with reduced reaction time for targeted level treatment. It was concluded that photocatalysis is a potential method for degradation of AMX under the set optimized conditions, and it may be adopted in-silo since photocatalysis coupled with sonication becomes energy-prohibitive for degradation of AMX.

For details refer to <https://doi.org/10.1016/j.eti.2020.101072>

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Dr. Manisha Verma was the Ph.D. research scholar in the Department of Environmental Engineering, DTU from August 2014 to December 2020. Before pursuing her Ph.D. She worked as an Assistant Professor at RIMT College of Engineering and Technology, Mandi Gobindgarh, Punjab for three years (2011 to 2014). She earned her Master of Technology degree in Environmental Engineering from Thapar University, Patiala Punjab. She has published six research papers in reputed journals, and has participated in various national and international seminars and conferences.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **M. Verma** and A. K. Haritash, "Photocatalytic degradation of amoxicillin in pharmaceutical wastewater: A potential tool to manage residual antibiotics", *Environmental Technology and Innovation*, vol. 20, pp. 101072, 2020. Impact Factor: 3.356.

Photocatalytic degradation of amoxicillin in pharmaceutical wastewater: A potential tool to manage residual antibiotics

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Abstract: The present study investigates the degradation of amoxicillin (AMX) using TiO₂ photocatalysis and sono-photocatalysis in aqueous solution under UV-A (365 nm) and sunlight exposure. The photocatalysis, as well as sono-photocatalysis, were coupled with H₂O₂ as well to assess the improvement in the degradation of AMX. Response surface methodology (RSM) based on three-level and four variable Box–Behnken experiment design was used to analyse and validate the degradation of AMX. Upon comparison of observed values with predicted, the value of the coefficient of regression (R) was 0.87 which indicate the good fit of the model. The optimum conditions for maximum degradation (80%) of AMX were AMX - 30mg/l, TiO₂ dosage - 450mg/l, H₂O₂ concentration -150 mg/l and pH - 7.0 under UV irradiation (672 W/m²). Significant improvement in rate kinetics of degradation was observed when photocatalysis was complemented with H₂O₂ and sonication (40 KHz) under optimized condition, but the maximal removal remained almost unaffected. The method proved efficient towards degradation of AMX in real pharmaceutical wastewater with reduced reaction time for targeted level treatment. It was concluded that photocatalysis is a potential method for degradation of AMX under the set optimized conditions, and it may be adopted in-silo since photocatalysis coupled with sonication becomes energy-prohibitive for degradation of AMX.

For details refer to <https://doi.org/10.1016/j.eti.2020.101072>



DR. RAJEEV KUMAR MISHRA
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Dr. Rajeev Mishra is working as an Assistant Professor in Department of Environmental Engineering. He received his Ph.D. from IIT Roorkee. The thrust areas of his research are Vehicular exhaust emissions, Ultrafine particulates, Environmental implications of urban transport systems, Air & Noise Pollution Monitoring and Modeling, Impact of urban transport on climate change and EIA. He has supervised 01 Ph.D. thesis, 13 M.Tech. dissertations and 15 B.Tech. projects. He has published 35 research papers in International and 8 research papers in National Journals. He has also presented 36 International and 7 National conference papers. Dr. Mishra has written 2 book chapters in Springer and Springer Nature. His research is also highlighted and cited by different newspapers like Navbharat Times, Hindustan Times, The Indian Express, Jansatta, Amar Ujala, Dainik Jagran and Times of India etc. He is the reviewer of different international journals like Transportation Research Part D (Elsevier), Transport Reviews (Taylor & Francis), Sustainable Cities and Society (Elsevier), Transport & Health (Elsevier), Environment Development and Sustainability (Springer), Environmental Impact Assessment Review (Elsevier), International Journal of Sustainable Built Environment ((Elsevier), Urban Climate (Elsevier) and Ecological Engineering (Elsevier) etc.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. A. Agarwal, A. Kaushik, S. Kumar and **R. K. Mishra**, “Comparative study on air quality status in Indian and Chinese cities before and during the COVID-19 lockdown period”, *Air Quality, Atmosphere and Health*, vol. 13, no. 10, pp. 1167-1178, 2020. Impact Factor: 2.870.
2. A. Kumar, **R. K. Mishra** and K. Sarma, “Mapping spatial distribution of traffic induced criteria pollutants and associated health risks using kriging interpolation tool in Delhi”, *Journal of Transport and Health*, vol. 18, pp. 100879, 2020. Impact Factor: 2.418.

Comparative study on air quality status in Indian and Chinese cities before and during the COVID-19 lockdown period

Aviral Agarwal, Aman Kaushik, Sankalp Kumar and **Rajeev Kumar Mishra***

Abstract: Amidst COVID-19 pandemic, extreme steps have been taken by countries globally. Lockdown enforcement has emerged as one of the mitigating measures to reduce the community spread of the virus. With a reduction in major anthropogenic activities, a visible improvement in air quality has been recorded in urban centres. Hazardous air quality in countries like India and China leads to high mortality rates from cardiovascular diseases. The present article deals with 6 megacities in India and 6 cities in Hubei province, China, where strict lockdown measures were imposed. The real-time concentration of PM_{2.5} and NO₂ were recorded at different monitoring stations in the cities for 3 months, i.e. January, February, and March for China and February, March, and April for India. The concentration data is converted into AQI according to US EPA parameters and the monthly and weekly averages are calculated for all the cities. Cities in China and India after 1 week of lockdown recorded an average drop in AQIPM_{2.5} and AQINO₂ of 11.32% and 48.61% and 20.21% and 59.26%, respectively. The results indicate that the drop in AQINO₂ was instantaneous as compared with the gradual drop in AQIPM_{2.5}. The lockdown in China and India led to a final drop in AQIPM_{2.5} of 45.25% and 64.65% and in AQINO₂ of 37.42% and 65.80%, respectively. This study will assist the policymakers in devising a pathway to curb down air pollutant concentration in various urban cities by utilising the benchmark levels of air pollution.

For details refer to <https://doi.org/10.1007/s11869-020-00881-z>

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Mapping spatial distribution of traffic induced criteria pollutants and associated health risks using kriging interpolation tool in Delhi

Amrit Kumar, **Rajeev Kumar Mishra*** and Kiranmay Sarma

Abstract: The present study undertakes to understand the spatial influence of traffic-induced criteria air pollutants and associated health risks assessment at major transport corridors in Delhi. The study includes the classification of vehicular pollutants parameters into five different distribution categories, i.e., low, moderately low, moderate, moderately high, and high. Spatial distribution maps were developed using Geographic Information System (GIS) environment for eleven districts covering 36 transport corridors of the city. The study demonstrated the concentration of three out of the five ambient air pollutants, namely, NO_x, PM₁₀ and PM_{2.5}, with highest values in the range of 294.10–362.57, 203.99–422.42 and 333.71–541.72 µg/m³, respectively. Corresponding National Ambient Air Quality Standards (NAAQS) values were found to be grossly violated as reflected by NO_x, PM_{2.5} and PM₁₀ concentrations with 2–5 times higher values. Remaining two (CO and SO_x) were found to be under permissible limits, and most of them exhibited low levels of observed concentrations. The ambient air quality in south, central, east, and New Delhi areas were found to be in high and moderately high categories and necessitating adequate control measures. The study reported a total of 281107, 20791, 31636 expected cases of human exposure to respiratory mortality, cardiovascular mortality and total mortality, respectively whereas, 281107 and 71608 number of cases were reported in relation to respiratory morbidity in terms of COPD hospital admission and cardiovascular morbidity along the transport corridors. The outcome of the study may provide a basis for decision makers to formulate the policy as per the scale of impact of traffic induced air pollution in critical areas around the major transport corridors.

For details refer to <https://doi.org/10.1016/j.jth.2020.100879>

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Ms. Ashima Yadav is working towards the Ph.D. degree from the Department of Information Technology, Delhi Technological University (formerly Delhi College of Engineering), New Delhi, India. She has submitted her Ph.D. thesis. Her current research interest includes Sentiment Analysis, Social Media Analytics, Deep learning, Natural language processing, Machine learning, and Emotion Recognition. She is a reviewer of various journals of IEEE, Springer. She has been awarded with “Commendable Research Award” by Delhi Technological University, Delhi, India, in the year 2020. She has published many research articles in Science Citation Index (SCI) journals and IEEE conferences.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	04

1. **A. Yadav** and D. K. Vishwakarma, “A unified framework of deep networks for genre classification using movie trailer”, *Applied Soft Computing*, vol. 96, pp. 106624, 2020. Impact Factor: 5.472.
2. **A. Yadav** and D. K. Vishwakarma, “Sentiment analysis using deep learning architectures: A review”, *Artificial Intelligence Review*, vol. 53, no. 6, pp. 4335-4385, 2020. Impact Factor: 5.747.
3. **A. Yadav** and D. K. Vishwakarma, “A comparative study on bio-inspired algorithms for sentiment analysis”, *Cluster Computing*, vol. 23, no. 4, pp. 2969–2989, 2020. Impact Factor: 3.458.
4. **A. Yadav** and D. K. Vishwakarma, “A deep learning architecture of RA-DLNet for visual sentiment analysis”, *Multimedia Systems*, vol. 26, pp. 431–451, 2020. Impact Factor: 1.563.

A unified framework of deep networks for genre classification using movie trailer

Ashima Yadav and Dinesh Kumar Vishwakarma

Abstract: Affective video content analysis has emerged as one of the most challenging and essential research tasks as it aims to analyze the emotions elicited by videos automatically. However, little progress has been achieved in this field due to the enigmatic nature of emotions. This widens the gap between the human affective state and the structure of the video. In this paper, we propose a novel deep affect-based movie trailer classification framework. We also develop an EmoGDB dataset, which contains 100 Bollywood movie trailers annotated with popular movie genres: Action, Comedy, Drama, Horror, Romance, Thriller, and six different types of induced emotions: Anger, Fear, Happy, Neutral, Sad, Surprise. The affect-based features are learned via ILDNet architecture trained on the EmoGDB dataset. Our work aims to analyze the relationship between the emotions elicited by the movie trailers and how they contribute in solving the multi-label genre classification problem. The proposed novel framework is validated by performing cross-dataset testing on three large scale datasets, namely LMTD-9, MMTF- 14K, and ML-25M datasets. Extensive experiments show that the proposed algorithm outperforms all the state-of-the-art methods significantly, as reported by the precision, recall, F1 score, precision–recall curves (PRC), and area under the PRC evaluation metrics.

For details refer to <https://doi.org/10.1016/j.asoc.2020.106624>

Sentiment analysis using deep learning architectures: A review

Ashima Yadav and Dinesh Kumar Vishwakarma

Abstract: Social media is a powerful source of communication among people to share their sentiments in the form of opinions and views about any topic or article, which results in an enormous amount of unstructured information. Business organizations need to process and study these sentiments to investigate data and to gain business insights. Hence, to analyze these sentiments, various machine learning, and natural language processing-based approaches have been used in the past. However, deep learning-based methods are becoming very popular due to their high performance in recent times. This paper provides a detailed survey of popular deep learning models that are increasingly applied in sentiment analysis. We present a taxonomy of sentiment analysis and discuss the implications of popular deep learning architectures. The key contributions of various researchers are highlighted with the prime focus on deep learning approaches. The crucial sentiment analysis tasks are presented, and multiple languages are identified on which sentiment analysis is done. The survey also summarizes the popular datasets, key features of the datasets, deep learning model applied on them, accuracy obtained from them, and the comparison of various deep learning models. The primary purpose of this survey is to highlight the power of deep learning architectures for solving sentiment analysis problems.

For details refer to <https://doi.org/10.1007/s10462-019-09794-5>

A comparative study on bio-inspired algorithms for sentiment analysis

Ashima Yadav and Dinesh Kumar Vishwakarma

Abstract: Data mining is one of the most explored and ongoing areas of research. Sentiment analysis is a popular application of data mining, where the information regarding the customer's emotions or attitude is extracted by applying various methods or techniques. The earlier work in sentiment analysis deals with supervised, unsupervised machine learning-based approaches and lexicon-based approaches. Nature-inspired algorithms are recently becoming an emerging topic of research for developing new algorithms and for optimizing the results as nature serves as an excellent source of inspiration. These techniques are divided into bio-inspired algorithms, physics–chemistry based algorithms, and others. This survey mainly deals with bio-inspired algorithms, which consist of swarm intelligence based and non-swarm intelligence-based algorithms. We present a comprehensive review of the significant bio-inspired algorithms that are popularly applied in sentiment analysis. We discuss state-of-the-art on these significant algorithms along with a comparative study on these algorithms by reviewing eighty articles from various journals, conferences, book chapters, etc. Finally, this review draws some essential conclusions and identifies some research gaps to motivate researchers in this area.

For details refer to <https://doi.org/10.1007/s10586-020-03062-w>

A deep learning architecture of RA-DLNet for visual sentiment analysis+

Ashima Yadav and Dinesh Kumar Vishwakarma

Abstract: Visual media has become one of the most potent means of conveying opinions or sentiments on the web. Millions of photos are being uploaded by the people on famous social networking sites for expressing themselves. The area of visual sentiment analysis is abstract in nature due to the high level of biasing in the human recognition process. This work proposes a residual attention-based deep learning network (RA-DLNet), which examines the problem of visual sentiment analysis. We aim to learn the spatial hierarchies of image features using CNN. Since the local regions in the image convey significant sentiments, we apply residual attention model, which focuses on crucial sentiment-rich, local regions in the image. The significant contribution of this work also includes an exhaustive analysis of seven popular CNN-based architectures such as VGG-16, VGG-19, Inception-Resnet-V2, Inception-V3, ResNet-50, Xception, and NASNet. The impact of fine-tuning on these CNN variants is demonstrated in visual sentiment analysis domain. The extensive experiments on eight popular benchmark data sets are conducted and the performance is measured in terms of accuracy. The comparison of accuracy with similar state-of-the-art exhibits the superiority of the proposed work.

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

+Eligible for Certificate only



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Dr. Dinesh Kumar Vishwakarma received the Ph.D. degree in the field of Computer Vision and Machine Learning from Delhi Technological University, New Delhi, India, in 2016. He is currently an Associate Professor with the Department of Information Technology, Delhi Technological University. His current research interests include Computer Vision, Deep/Machine Learning, Sentiment Analysis, Fake News Detection, Multimedia Data Analytics and Crowd Behaviour Analysis. He received research excellence awards from the Delhi Technological University in the year 2017, 2018 and 2019. He is a reviewer of various journals/transactions of the ACM, IEEE, Elsevier, and Springer. He is a senior member of IEEE and lifetime member of ISTE.

Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01
Commendable Research Award	07

1. A. Yadav and **D. K. Vishwakarma**, “A comparative study on bio-inspired algorithms for sentiment analysis”, *Cluster Computing*, vol. 23, no. 4, pp. 2969–2989, 2020, Impact Factor: 3.458.
2. A. Yadav and **D. K. Vishwakarma**, “A deep learning architecture of RA-DLNet for visual sentiment analysis”, *Multimedia Systems*, vol. 26, pp. 431–451, 2020, Impact Factor: 1.563.
3. **D. K. Vishwakarma**, “A two-fold transformation model for human action recognition using decisive pose”, *Cognitive Systems Research*, vol. 61, pp. 1-13, 2020, Impact Factor: 1.902.

4. C. Dhiman and **D. K. Vishwakarma**, “View-invariant deep architecture for human action recognition using two-stream motion and shape temporal dynamics”, *IEEE Transactions on Image Processing*, vol. 29, pp. 3835-3844, 2020. Impact Factor: 9.369.
5. K. Singh, S. Rajora, G. Tripathi, **D. K. Vishwakarma**, S. Kumar and G. S. Walia, “Crowd anomaly detection using aggregation of ensembles of fine-tuned convNets”, *Neurocomputing*, vol. 371, pp. 188–198, 2020. Impact Factor: 4.438.
6. P. Meel and **D. K. Vishwakarma**, “Fake news, rumor, information pollution in social media and web: A contemporary survey of state-of-the-art, challenges and opportunities”, *Expert Systems with Applications*, vol. 153, pp. 112986, 2020. Impact Factor: 5.452.
7. A. Yadav and **D. K. Vishwakarma**, “A unified framework of deep networks for genre classification using movie trailer”, *Applied Soft Computing*, vol. 96, pp. 106624, 2020. Impact Factor: 5.472.
8. A. Yadav and **D. K. Vishwakarma**, “Sentiment analysis using deep learning architectures: A review”, *Artificial Intelligence Review*, vol. 53, no. 6, pp. 4335-4385, 2020. Impact Factor: 5.747.

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

**Corresponding Author*

A two-fold transformation model for human action recognition using decisive pose

Dinesh Kumar Vishwakarma

Abstract: Human action recognition in videos is a tough task due to the complex background, geometrical transformation and an enormous volume of data. Hence, to address these issues, an effective algorithm is developed, which can identify human action in videos using a single decisive pose. To achieve the task, a decisive pose is extracted using optical flow, and further, feature extraction is done via a two-fold transformation of wavelet. The two-fold transformation is done via Gabor Wavelet Transform (GWT) and Ridgelet Transform (RT). The GWT produces a feature vector by calculating first-order statistics values of different scale and orientations of an input pose, which have robustness against translation, scaling and rotation. The orientation-dependent shape characteristics of human action are computed using RT. The fusion of these features gives a robust unified algorithm. The effectiveness of the algorithm is measured on four publicly datasets i.e. KTH, Weizmann, Ballet Movement, and UT Interaction and accuracy reported on these datasets are 96.66%, 96%, 92.75% and 100%, respectively. The comparison of accuracies with similar state-of-the-arts shows superior performance.

For details refer to <https://doi.org/10.1016/j.cogsys.2019.12.004>

View-Invariant Deep Architecture for Human Action Recognition Using Two-Stream Motion and Shape Temporal Dynamics

Chhavi Dhiman and Dinesh Kumar Vishwakarma*

Abstract: Human action Recognition for unknown views, is a challenging task. We propose a deep view-invariant human action recognition framework, which is a novel integration of two important action cues: motion and shape temporal dynamics (STD). The motion stream encapsulates the motion content of action as RGB Dynamic Images (RGB-DIs), which are generated by Approximate Rank Pooling (ARP) and processed by using fine-tuned InceptionV3 model. The STD stream learns long-term view-invariant shape dynamics of action using a sequence of LSTM and Bi-LSTM learning models. Human Pose Model (HPM) generates view-invariant features of structural similarity index matrix (SSIM) based key depth human pose frames. The final prediction of the action is made on the basis of three types of late fusion techniques i.e. maximum (max), average (avg) and multiply (mul), applied on individual stream scores. To validate the performance of the proposed novel framework, the experiments are performed using both cross-subject and cross-view validation schemes on three publically available benchmarks-NUCLA multi-view dataset, UWA3D-II Activity dataset and NTU RGB-D Activity dataset. Our algorithm outperforms existing state-of-the-arts significantly, which is measured in terms of recognition accuracy, receiver operating characteristic (ROC) curve and area under the curve (AUC).

For details refer to <https://doi.org/10.1109/TIP.2020.2965299>

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Crowd anomaly detection using aggregation of ensembles of fine-tuned convNets+

Kuldeep Singh, Shantanu Rajora, **Dinesh Kumar Vishwakarma***, Gaurav Tripathi, Sandeep Kumar and Gurjit SinghWalia

Abstract: Anomaly detection in crowded scenes plays a crucial role in automatic video surveillance to avert any casualty in the areas witnessing the high amount of footfalls. The key challenge for automatically classifying the anomalies in crowd image is the usage of feature set and techniques which can be replicated in every crowded scenario. In this paper, we propose a novel concept of Aggregation of Ensembles (AOE) for detecting an anomaly in video data showing crowded scenes, which leverage the existing capability of pre-trained ConvNets and a pool of classifiers. The proposed approach uses an ensemble of different fine-tuned Convolutional Neural Networks (CNN) based on the hypothesis that different CNN architectures learn different levels of semantic representation from crowd videos and thus an ensemble of CNNs will enable enriched feature sets to be extracted. The proposed AOE concept utilizes the fine-tuned ConvNets as fixed feature extractors to train variants of SVM classifier and then the posterior probabilities are fused to predict the anomaly in the crowd frame sequences. The experimental results show that the proposed Aggregation of Ensembles fine-tuned CNNs of various architectures achieve a higher accuracy in comparison with other established methods on benchmark datasets.

For details refer to <https://doi.org/10.1016/j.neucom.2019.08.059>

Fake news, rumor, information pollution in social media and web: A contemporary survey of state-of-the-arts, challenges and opportunities+

Priyanka Meel and **Dinesh Kumar Vishwakarma***

Abstract: Internet and social media have become a widespread, large scale and easy to use platform for real-time information dissemination. It has become an open stage for discussion, ideology expression, knowledge dissemination, emotions and sentiment sharing. This platform is gaining tremendous attraction and a huge user base from all sections and age groups of society. The matter of concern is that up to what extent the contents that are circulating among all these platforms every second changing the mindset, perceptions and lives of billions of people are verified, authenticated and up to the standards. This paper puts forward a holistic view of how the information is being weaponized to fulfil the malicious motives and forcefully making a biased user perception about a person, event or firm. Further, a taxonomy is provided for the classification of malicious information content at different stages and prevalent technologies to cope up with this issue from origin, propagation, detection and containment stages. We also put forward a research gap and possible future research directions so that the web information content could be more reliable and safer to use for decision making as well as for knowledge sharing.

For details refer to <https://doi.org/10.1016/j.eswa.2019.112986>

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Sentiment analysis using deep learning architectures: A review+

Ashima Yadav and **Dinesh Kumar Vishwakarma***

Abstract: Social media is a powerful source of communication among people to share their sentiments in the form of opinions and views about any topic or article, which results in an enormous amount of unstructured information. Business organizations need to process and study these sentiments to investigate data and to gain business insights. Hence, to analyze these sentiments, various machine learning, and natural language processing-based approaches have been used in the past. However, deep learning-based methods are becoming very popular due to their high performance in recent times. This paper provides a detailed survey of popular deep learning models that are increasingly applied in sentiment analysis. We present a taxonomy of sentiment analysis and discuss the implications of popular deep learning architectures. The key contributions of various researchers are highlighted with the prime focus on deep learning approaches. The crucial sentiment analysis tasks are presented, and multiple languages are identified on which sentiment analysis is done. The survey also summarizes the popular datasets, key features of the datasets, deep learning model applied on them, accuracy obtained from them, and the comparison of various deep learning models. The primary purpose of this survey is to highlight the power of deep learning architectures for solving sentiment analysis problems.

For details refer to <https://doi.org/10.1007/s10462-019-09794-5>

A unified framework of deep networks for genre classification using movie trailer+

Ashima Yadav and **Dinesh Kumar Vishwakarma***

Abstract: Affective video content analysis has emerged as one of the most challenging and essential research tasks as it aims to analyze the emotions elicited by videos automatically. However, little progress has been achieved in this field due to the enigmatic nature of emotions. This widens the gap between the human affective state and the structure of the video. In this paper, we propose a novel deep affect-based movie trailer classification framework. We also develop an EmoGDB dataset, which contains 100 Bollywood movie trailers annotated with popular movie genres: Action, Comedy, Drama, Horror, Romance, Thriller, and six different types of induced emotions: Anger, Fear, Happy, Neutral, Sad, Surprise. The affect-based features are learned via ILDNet architecture trained on the EmoGDB dataset. Our work aims to analyze the relationship between the emotions elicited by the movie trailers and how they contribute in solving the multi-label genre classification problem. The proposed novel framework is validated by performing cross-dataset testing on three large scale datasets, namely LMTD-9, MMTF- 14K, and ML-25M datasets. Extensive experiments show that the proposed algorithm outperforms all the state-of-the-art methods significantly, as reported by the precision, recall, F1 score, precision–recall curves (PRC), and area under the PRC evaluation metrics.

For details refer to <https://doi.org/10.1016/j.asoc.2020.106624>

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Heena Hooda is working towards the PhD degree from Department of Information Technology, Delhi Technological University, Delhi, India. She received M.Tech. in Information Technology from DTU in 2013. She is currently appointed as Lecturer Computer Science in School of Excellence, Sector-17, Rohini, Delhi. Her area of interests include artificial intelligence, soft computing, pattern recognition and medical image processing. She has published several papers in the field of medical image processing and its application to brain images.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. O. P. Verma and **H. Hooda**, “A novel intuitionistic fuzzy co-clustering algorithm for brain images”, *Multimedia Tools and Applications*, vol. 79, no. 41, pp. 31517–31540, 2020. Impact Factor: 2.313.

A novel intuitionistic fuzzy co-clustering algorithm for brain images

Om Prakash Verma and Heena Hooda*

Abstract: Segmentation of Magnetic Resonance Imaging Brain images is a very important step in detection of brain tumor. This process is hand operated in labs which is rather an enervating and a long drawn out task and the resultant data so obtained has high degree of erroneity and inconsistency. Hence, automated segmentation systems have become the need of the hour. This paper presents a novel technique to automatically detect brain tumor. Also, segmentation of three main brain tissues is carried out namely white matter, gray matter and cerebrospinal fluid from real time Magnetic Resonance Imaging images. The Intuitionistic Fuzzy Set theory is incorporated as it is more suitable for handling uncertainty as compared to fuzzy sets theory. The algorithm is based on the Co-Clustering approach as it offers the advantage of assigning membership functions to both object as well as features. The parameters in the IFCC algorithm are optimized using Particle Swarm Optimization. The performance of the algorithm is evaluated on the basis of quantitative measures such as match score, accuracy score, dice score and Jaccard's similarity coefficient.

For details refer to <https://doi.org/10.1007/s11042-020-09320-8>

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Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01
Commendable Research Award	05

1. Kumar, G. S. Walia and **K. Sharma**, “A novel approach for multi-cue feature fusion for robust object tracking”, *Applied Intelligence*, vol. 50, pp. 3201–3218, 2020. Impact Factor: 3.325.
2. A. Kumar, G. S. Walia and **K. Sharma**, “Real-time visual tracking via multi-cue based adaptive particle filter framework”, *Multimedia Tools and Applications*, vol. 79, no. 29, pp. 20639–20663, 2020. Impact Factor: 2.313.
3. G. S. Walia, A. Kumar, A. Saxena, **K. Sharma** and K. Singh, “Robust object tracking with crow search optimized multi-cue particle filter”, *Pattern Analysis and Applications*, vol. 23, no. 3, pp. 1439–1455, 2020. Impact Factor: 1.512.
4. G. S. Walia, H. Ahuja, A. Kumar, N. Bansal and **K. Sharma**, “Unified graph-based multicue feature fusion for robust visual tracking”, *IEEE Transactions on Cybernetics*, vol. 50, no. 6, pp. 2357-2368, 2020. Impact Factor: 11.709.
5. K. Gupta, G. Walia and **K. Sharma**, “Quality based adaptive score fusion approach for multimodal biometric system”, *Applied Intelligence*, vol. 50, no. 4, pp. 1086-1099, 2020. Impact Factor: 3.325
6. A. Kumar, G. S. Walia and **K. Sharma**, “Recent trends in multicue based visual tracking: A review”, *Expert Systems with Applications*, vol. 162, pp. 113711, 2020. Impact Factor: 5.452.

A novel approach for multi-cue feature fusion for robust object tracking

Ashish Kumar, Gurjit Singh Walia and **Kapil Sharma***

Abstract: Object tracking is a significant problem of computer vision due to challenging environmental variations. Single cue appearance model is not sufficient to handle the variations. To this end, we propose a multi-cue tracking framework in which complementary cues namely, LBP and HOG were exploited to develop a robust appearance model. The proposed feature fusion captures the high-level relationship between the features and diminishes the low-level relationship. Transductive reliability is also integrated at each frame to make tracker adaptive with the changing environment. In addition, K-Means based classifier creates clear and concise boundary between positive and negative fragments which are further used to update the reference dictionary. This adaptation strategy prevents the erroneous updation of the proposed tracker during background clutters, occlusion, and fast motion. Qualitative and quantitative analysis on challenging video sequences from OTB-100 dataset, VOT dataset and UAV123 reveal that the proposed tracker performs favorably against 13 others state-of-the-art trackers.

For details refer to <https://doi.org/10.1007/s10489-020-01649-9>

Real-time visual tracking via multi-cue based adaptive particle filter framework

Ashish Kumar, Gurjit Singh Walia and **Kapil Sharma***

Abstract: Visual tracking using particle filter has been extensively investigated due to its myriad of application in the field of computer vision. However, particle filter framework performance is heavily impaired due to its inherent problems namely, particle degeneracy and impoverishment. In addition, most of the tracking methods using single cue are greatly affected by dynamic environmental challenges. To address these issues, we propose an adaptive multi-cue particle filter based real-time visual tracking framework. Three complementary cues namely, color histogram, LBP and pyramid of histogram of gradient have been exploited for object's appearance model. These cues are integrated using the proposed adaptive fusion model for the automatic boosting of important particles and suppression of unimportant particles. Resampling method using butterfly search optimization relocate low performing particles to high likelihood area. Proposed outlier detection mechanism not only helps in detecting low performing particles but also aids in updating of the reference dictionary. Online estimation of cue reliability along with its multi-cue fusion leads to quick adaptation of the proposed tracker. On average of the outcome, our tracker achieves average center location error of 6.89 (in pixels) and average F-measure of 0.786 when evaluated on OTB-100 and VOT dataset against 13 others state-of-the-art.

For details refer to <https://doi.org/10.1007/s11042-020-08655-6>

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Robust object tracking with crow search optimized multi-cue particle filter

Gurjit Singh Walia, Ashish Kumar, Astitwa Saxena, **Kapil Sharma*** and Kuldeep Singh

Abstract: Particle filter is used extensively for estimation of target nonlinear and non-Gaussian state. However, its performance suffers due to its inherent problem of sample degeneracy and impoverishment. In order to address this, we propose a novel resampling method based upon crow search optimization to overcome low performing particles detected as the outlier. Proposed outlier detection mechanism with transductive reliability achieves faster convergence of the proposed PF tracking framework. In addition, we present an adaptive fusion model to integrate multi-cue extracted for each evaluated particle. Automatic boosting and suppression of particles using the proposed fusion model not only enhance the performance of the resampling method but also achieve optimal state estimation. Performance of the proposed tracker has been evaluated over benchmark video sequences and compared with state-of-the-art solutions. Qualitative and quantitative results reveal that the proposed tracker not only outperforms existing solutions but also efficiently handles various tracking challenges. On average of the outcome, we achieve CLE of 10.99 and F measure of 0.683.

For details refer to <https://doi.org/10.1007/s10044-019-00847-7>

Unified graph-based multicue feature fusion for robust visual tracking

Gurjit Singh Walia, Himanshu Ahuja, Ashish Kumar, Nipun Bansal and **Kapil Sharma***

Abstract: Visual tracking is a complex problem due to unconstrained appearance variations and a dynamic environment. The extraction of complementary information from the object environment via multiple features and adaption to the target's appearance variations are the key problems of this paper. To this end, we propose a robust object tracking framework based on the unified graph fusion (UGF) of multicue to adapt to the object's appearance. The proposed cross-diffusion of sparse and dense features not only suppresses the individual feature deficiencies but also extracts the complementary information from multicue. This iterative process builds robust unified features which are invariant to object deformations, fast motion, and occlusion. Robustness of the unified feature also enables the random forest classifier to precisely distinguish the foreground from the background, adding resilience to background clutter. In addition, we present a novel kernel-based adaptation strategy using outlier detection and a transductive reliability metric. The adaptation strategy updates the appearance model to accommodate variations in scale, illumination, and rotation. Both qualitative and quantitative analyses on benchmark video sequences from OTB-50, OTB-100, VOT2017/18, and UAV123 show that the proposed UGF tracker performs favorably against 18 other state-of-the-art trackers under various object tracking challenges.

For details refer to <https://doi.org/10.1109/TCYB.2019.2920289>

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Quality based adaptive score fusion approach for multimodal biometric system+

Kehev Gupta, Gurjit Singh Walia and Kapil Sharma*

Abstract: Multimodal Biometric Systems are extensively employed over unimodal counterparts for user authentication in the digital world. However, the application of multimodal systems to security-critical applications is limited mainly due to non-adaptiveness of these systems to the dynamic environment and inability to distinguish between spoofing attack and the noisy input image. In order to address these issues, a multimodal biometric system, which adaptively combines the scores from individual classifiers is proposed. For this, three modalities viz. face, finger, and iris are used to extract individual classifier scores. These classifier scores are adaptively fused considering that concurrent modalities are boosted and discordant modalities are suppressed. The conflicting belief among classifiers is resolved not only to achieve optimum fusion of classifier scores but also to cater dynamic environment. The proposed quality based score fusion also distinguish between spoofing attacks and noisy inputs as well. The performance of the proposed multimodal biometric system is experimentally validated using three chimeric multimodal databases. On an average, the proposed system achieves an accuracy of 99.5%, an EER of 0.5% and also outperforms state-of-the-art methods.

For details refer to <https://doi.org/10.1007/s10489-019-01579-1>

Recent trends in multicue based visual tracking: A review+

Ashish Kumar, Gurjit Singh Walia and Kapil Sharma*

Abstract: In the recent years, multicue visual tracking frameworks have been preferred over single cue visual tracking approaches to address critical environmental challenges. In literature, it has been well accepted that combining multiple complementary cues extracted from single sensor or multiple sensors, deep features and features extracted from different layers of deep learning architecture enhance tracking performance and accuracy. In this paper, we have categorized the multi-cue object tracking work based on the exploited appearance model into traditional architecture and deep learning based trackers. The categorized work have been tabulated to provide detailed overview of the representative work and to list out the new trends in the domain. Also, we have briefly analyzed the various tracking benchmark and tabulated their substantial parameters. Our review work analyze the recent trends in the field of object tracking alongwith the latest tracking benchmark to indicate the future directions to the researchers. In addition, we have experimentally evaluated the state-of-the-arts on OTB-15, UAV123, VOT2017 and LaSOT datasets under various tracking challenges.

For details refer to <https://doi.org/10.1016/j.eswa.2020.113711>

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Nitin Jain is a research scholar in the Department of Information Technology, Delhi Technological University, Delhi, India. He has completed his M.Tech (CSE) from University School of Information Technology (USIT) and was the batch topper for two consecutive years. He completed his B.Tech (CSE) from the same institute and attained 2nd rank in his 8th semester. He has received international funding to participate and to present a poster in Real world crypto- 2015, held at London School of Economics, London United Kingdom. He has also attended sponsored Summer School on real-world crypto and privacy at Šibenik, Croatia. He has published research article in international conference and journals of repute. He has worked as a research intern at Scientific Analysis Group, DRDO, Delhi. He is a valued member of the Institute of Electrical and Electronics Engineers (IEEE). His interest lies in the field of applied cryptography, homomorphic encryption and big data Analytics.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. O. P. Verma, **N. Jain** and S. K. Pal, “Design and analysis of an optimal ECC algorithm with effective access control mechanism for big data”, *Multimedia Tools and Applications*, vol. 79, pp. 9757–9783, 2020. Impact Factor: 2.313.
2. O. P. Verma, **N. Jain** and S. K. Pal, “A hybrid-based verifiable secret sharing scheme using chinese remainder theorem”, *Arabian Journal for Science and Engineering*, vol. 45, no. 4, pp. 2395–2406, 2020. Impact Factor: 1.711.

Design and analysis of an optimal ECC algorithm with effective access control mechanism for big data

Om Prakash Verma, **Nitin Jain*** and Saibal Kumar Pal

Abstract: Big data is a high volume data, as it comprises complex and large volume of information. A successful solution is to redistribute the data to a cloud server that has the capacity of storing and processing big data in an effective manner. The main intention of the research is to secure storage of big data and effective access control mechanism. The main stages of the proposed method are map reduce framework, secure storage process and access control mechanism process. Map Reduce is a distributed programming framework used to process big data. In mapper, the input dataset is grouped using hybrid kernel fuzzy c means (HKFCM) clustering algorithm. Finally, the reduced output is fed to the data owner for secure storage. In secure storage process, the suggested method utilizes optimal elliptic curve cryptography (OECC). Here the fundamental values are optimally selected by Modified grasshopper optimization algorithm (MGOA). In the access control mechanism, the effective policy update is proposed along with data storage construction and data deconstruction stage. The routine of the recommended method is assessed using memory and execution time by differentiating the number data size, number cluster size and the number of mapper. The proposed method attains the minimum time and memory utilization when compared to the existing method. The suggested method is implemented in cloud sim with Hadoop Map-reduce framework.

For details refer to <https://doi.org/10.1007/s11042-019-7677-2>

A hybrid-based verifiable secret sharing scheme using chinese remainder theorem

Om Prakash Verma, **Nitin Jain*** and S. K. Pal

Abstract: It is not always in the best interests to rely on an individual to have control of entire sensitive information. This has led to the need for secret sharing schemes, which divide secret (key) among many participants or shareholders. To avoid any cheating by any of the shareholders, the need for verifiable secret sharing (VSS) has emerged. In this context, a hybrid approach for VSS scheme is suggested in this paper. The proposed algorithm shares multiple secrets among shareholders, where shareholders are also divided/classified into different levels. Hence, it includes multiple as well as multilevel secret sharing. Secrets can be recovered at intra- or inter-level, where shareholders of higher level can contribute their shares to lower levels. To reduce the complexity, the one-way hash function is used instead of the hard number-theoretic problems. The proposed scheme stands against the dishonest dealer and shareholders. To rule out a typical dishonest strategy of leaking secret information in the valid shares, the concept of dealer leakage resilience is used by reducing the dealer's powers of selecting random values on his own. The execution is also done using cryptographic libraries. Finally, it is demonstrated that the scheme satisfies the security requirements of VSS.

For details refer to <https://doi.org/10.1007/s13369-019-03992-7>

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Ms. Priyanka Meel is an Assistant Professor in Information Technology department of Delhi Technological University, New Delhi India. She completed her B. Tech. and M. Tech. degree from Indian Institute of Information Technology and Management, Gwalior. Her current research interests include social media mining, data analytics, AI in medial field, deep learning and machine learning.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **P. Meel** and D. K. Vishwakarma, “Fake news, rumor, information pollution in social media and web: A contemporary survey of state-of-the-art, challenges and opportunities”, *Expert Systems with Applications*, vol. 153, pp. 112986, 2020. Impact Factor: 5.452.

Fake news, rumor, information pollution in social media and web: A contemporary survey of state-of-the-arts, challenges and opportunities

Priyanka Meel and Dinesh Kumar Vishwakarma

Abstract: Internet and social media have become a widespread, large scale and easy to use platform for real-time information dissemination. It has become an open stage for discussion, ideology expression, knowledge dissemination, emotions and sentiment sharing. This platform is gaining tremendous attraction and a huge user base from all sections and age groups of society. The matter of concern is that up to what extent the contents that are circulating among all these platforms every second changing the mindset, perceptions and lives of billions of people are verified, authenticated and up to the standards. This paper puts forward a holistic view of how the information is being weaponized to fulfil the malicious motives and forcefully making a biased user perception about a person, event or firm. Further, a taxonomy is provided for the classification of malicious information content at different stages and prevalent technologies to cope up with this issue form origin, propagation, detection and containment stages. We also put forward a research gap and possible future research directions so that the web information content could be more reliable and safer to use for decision making as well as for knowledge sharing.

For details refer to <https://doi.org/10.1016/j.eswa.2019.112986>



BIOGRAPHY

MS. RITU AGARWAL

Department of Information Technology

Ms. Ritu Agarwal is working as an Assistant Professor in the Department of Information Technology at Delhi Technological University, Delhi India and currently pursuing her Ph.D. Her research interests include Information Security, Data Recovery, Digital Media Forensics and Cyber Forensics.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **R. Agarwal** and O. P. Verma, “An efficient copy move forgery detection using deep learning feature extraction and matching algorithm”, *Multimedia Tools and Applications*, vol. 79, pp. 7355–7376, 2020. Impact Factor: 2.313.

An efficient copy move forgery detection using deep learning feature extraction and matching algorithm

Ritu Agarwal and Om Prakash Verma

Abstract: The image forgery activities are on the rise because of the development of various image editing tools. Such activities are done by attackers with intentions of defaming people and websites or for gaining monetary advantage, extortion etc. Image forgeries are carried out through various ways, among one is the copy-move forgery. The basic process of copy-move image forgery is copying the objects present in an image and create the new image by using the copied objects or placing the copied object on the same image on a different location, hence the need for a forgery detection system to protect the authenticity of images. The existing forgery detection techniques detect the tampered regions with less efficiency because of the large size and lower contrast of the images. This article proposes an efficient technique for detecting the copy-move forged image based on deep learning. The proposed algorithm initializes the tampered image as the input for our system to detect the tampered region. Our system includes processes like segmentation, feature extraction, dense depth reconstruction, and finally identifying the tampered areas. The proposed deep learning based system can save on computational time and detect the duplicated regions with more accuracy.

For details refer to <https://doi.org/10.1007/s11042-019-08495-z>



DR. SEBA SUSAN

Department of Information Technology

Dr. Seba Susan is an Associate 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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. **S. Susan**, R. Ranjan, U. Taluja, S. Rai and P. Agarwal, “Global-best optimization of ANN trained by PSO using the non-extensive cross-entropy with gaussian gain”, *Soft Computing*, vol. 24, no. 23, pp. 18219–18231, 2020. Impact Factor: 3.050.
2. **S. Susan** and K. M. R. Devi, “Text area segmentation from document images by novel adaptive thresholding and template matching using texture cues”, *Pattern Analysis and Applications*, vol. 23, pp. 869–881, 2020. Impact Factor: 1.512.
3. S. Vashishtha and **S. Susan**, “Sentiment cognition from words shortlisted by fuzzy entropy”, *IEEE Transactions on Cognitive and Developmental Systems*, vol. 12, no. 3, pp. 541-550, 2020. Impact Factor: 2.667.

Global-best optimization of ANN trained by PSO using the non-extensive cross-entropy with gaussian gain

Seba Susan, Rohit Ranjan, Udyant Taluja, Shivang Rai, and Pranav Agarwal

Abstract: An efficient optimization of network weights has been the primary goal of the artificial neural network (ANN) research community since decades. The aim of every optimization problem is to minimize the network cost which is some form of error function between the desired and the actual network outputs, during the training phase. The conventional gradient-based optimization algorithms like backpropagation are likely to get trapped in local minima and are sensitive to choices of initial weights. The evolutionary algorithms have proved their usefulness in introducing randomness into the optimization procedure, since they work on a global search strategy and induce a globally minimum solution for the network weights. In this paper, we particularly focus on ANN trained by Particle Swarm Optimization (ANN-PSO), in which the local-best and global-best particle positions represent possible solutions to the set of network weights. The global-best position of the swarm, which corresponds to the minimum cost function over time, is determined in our work by minimizing a new non-extensive cross-entropy error cost function. The non-extensive cross-entropy is derived from the non-extensive entropy with Gaussian gain that has proven to give minimum values for regular textures containing periodic information represented by uneven probability distributions. The new cross-entropy is defined, and its utility for optimizing the network weights to a globally minimum solution is analyzed in this paper. Extensive experimentation on two different versions: the baseline ANN-PSO and one of its most recent variants IOPSO-BPA, on benchmark datasets from the UCI repository, with comparisons to the state of the art, validates the efficacy of our method.

For details refer to <https://doi.org/10.1007/s00500-020-05080-7>

Text area segmentation from document images by novel adaptive thresholding and template matching using texture cues

Seba Susan and K. M. Rachna Devi

This paper presents a new perspective of text area segmentation from document images using a novel adaptive thresholding for image enhancement. Using sliding windows, the texture of the enhanced image is matched with that of a fixed training template image containing the typed letters ‘dB.’ The affine-invariant, low-dimensional difference theoretic texture feature set is used for the texture measurement. The distance matrix is binarized using Otsu threshold, and the ‘0’ pixels indicate the text area. One primary contribution of this paper is the novel adaptive thresholding for document image enhancement prior to the extraction of texture cues. The proposed adaptive thresholding mimics the ability of the human eye to iteratively adjust to varying light intensities through iterative gamma correction followed by contrast stretching so that the text becomes well defined against the background clutter. The text blobs so segmented are binarized using Yanowitz and Bruckstein method of text binarization, and the results are applied for evaluation with respect to the ground-truth annotations. We tested our algorithm on the benchmark DIBCO 2009, 2010, 2011, 2012, 2013 document image datasets in comparison with the state of the art. The high precision–recall and F-score values establish the efficiency of our approach.

For details refer to <https://doi.org/10.1007/s10044-019-00811-5>

Sentiment cognition from words shortlisted by fuzzy entropy

Srishti Vashishtha and **Seba Susan***

Abstract: Sentiment analysis (SA) is the process of evaluating human emotions, opinions, and reviews expressed in text to detect the writer’s mental outlook toward a particular event, topic, product, service, etc., and assign a relevant sentiment. In SA, to highlight the correct words which contribute toward sentiment cognition is very difficult. Simulating this task of shortlisting of words by human observers is challenging due to complexity of human mind’s processing. The use of fuzzy entropy is proposed in this article as an innovative step to tap sentiment quotients of online movie reviews. We have proposed a novel approach of shortlisting of words that help in sentiment cognition using a combination of fuzzy entropy, k-means clustering, and sentiment lexicon SentiWordNet. We have addressed this challenging task of simulating the human cognition of words by developing a model that recognizes sentiment based on fuzzy scores derived from SentiWordNet in an automatic manner. Experiments on two benchmark movie review data sets—IMDB and polarity data sets by Pang and Lee—with training by long short-term memory neural networks, yields high accuracy for our approach as compared to other state-of-the-art-methods of SA.

For details refer to <https://doi.org/10.1109/TCDS.2019.2937796>

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Srishti Vashishtha has received the B.Tech. degree in information technology from the Maharaja Surajmal Institute of Technology, Guru Gobind Singh Indraprastha University (GGSIU), New Delhi, India, and the M.Tech. degree in computer science from the University School of Information, Communication and Technology, GGSIU. 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, and machine learning.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Vashishtha** and S. Susan, “Sentiment cognition from words shortlisted by fuzzy entropy”, *IEEE Transactions on Cognitive and Developmental Systems*, vol. 12, no. 3, pp. 541-550, 2020. Impact Factor: 2.667.

Sentiment cognition from words shortlisted by fuzzy entropy

Srishti Vashishtha and Seba Susan

Abstract: Sentiment analysis (SA) is the process of evaluating human emotions, opinions, and reviews expressed in text to detect the writer’s mental outlook toward a particular event, topic, product, service, etc., and assign a relevant sentiment. In SA, to highlight the correct words which contribute toward sentiment cognition is very difficult. Simulating this task of shortlisting of words by human observers is challenging due to complexity of human mind’s processing. The use of fuzzy entropy is proposed in this article as an innovative step to tap sentiment quotients of online movie reviews. We have proposed a novel approach of shortlisting of words that help in sentiment cognition using a combination of fuzzy entropy, k-means clustering, and sentiment lexicon SentiWordNet. We have addressed this challenging task of simulating the human cognition of words by developing a model that recognizes sentiment based on fuzzy scores derived from SentiWordNet in an automatic manner. Experiments on two benchmark movie review data sets—IMDB and polarity data sets by Pang and Lee—with training by long short-term memory neural networks, yields high accuracy for our approach as compared to other state-of-the-art-methods of SA.

For details refer to <https://doi.org/10.1109/TCDS.2019.2937796>



DR. AKHILESH ARORA
Department of Mechanical Engineering

Dr. Akhilesh Arora is working as Associate Professor in the Department of Mechanical Engineering 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 2012 to 2014. He obtained Master's Degree and Ph.D. degrees from the Indian Institute of Technology, Delhi in the year 1997 and 2010 respectively. His research areas are Refrigeration and Air Conditioning, Thermal Engineering; Energy Conservation and Waste Heat Recovery. He has guided five PhD students for their doctorate degree and presently eight students are pursuing PhD under my supervision. He is an active member of ASHRAE and ISHRAE and started the ISHRAE and ASHRAE student chapters at DTU.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. S. Agarwal, **A. Arora** and B. B. Arora, "Energy and exergy analysis of vapor compression-triple effect absorption cascade refrigeration system", *Engineering Science and Technology, an International Journal*, vol. 23, no. 3, pp. 625-641, 2020. Impact Factor: 3.219.

Energy and exergy analysis of vapor compression-triple effect absorption cascade refrigeration system

Shyam Agarwal, **Akhilesh Arora*** and B. B. Arora

Abstract: In the present work, an absorption-compression cascade refrigeration system (ACCRS) has been analyzed theoretically for low temperature cooling applications. It comprises of a triple effect H₂O-LiBr series flow vapor absorption refrigeration system in higher temperature section associated with vapor compression refrigeration (VCR) system using R1234yf refrigerant in lower temperature section. The cascade system provides lower temperature i.e. 223.15–263.15 K for freeze drying, pharmaceuticals, chemical and petroleum industry at lower running cost using waste available from the exhaust of gas turbine or steam turbine to run the triple effect vapor absorption refrigeration system which reduces the overall high grade energy (electricity) consumption of the cascade system. Moreover, the use of R1234yf protects the environment from global warming and ozone depletion. Energetic and exergetic analysis have been performed for the parametric investigation of the system. An EES software based computational model has been formulated for the computation of performance parameters. The analysis determines the effect of generator temperature (448.15–473.15 K), absorber temperature (298.15–313.15 K) and evaporator temperature (223.15–263.15 K) on the energetic (COP) and exergetic (exergetic-efficiency, exergy destruction rate and exergy destruction ratio performances of the system. The results illustrate that the electricity savings of triple effect cascade system are 45.84% in comparison to conventional VCR cycle. The COP and exergetic-efficiency of VCR circuit in the cascade system boost up by 85.26% and 85.28% respectively. The COP and exergetic efficiency of triple effect cascade system are higher than that of single and double effect absorption compression cascade refrigeration systems. The system circulation pump and absorber are the sites of lowest and highest irreversibility in comparison to the other system components.

For details refer to <https://doi.org/10.1016/j.jestch.2019.08.001>

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MR. ANUJ SHARMA

Department of Mechanical Engineering

Anuj Sharma is a research scholar in Department of Mechanical Engineering at 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 1 impact factor.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **Anuj Sharma**, Vikas Rastogi and Atul Kumar Agrawal, “Microstructural, dynamic and residual stress analysis of metal matrix composite shafts”, *Transactions of the Indian Institute of Metals*, vol. 73, no. 12, pp. 2995–3005, 2020. Impact Factor: 1.205.

Microstructural, dynamic and residual stress analysis of metal matrix composite shafts

Anuj Sharma, Vikas Rastogi and Atul Kumar Agrawal

Abstract: Metal matrix shafts are widely used in industries, and various research works are available for the characterization and applications of these components. These research works are limited to the conventional characterization of the material. In this paper, a novel characterization approach has been adopted, which determines the effect of reinforcements on the dynamic properties and residual stress of the Al 6061/Al₂O₃ shafts. Long and slender shafts were fabricated through a stir casting process. Grain structure was obtained through optical microscopy, and morphological evaluation of the composites was performed through scanning electron microscopy. In addition, X-ray diffraction patterns were analysed, and residual stress was calculated by X-ray residual stress measurement system μ -X360 Ver. 2.3.0.1. Tensile residual stress was observed for pure Al 6061 alloy shaft on the surface of shafts, whereas compressive residual stress was observed in the case of composite shafts. The magnitude of the compressive residual stress increased with the increased wt% of alumina in the Al 6061 matrix. The amplitudes of vibration were also reduced by the introduction of reinforcements in metal matrix composites.

For details refer to <https://doi.org/10.1007/s12666-020-02101-9>



BIOGRAPHY

MR. ASHOK KUMAR SINGH *Department of Mechanical Engineering*

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 in Mechanical Engineering and M.Tech. from Maharshi Dayanand University, Rohtak, Haryana in Manufacturing Technology and Automation. Mr. Ashok Kumar Singh has a rich experience of teaching about 13 years and published 6 SCI indexed papers in reputed International Journals, and more than 15 Scopus indexed papers in International Conferences and Journals. His research areas of interests are solar energy, solar energy systems, and solar desalination systems.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. K. Singh** and Samsher, “Analytical study of evacuated annulus tube collector assisted solar desalination”, *Solar Energy*, vol. 207, pp. 1404-1426, 2020. Impact Factor: 4.608.

Analytical study of evacuated annulus tube collector assisted solar desalination

Ashok Kumar Singh and Samsher

Abstract: Evacuated annulus tube collector (EATC) recommendations in association with solar desalination systems have a wide scope and lead with remarkable performance to reduce the scarcity of potable water in the subsequent regions among the population, especially in solar rich remote areas. This paper covers the review of the performance of EATC assisted solar desalination systems with its responsible analytical parameters. An emphasized study on the performance and status of EATC solar desalination systems has been reviewed thoroughly. Advancements of EATC integrated solar desalination systems with the effectiveness of EATCs over other collectors have also been discussed. Moreover, thermosiphon EATC solar desalination systems 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.

For details refer to <https://doi.org/10.1016/j.solener.2020.07.097>



BIOGRAPHY

MR. FURKAN AHMAD

Department of Mechanical Engineering

Furkan Ahmad completed B.Tech. from IMS Engineering College Ghaziabad. He has done M.Tech. (Production engineering) from Netaji Subhas Institute of Technology (University of Delhi). He has a six years of teaching experience. Currently, he is pursuing Ph.D. (Part Time) in Department of Mechanical Engineering from Delhi Technological University, Delhi, India. He is working in the field of polymer composite materials. Polymer composites are being used in aerospace/automobile industries due to light weight and high specific strength. Specifically, the reinforcement of polymeric composites needs a lot of attention to improve the mechanical strength of the composites. The mesoscale level changes in reinforcement can improve the characteristics of polymer composites.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. V. Chaudhary and **F. Ahmad**, “A review on plant fiber reinforced thermoset polymers for structural and frictional composites”, *Polymer Testing*, vol. 91, pp. 106792, 2020. Impact Factor: 3.275.
2. **F. Ahmad**, N. Yuvaraj and P. K. Bajpai, “Effect of reinforcement architecture on the macroscopic mechanical properties of fibrous polymer composites: A review”, *Polymer Composites*, vol. 41, no. 6, pp. 2518-2534, 2020. Impact Factor: 2.265.

A review on plant fiber reinforced thermoset polymers for structural and frictional composites

Vijay Chaudhary and **Furkan Ahmad***

Abstract: In recent past years, utilization of synthetic materials has become a matter of immense concern due to increasing environmental awareness in terms of safety, sustainability and maintaining ecological balance. A substantial amount of work has been carried out on various aspects of plant based natural fiber reinforced thermoset polymer composite materials due to their numerous inherent properties like high specific strength, low cost and degradability. Current issues and challenges associated with mechanical and tribological properties of only plant based natural fiber reinforced thermoset composites have been highlighted in the present study. Various factors influencing mechanical and tribological characteristics have been discussed keeping the focus on plant fiber reinforced thermoset composites. A detailed discussion on mechanical (tensile, compressive, flexural, impact strength) and tribological properties (friction and specific wear rate) have been reported. Interfacial adhesion was found to be a dominating factor with respect to mechanical and tribological properties. Wear and frictional characteristics of plant fiber based thermoset composites can be controlled using suitable fillers and reinforcement orientation. A discussion on interfacial adhesion and its effect on composite performance have also been included.

For details refer to <https://doi.org/10.1016/j.polymertesting.2020.106792>

**Corresponding Author*



Effect of reinforcement architecture on the macroscopic mechanical properties of fibrous polymer composites: A review

Furkan Ahmad, N Yuvaraj and Pramendra K. Bajpai

Abstract: In order to curb the fuel consumption and corresponding CO₂ emission, defence, automobile, and aerospace industries are leaning towards the use of light weight-high stiffness engineered materials like fiber reinforced polymer composites (FRPCs). One of the major advantages of FRPCs is that various properties (stiffness, tensile strength, flexural strength, etc.) can be tailored according to requirements of the application. Architecture of the reinforcement used in FRPCs has been proved to affect these properties substantially. Composite materials have seen a lot of advancement in the field of reinforcement architectures starting from the plain-woven fabrics to advanced 3D braided/woven preforms. The architecture of reinforcement must be wisely selected to design the required properties of developed composites and to reduce the overall cost without compromising the performance. The problem addressed in the present study is the selection of reinforcement architecture while developing a composite material. 2D Plain woven reinforcements are better than other reinforcements in terms of in-plane properties but their out-of-plane properties are very poor. Therefore, advanced architectures like 3D woven fabrics, 5D Braided preforms, knitted preforms, and 3D needle punched fibers are being used in various high performance applications. The present article is an attempt to analyse the effect of various available architectures of reinforcement on the macroscopic mechanical properties of FRPC laminates and to propose a systematic way to select a reinforcement.

For details refer to <https://doi.org/10.1002/pc.25666>

**Corresponding Author*



MR. HUSAIN MEHDI

Department of Mechanical Engineering

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 277 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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **H. Mehdi** and R. S. Mishra, “Influence of friction stir processing on weld temperature distribution and mechanical properties of TIG welded joint of AA6061 and AA7075”, *Transactions of the Indian Institute of Metals*, vol. 73, pp. 1773–1788, 2020. Impact Factor: 1.205.

Influence of friction stir processing on weld temperature distribution and mechanical properties of TIG welded joint of AA6061 and AA7075

Husain Mehdi and R. S. Mishra

Abstract: The joining of dissimilar materials is required in many engineering and defense applications, and the conventional fusion welding often results in defective welds. The friction stir welding has minimized the welding defects, but not completed. This work focuses on the effect of friction stir processing on TIG-welded joints with filler ER 5356 to improve the mechanical properties of TIG welded joints. In this paper, the FSP tool pin rotates on an already welded joint by TIG welding to lower the welding load and improve the weld quality by adjusting the processing parameters of friction stir processing. After analyzing the mechanical properties of TIG+FSP-welded joint, computational fluid dynamics-based numerical model was developed to predict the temperature distribution and material flow during TIG+FSP of dissimilar aluminum alloys AA6061 and AA7075 by ANSYS fluent software. The minimum compressive residual stress 18 MPa, maximum tensile strength (281.1 MPa) and hardness (107 HV) were located at the nugget zone of the TIG+FSP weldment at tool rotation speed of 1300 rpm, traverse speed of 30 mm/min and tilt angle 2°. The predicted peak values of temperature at the weld region were calculated and the maximum temperature (505°C) and maximum heat flux ($2.93 \times 10^6 \text{ w/m}^2$) were observed at a tool rotation of 1300 rpm.

For details refer to <https://doi.org/10.1007/s12666-020-01994-w>



MR. KAUSHALENDRA KUMAR SINGH
Department of Mechanical Engineering

Mr. Kaushalendra Kumar Singh is currently a research scholar under the guidance of Prof. Rajesh Kumar in the department of Mechanical Engineering, Delhi Technological University, Delhi. He has completed his B.Tech. in Mechanical Engineering from BBD 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 more than ten 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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **K. K. Singh**, R. Kumar and A. Gupta, "Comparative energy, exergy and economic analysis of a cascade refrigeration system incorporated with flash tank (HTC) and a flash intercooler with indirect subcooler (LTC) using natural refrigerant couples," *Sustainable Energy Technologies and Assessments*, vol. 39, pp. 100716, 2020. Impact Factor: 3.427.

Comparative energy, exergy and economic analysis of a cascade refrigeration system incorporated with flash tank (HTC) and a flash intercooler with indirect subcooler (LTC) using natural refrigerant couples

Kaushalendra Kumar Singh, Rajesh Kumar and Anjana Gupta

Abstract: In this paper, comparative energy, exergy and economic analysis of natural refrigerant couples working in a cascade refrigeration system incorporated with a flash tank in its higher temperature cycle and a flash intercooler with indirect sub-cooler in its lower temperature cycle have been done. An analysis is conducted using seventeen refrigerant couples from eight natural refrigerants, namely R717, R290, R600a, R744, R744a, R170, R1150 and R1270. Comparison based on COP, exergy efficiency, system cost rates, and exergy destruction rate, to identify the best alternative refrigerant couple, is performed. Thermodynamic optimization has also been carried out with evaporator temperature, condenser temperature, LTC condenser temperature, cascade temperature difference, de-superheating and subcooling parameter of LTC intercooler, as six design variables. To evaluate the economic accountability of refrigerant couples a simple payback analysis has been done at the thermodynamic optimal conditions of the system. Results of analysis and optimization show that R717-R290 is the best refrigerant couple for this system from thermodynamic as well as economic points of view. The maximum COP and exergy efficiency obtained is 1.917 and 39.14% respectively and the corresponding total annualized system cost is 836,395 \$/yr for R717-R290 refrigerant couple.

For details refer to <https://doi.org/10.1016/j.seta.2020.100716>



BIOGRAPHY

MR. MUKUL TOMAR

Department of Mechanical Engineering

Mukul Tomar is working as a Senior Research Scholar 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 10 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 & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **M. Tomar** and N. Kumar, “Effect of multi-walled carbon nanotubes and alumina nano-additives in a light duty diesel engine fuelled with *schleichera oleosa* biodiesel blends”, *Sustainable Energy Technologies and Assessments*, vol. 42, pp. 100833, 2020. Impact Factor: 3.427.
2. **M. Tomar**, A. Jain, P. C. Pujari, H. Dewal and N. Kumar, “Potentials of waste plastic pyrolysis oil as an extender fuel for diesel engine”, *Arabian Journal of Geosciences*, vol. 13, 2020. Impact Factor: 1.327.

Effect of multi-walled carbon nanotubes and alumina nano-additives in a light duty diesel engine fuelled with *schleichera oleosa* biodiesel blends

Mukul Tomar and Naveen Kumar

Abstract: In the present research, the efforts have been lodged to improve the combustion and performance characteristics along with exhaust emissions of diesel-*schleichera oleosa* biodiesel blends by adding nanoparticles of alumina and multi-walled carbon nanotubes. The nanoparticles (np's) were synthesized and their morphologies were characterized by using Field-Emission Scanning Electron Microscopy (FESEM) and X-ray Diffraction spectroscopy (XRD) techniques. Test fuels containing 50 ppm and 100 ppm dosage of nanoparticles were dispersed with diesel-biodiesel blends and were labelled as D80B20A50, D80B20A100 (alumina (Al₂O₃) nanoparticles) and D80B20C50, D80B20C100 (multi-walled carbon nanotubes (MWCNT)). The droplet size of test fuels was analysed by using a laser-diffraction based Malvern Spraytec set-up. Interestingly, nano-additive dispersed test fuels showed smaller droplet size due to the higher force of collision between the nanoparticles. Moreover, the engine trial showed up to a 2–13% increase in brake thermal efficiency and upto 5–60% drop in exhaust emissions for nanoparticles dispersed test fuels. Also, alumina showed better results than MWCNT in terms of higher thermal efficiency, lower specific energy consumption and lower exhaust emissions as compared to diesel. However, due to the superior sorbent of nitrogen oxides, the (100 ppm) MWCNT has resulted in a maximum reduction of NO emissions.

For details refer to <https://doi.org/10.1016/j.seta.2020.100833>

Potentials of waste plastic pyrolysis oil as an extender fuel for diesel engine

Mukul Tomar, Amit Jain, Prashant Chandra Pujari, Hansham Dewal and Naveen Kumar

Abstract: Plastic waste is accumulating globally and its harmful environmental effects are on the rise. In order to reduce the challenges of waste management, the valorization of this heterogeneous plastic waste is of vital importance. The transformation of waste plastic for the production of alternative fuel is among the most promising pathway for its treatment. In this context, pyrolysis is an emerging trend, which can transform a wide variety of wastes into plastic oil. Due to the abundance and unlimited accessibility of the feedstock, higher heating value, the waste plastic pyrolyzed oil can be a potential extender fuel for CI engines. In the present study, an attempt has been made to improve the performance and emission characteristics of diesel-waste cooking oil (WCO) biodiesel blends by adding waste plastic pyrolyzed oil (WPPO). Different test fuels containing 10% and 20% by volume of waste plastic pyrolyzed oil, 20% by volume of waste cooking oil biodiesel, and 60%, 70%, and 80% by volume of diesel were prepared and labeled as D80B20, D70B20P10, and D60B20P20, respectively. To investigate the engine ignition characteristics of test fuels, ignition probability was calculated. Further, the performance and emission characteristics of test fuels were evaluated by conducting the engine trials at different loading conditions. A single-cylinder DI four-stroke diesel engine was used for the analysis, and the outcomes were compared with neat diesel (D100). The test fuel containing 20% vol. of WPPO (D60B20P20) showed up to 12.2% increase in brake thermal efficiency and up to 9.6% decrease in brake-specific energy consumption in comparison with diesel and biodiesel blends. The exhaust emissions were also decreased considerably as the percentage of WPPO in fuel blend is increased. At full load, an overall reduction of about 30% in NO_x, CO, and UBHC emissions was observed for D60B20P20 in comparison with neat diesel.

For details refer to <https://doi.org/10.1007/s12517-020-05574-6>



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Department of Mechanical Engineering

Dr. Nagendra Kumar Maurya completed M.Tech (2010) from Motilal Nehru National Institute of Technology Allahabad and Ph.D. (2020) from Delhi Technological University (Formerly Delhi College of Engineering). He is working as Assistant Professor in the Department of Mechanical Engineering in G L Bajaj Institute of Technology and Management (GLBITM), Greater Noida. His current research deals with the rapid prototyping, development of composite materials, evaluation of mechanical and tribological properties of the materials. He has published three SCI papers and 3 SCOPUS papers during his Ph.D. with DTU affiliation. He acted as Conference Secretary in “International Conference on Computational and Experimental Methods in Mechanical Engineering”. He has also served as Editor in ICCEMME-2019 conference. He has developed Lab Manuals of Additive Manufacturing and Design & Simulation Lab-II during lockdown period for E-learning.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **N. K. Maurya**, V. Rastogi and P. Singh, “An overview of mechanical properties and form error for rapid prototyping”, *CIRP Journal of Manufacturing Science and Technology*, vol. 29, Part A, pp. 53-70, 2020. Impact Factor: 2.991.

An overview of mechanical properties and form error for rapid prototyping

Nagendra Kumar Maurya, Vikas Rastogi and Pushpendra Singh

Abstract: Rapid prototyping (RP) is one of the most imperative advanced manufacturing techniques. RP has attracted attention in the prototyping community due to its capability of reducing the lead time of the product development. It has emerged as an alternative method to fabricate component. RP has recently shown a wide range of engineering as well as medical applications. However, dimensional accuracy, surface roughness and part strength of the component fabricated by RP technology are poorer compared to that of traditional manufacturing process. The main emphasis of authors in this research work is to describe the methodology adopted by researchers. The novelty of this work lies in the fact that it provides a systematic approach to enable potential for persons from industry as well academic users to select suitable process parameters for fabricating the component.

For details refer to <https://doi.org/10.1016/j.cirpj.2020.02.003>



PROF. NAVEEN KUMAR
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Prof. Naveen Kumar did the B.E. from Dayal Bagh Educational Institute, Agra, the M.Tech. from IIT Delhi and Ph.D. from University of Delhi. He is a Fellow of Institution of Mechanical Engineers (FIMechE), UK; Fellow of Institution of Engineers (FIE), India and Chartered Engineer, Engineering Council, UK. His research interests include; alternative fuels with special emphasis on biofuels, decentralized energy systems, renewable energy, waste recycling and sustainable development. Presently working as Professor of Mechanical Engineering at Delhi Technological University (Formerly Delhi College of Engineering) since 1996; Prof. Kumar possesses 29 years of experience in academics, industry, and research. Prof. Kumar has the rich administrative experience and worked as Head of the Department; Dean, Students Welfare; Dean, International Collaboration; Coordinator, TEQIP II Project; Chairman, Board of Discipline; Proctor; Chairman, Cultural Council; Chairman, B.Tech., Admission Committee.

Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01

1. **Naveen Kumar**, Ankit Sonthalia and Rashi Koul, “Optimization of the Process Parameters for Hydrotreating Used Cooking Oil by the Taguchi Method and Fuzzy Logic”, *Journal of Energy Resources Technology*, vol. 142, no. 12, pp. 123006, 2020. Impact Factor: 2.650.

Optimization of the Process Parameters for Hydrotreating Used Cooking Oil by the Taguchi Method and Fuzzy Logic

Naveen Kumar, Ankit Sonthalia and Rashi Koul

Abstract: Hydrotreating process is an alternate approach for producing diesel hydrocarbons from the biomass-based oils. In the present study, used cooking oil was selected for the hydrotreating process due to its high abundance. A batch reactor was used for carrying out the experiments. To increase the reaction rate a manganese, cerium promoted ruthenium-based catalyst supported on Al_2O_3 was used. The design of experiments was used for optimizing the process parameters. The Taguchi method was selected as it reduces the number of experiments which saves time and money. The study was aimed at increasing the conversion percentage and diesel selectivity and reducing the naphtha selectivity. Since multi-objective optimization was required, fuzzy logic was incorporated which utilizes the human thought logic. The analysis of variance shows that the reaction temperature and reaction pressure significantly affect the output parameters. Higher temperature leads to cracking of the oil resulting in the formation of large amount of lower carbon chains. Moreover, high hydrogen pressure results in increase in the hydrogenation process, thereby increasing the diesel selectivity. The optimized parameters obtained from the study were 360 °C reaction temperature, 40-bar initial reaction pressure, and 200-min reaction time. Confirmation experiment was carried out using these parameters, and the conversion efficiency and diesel selectivity was 89.7% and 88.2%, respectively. The study shows that the combination of Taguchi and fuzzy logic is an effective method for optimizing the process parameters of the hydrotreating process.

For details refer to <https://doi.org/10.1115/1.4047405>



DR. PARVESH ALI

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Dr. Parvesh Ali is working as an Assistant Professor in the Department of Mechanical Engineering, Echelon Institute of Technology, Faridabad. He received the Ph. D degree in Mechanical Engineering in 2019 from Delhi Technological University, Delhi. His doctoral research focused on nano finishing through Thermal additive Centrifugal Abrasive flow Machining Process. He has received his M.Tech degree in Production Engineering in 2014 from Delhi Technological University, Delhi. He got his B. Tech degree in Mechanical Engineering in 2011 from Uttar Pradesh Technical University, Lucknow. He has more than 2 years of teaching and research experience. He has published 17 research papers in International Journals as well as International and National Conferences. His research interest includes advanced manufacturing and machining techniques, nano finishing and composite fabrication.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **P. Ali**, S. M. Pandey, M. S. Ranganath, R. S. Walia and Q. Murtaza, "Experimentation and Modelling of CNT additive abrasive media for micro finishing", *Measurement*, vol. 151, pp. 107133, 2020. Impact Factor: 3.364.
2. **P. Ali**, R. S. Walia, Q. Murtaza and R. M. Singari, "Material Removal analysis of Hybrid EDM assisted Centrifugal Abrasive Flow machining Process for performance enhancement", *Journal of the Brazilian Society of Mechanical Sciences and Engineering*, vol. 42, 2020. Impact Factor: 1.755.

Experimentation and Modelling of CNT additive abrasive media for micro finishing

Parvesh Ali, S. M. Pandey, M. S. Ranganath, R. S. Walia and Qasim Murtaza

Abstract: Abrasive flow machining (AFM) is a micro finishing methodology applied to achieve complex geometries which are not easy to obtain using other conventional techniques. AFM removes the material in form of small chips using abrasion mechanism. It gives good surface finishing but has a limitation of low material removal. To overcome the limitation, various hybridizations of AFM process have been developed. AFM process parameters such as pressure, velocity of media and temperature distribution on work piece play a major role in micro finishing. In order to enhance the AFM process capability, it is required to analyze the critical conditions of AFM process parameters using any commercially available software's. Therefore, in present study, three dimensional modelling of the media flow path in abrasive flow machining was developed and analyzed to obtain the effect of the parameters using ANSYS and Fluent software. Further to overcome the major limitation of the AFM process that is low material removal, an experiment was conducted using abrasive media with carbon nano tube (CNT) and alumina. To enhance productivity, AFM process was optimized using Taguchi L₉ OA. Also, the work piece wear during AFM process obtained from the experiments was compared with Reye–Archard–Khrushchov wear law.

For details refer to <https://doi.org/10.1016/j.measurement.2019.107133>

Material Removal analysis of Hybrid EDM assisted Centrifugal Abrasive Flow machining Process for performance enhancement

Parvesh Ali, R. S. Walia, Qasim Murtaza and Ranganath Muttanna Singari

Abstract: Finishing of metallic machine components is a prime requirement for the better performance and longer product life cycle. To get highly finished machine components, a number of conventional and non-conventional finishing processes have evolved in recent times to overcome constraints due to shape and properties of materials. This paper discusses a new hybrid technique, Thermal additive centrifugal abrasive flow machining (TACAFM) which is a combination of centrifugal force assisted abrasive flow machining and electrical discharge machining (EDM) process. In this process abrasive particles move coaxially with workpiece and also rotate inside the hollow workpiece with the help of a rotating system and also generated thermal effect as in EDM process. Due to the movement of abrasive particles along with rotation, Coriolis effect plays a major role in determining the position of abrasives at any time. Therefore, in the present study, Coriolis component effect is incorporated in the mathematical model to predict the material removal in TACAFM. Also, its parameters, viz current, abrasive concentration, pressure, duty cycle, and rotation of electrode, were optimized using response surface methodology. A simulation model is also presented using Ansys® 15 software to analyze the effect of temperature around the work surface when varying gap between the electrode and work surface along with rotational speed of electrode. Experimental results show a good agreement with the mathematical model. The experiments conducted on the developed process show average 44.34% improvement in material removal and average 39.74% improvement in surface finish, respectively.

For details refer to <https://doi.org/10.1007/s40430-020-02375-6>



BIOGRAPHY

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Dr. Qasim Murtaza is a Professor in the Department of Mechanical Engineering, Delhi Technological University. He got his PhD (2006) in the area of manufacturing process, Dublin City University, Ireland. He worked also as Research Associate at Manchester, UK. His research interest includes Precision Manufacturing and Advanced Manufacturing Processes such as Metal coatings, Free-standing metal coating components, Hybrid stir casting & including tribological assessment, Super-finishing processes and Re-manufacturing. He guided 35 M.Tech. thesis and 9 Ph.D.. He has published more than 110 research papers in reputed journals and conference proceedings and got best paper award from Elsevier, Emerald and Springer publication house.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	04

1. R. Butola, **Q. Murtaza** and R. M. Singari, “Formation of self-assembled monolayer and characterization of AA7075-T6/B₄C nano-ceramic surface composite using friction stir processing”, *Surface Topography: Metrology and Properties*, vol. 8, no. 2, pp. 025030, 2020. Impact Factor: 1.613.
2. P. Ali, R. S. Walia, **Q. Murtaza** and R. M. Singari, “Material removal analysis of hybrid EDM-assisted centrifugal abrasive flow machining process for performance enhancement”, *Journal of the Brazilian Society of Mechanical Sciences and Engineering (Springer)*, vol. 42, 2020. Impact Factor: 1.755.
3. R. Butola, R. M Singari and **Q. Murtaza**, “Mechanical and wear behaviour of friction stir processed surface composite through self-assembled monolayer technique”, *Surface Topography: Metrology and Properties*, vol. 8, no. 4, pp. 045007, 2020. Impact Factor: 1.613.
4. P. Ali, S. M. Pandey, M. S. Ranganath, R. S. Walia and **Q. Murtaza**, “Experimentation and Modelling of CNT additive abrasive media for micro finishing”, *Measurement*, vol. 151, pp. 107133, 2020. Impact Factor: 3.364.

Formation of self-assembled monolayer and characterization of AA7075-T6/B₄C nano-ceramic surface composite using friction stir processing

Ravi Butola, **Qasim Murtaza*** and Ranganath M. Singari

Abstract: In the present study, fabrication of surface composite using AA7075-T6 as a matrix material and boron carbide nanoparticles as reinforcement through Friction stir processing (FSP) has been done. FSP technique has been widely utilized for surface modification and the formation of composite material. The B₄C nanoparticles size (<30 nm) as reinforcement were padded in dimension of 2mm width and 1.5mm depth groove of AA7075-T6 plate as a matrix material. The single-pass process executed using a square tool pin with tool rotation and traverse speed of 1000 rpm and 40mmmin⁻¹ respectively. This research aims to observe and process Self-Assembled Monolayer (SAM), investigate the effect of the B₄C nanoceramic particles on the AA7075-T6 and its mechanical properties of the nano-ceramic surface composite. Frictional and wear analysis investigations under various physical conditions have highlighted surface durability characteristics of the metal matrix composite of AA7075-T6. Microstructure results along with fractography-image highlight the homogeneous distribution of boron carbide nano-ceramic particle. Tensile test, Microhardness, microstructure, Field Emission Scanning-Electron Microscope (FESEM), and X-Ray Diffraction (XRD) analyzed the fabricated (Al+B₄C) nano-ceramic surface composite. The fabricated nano-ceramic surface composite could be utilized in lightweight applications such as aerospace, marine, defence, and automotive industry.

For details refer to <https://doi.org/10.1088/2051-672X/ab96db>

**Corresponding Author*

Material removal analysis of hybrid EDM-assisted centrifugal abrasive flow machining process for performance enhancement

Parvesh Ali, R. S. Walia, **Qasim Murtaza*** and Ranganath Muttanna Singari

Abstract: Finishing of metallic machine components is a prime requirement for the better performance and longer product life cycle. To get highly finished machine components, a number of conventional and non-conventional finishing processes have evolved in recent times to overcome constraints due to shape and properties of materials. This paper discusses a new hybrid technique, Thermal additive centrifugal abrasive flow machining (TACAFM) which is a combination of centrifugal force-assisted abrasive flow machining and electrical discharge machining (EDM) process. In this process abrasive particles move coaxially with workpiece and also rotate inside the hollow workpiece with the help of a rotating system and also generated thermal effect as in EDM process. Due to the movement of abrasive particles along with rotation, Coriolis effect plays a major role in determining the position of abrasives at any time. Therefore, in the present study, Coriolis component effect is incorporated in the mathematical model to predict the material removal in TACAFM. Also, its parameters, viz current, abrasive concentration, pressure, duty cycle, and rotation of electrode, were optimized using response surface methodology. A simulation model is also presented using Ansys® 15 software to analyze the effect of temperature around the work surface when varying gap between the electrode and work surface along with rotational speed of electrode. Experimental results show a good agreement with the mathematical model. The experiments conducted on the developed process show average 44.34% improvement in material removal and average 39.74% improvement in surface finish, respectively.

For details refer to <https://doi.org/10.1007/s40430-020-02375-6>

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Mechanical and wear behaviour of friction stir processed surface composite through self-assembled monolayer technique

Ravi Butola, Ranganath M. Singari and **Qasim Murtaza***

Abstract: In the present research study, Friction stir processing (FSP) has been utilized to prepare nano surface Composites, AA7075 based matrix was reinforced with B_4C nanoparticles (size < 30 nm). The aim of this study is to form a thin layer of B_4C over the surface of AA7075 based matrix material through Self-Assembled Monolayer (SAM) technique followed by Friction stir processing. The major advantage of SAM is to minimize the quantity of B_4C nanoparticles used in the preparation of nano surface composites. Additionally, this research also investigates the effect of tool rotation speed of Friction stir processing on mechanical and wear properties of processed nano surface composite. The results observed a uniform dispersion of nanoparticles in the processed nano surface composite and an improved value of microhardness with maximum value was found to be 185 Hv of the sample processed at 1200 rpm, compared to base metal. For the constant load, as FSP tool rotation speed increases, wear resistance increases from 1000 to 1200 rpm and decreases slightly for 1400 rpm. Scanning Electron Microscope (SEM) micrograph, tensile test and Field Emission Scanning-Electron Microscope (FESEM) fractography image used to study microstructure and the mechanical properties of processed nano surface composite. The x-ray Diffraction (XRD) showed the presence of B_4C nanoparticles. Processed nano surface composites can be used for aircraft and automobile industry applications.

For details refer to <https://doi.org/10.1088/2051-672X/abbcb8>

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Experimentation and Modelling of CNT additive abrasive media for micro finishing⁺

Parvesh Ali, S. M. Pandey, M. S. Ranganath, R. S. Walia and **Qasim Murtaza***

Abstract: Abrasive flow machining (AFM) is a micro finishing methodology applied to achieve complex geometries which are not easy to obtain using other conventional techniques. AFM removes the material in form of small chips using abrasion mechanism. It gives good surface finishing but has a limitation of low material removal. To overcome the limitation, various hybridizations of AFM process have been developed. AFM process parameters such as pressure, velocity of media and temperature distribution on work piece play a major role in micro finishing. In order to enhance the AFM process capability, it is required to analyze the critical conditions of AFM process parameters using any commercially available software's. Therefore, in present study, three dimensional modelling of the media flow path in abrasive flow machining was developed and analyzed to obtain the effect of the parameters using ANSYS and Fluent software. Further to overcome the major limitation of the AFM process that is low material removal, an experiment was conducted using abrasive media with carbon nano tube (CNT) and alumina. To enhance productivity, AFM process was optimized using Taguchi L₉ OA. Also, the work piece wear during AFM process obtained from the experiments was compared with Reye–Archard–Khrushchov wear law.

For details refer to <https://doi.org/10.1016/j.measurement.2019.107133>

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+Eligible for Certificate only



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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 20 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 20 M. Tech and 15 Ph. D. thesis. He has published more than 30 research papers in reputed international journals of Elsevier, ASME Transactions, ASHRAE Transaction, Wiley, Inderscience, Springer etc. He is also a reviewer of ASME, Elsevier, Inderscience, Springer, Wiley. He is a life member of Solar Energy Society of India and fellow of Institution of Engineers.

Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01
Commendable Research Award	01

1. A. Khaliq, M. A. Alharthi, S. Alqaed. E. M. A. Mokheimer and **R. Kumar**, "Analysis and assessment of tower solar collector driven trigeneration system", *Journal of Solar Energy Engineering*, vol. 142, no. 5, pp. 051003, 2020. Impact Factor: 1.641.
2. K. K. Singh, **R. Kumar** and A. Gupta, "Comparative energy, exergy and economic analysis of a cascade refrigeration system incorporated with flash tank (HTC) and a flash intercooler with indirect subcooler (LTC) using natural refrigerant couples," *Sustainable Energy Technologies and Assessments*, vol. 39, pp. 100716, 2020. Impact Factor: 3.427.

Analysis and assessment of tower solar collector driven trigeneration system

Abdul Khaliq, Mathkar A. Alharthi, Saeed Alqaed, Esmail M. A. Mokheimer and
Rajesh Kumar*

Abstract: This paper describes the development and performance assessment of a tower solar collector driven integrated system operating in trigeneration mode to generate electricity, heating, and cooling, in a carbon-free manner. The proposed system applies a heliostat-based central receiver unit as a base of solar energy input to drive the steam Rankine cycle which is combined with the process heater and the lithium bromide-water operated absorption chiller. An analysis is performed to monitor the behavior of energy and exergy efficiency at various operating conditions of the proposed trigeneration system. The computed results are authenticated with the reported literature. A comparison is made between the present findings and reported results in the form of exergy efficiency, total exergy destroyed, and energy efficiency. Consideration of process heat and cold along with electricity provides a promising increase in energy efficiency from 15.8% to 64.1% while the exergy efficiency is enhanced from 16.9% to 24.4%. Variation in direct normal irradiations from 600 W/m² to 1000 W/m² results in the significant rise of energetic and exergetic outcomes of the proposed trigeneration system. Out of 100% solar exergy supplied to the proposed trigeneration, 24% is generated as the exergetic output, 1.6% is lost to ambient, and the remaining 74.4% is the exergy destroyed in the system components.

For details refer to <https://doi.org/10.1115/1.4046389>

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Comparative energy, exergy and economic analysis of a cascade refrigeration system incorporated with flash tank (HTC) and a flash intercooler with indirect subcooler (LTC) using natural refrigerant couples

Kaushalendra Kumar Singh, **Rajesh Kumar*** and Anjana Gupta

Abstract: In this paper, comparative energy, exergy and economic analysis of natural refrigerant couples working in a cascade refrigeration system incorporated with a flash tank in its higher temperature cycle and a flash intercooler with indirect sub-cooler in its lower temperature cycle have been done. An analysis is conducted using seventeen refrigerant couples from eight natural refrigerants, namely R717, R290, R600a, R744, R744a, R170, R1150 and R1270. Comparison based on COP, exergy efficiency, system cost rates, and exergy destruction rate, to identify the best alternative refrigerant couple, is performed. Thermodynamic optimization has also been carried out with evaporator temperature, condenser temperature, LTC condenser temperature, cascade temperature difference, de-superheating and subcooling parameter of LTC intercooler, as six design variables. To evaluate the economic accountability of refrigerant couples a simple payback analysis has been done at the thermodynamic optimal conditions of the system. Results of analysis and optimization show that R717-R290 is the best refrigerant couple for this system from thermodynamic as well as economic points of view. The maximum COP and exergy efficiency obtained is 1.917 and 39.14% respectively and the corresponding total annualized system cost is 836,395 \$/yr for R717-R290 refrigerant couple.

For details refer to <https://doi.org/10.1016/j.seta.2020.100716>

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Mr. Ravi Butola is a research scholar in the Department of Mechanical Engineering at 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 eight year of teaching experience. He has published more than 20 research papers in International Journal and Conferences Proceeding, 3 Book chapters. He is currently working in the area of Composite material, Surface modification and Manufacturing process.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **R. Butola**, Q. Murtaza and R. M. Singari, "Formation of self-assembled monolayer and characterization of AA7075-T6/B₄C nano-ceramic surface composite using friction stir processing", *Surface Topography: Metrology and Properties*, vol. 8, no. 2, pp. 025030, 2020. Impact Factor: 1.613.
2. **R. Butola**, R. M Singari and Q. Murtaza, "Mechanical and wear behaviour of friction stir processed surface composite through self-assembled monolayer technique", *Surface Topography: Metrology and Properties*, vol. 8, no. 4, pp. 045007, 2020. Impact Factor: 1.613.

Formation of self-assembled monolayer and characterization of AA7075-T6/B₄C nano-ceramic surface composite using friction stir processing

Ravi Butola, Qasim Murtaza and Ranganath M. Singari

Abstract: In the present study, fabrication of surface composite using AA7075-T6 as a matrix material and boron carbide nanoparticles as reinforcement through Friction stir processing (FSP) has been done. FSP technique has been widely utilized for surface modification and the formation of composite material. The B₄C nanoparticles size (<30 nm) as reinforcement were padded in dimension of 2mm width and 1.5mm depth groove of AA7075-T6 plate as a matrix material. The single-pass process executed using a square tool pin with tool rotation and traverse speed of 1000 rpm and 40mmmin⁻¹ respectively. This research aims to observe and process Self-Assembled Monolayer (SAM), investigate the effect of the B₄C nanoceramic particles on the AA7075-T6 and its mechanical properties of the nano-ceramic surface composite. Frictional and wear analysis investigations under various physical conditions have highlighted surface durability characteristics of the metal matrix composite of AA7075-T6. Microstructure results along with fractography-image highlight the homogeneous distribution of boron carbide nano-ceramic particle. Tensile test, Microhardness, microstructure, Field Emission Scanning-Electron Microscope (FESEM), and X-Ray Diffraction (XRD) analyzed the fabricated (Al+B₄C) nano-ceramic surface composite. The fabricated nano-ceramic surface composite could be utilized in lightweight applications such as aerospace, marine, defence, and automotive industry.

For details refer to <https://doi.org/10.1088/2051-672X/ab96db>

Mechanical and wear behaviour of friction stir processed surface composite through self-assembled monolayer technique

Ravi Butola, Ranganath M. Singari and Qasim Murtaza

Abstract: In the present research study, Friction stir processing (FSP) has been utilized to prepare nano surface Composites, AA7075 based matrix was reinforced with B_4C nanoparticles (size < 30 nm). The aim of this study is to form a thin layer of B_4C over the surface of AA7075 based matrix material through Self-Assembled Monolayer (SAM) technique followed by Friction stir processing. The major advantage of SAM is to minimize the quantity of B_4C nanoparticles used in the preparation of nano surface composites. Additionally, this research also investigates the effect of tool rotation speed of Friction stir processing on mechanical and wear properties of processed nano surface composite. The results observed a uniform dispersion of nanoparticles in the processed nano surface composite and an improved value of microhardness with maximum value was found to be 185 Hv of the sample processed at 1200 rpm, compared to base metal. For the constant load, as FSP tool rotation speed increases, wear resistance increases from 1000 to 1200 rpm and decreases slightly for 1400 rpm. Scanning Electron Microscope (SEM) micrograph, tensile test and Field Emission Scanning-Electron Microscope (FESEM) fractography image used to study microstructure and the mechanical properties of processed nano surface composite. The x-ray Diffraction (XRD) showed the presence of B_4C nanoparticles. Processed nano surface composites can be used for aircraft and automobile industry applications.

For details refer to <https://doi.org/10.1088/2051-672X/abbcb8>

**DR. SANJAY SUNDRIYAL**
Department of Mechanical Engineering

Dr. Sanjay Sundriyal completed his PhD under the supervision of Prof. R. S. Walia and Prof. Vipin.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Sundriyal**, J. Yadav, R. S. Walia, Vipin, and R. Kumar, “Thermophysical-based modeling of material removal in powder mixed near-dry electric discharge machining, *Journal of Materials Engineering and Performance*, vol. 29, no. 10, pp. 6550–6569, 2020. Impact Factor: 1.652.

Thermophysical-based modeling of material removal in powder mixed near-dry electric discharge machining

Sanjay Sundriyal, Jitender Yadav, R. S. Walia, Vipin and Rajesh Kumar

Abstract: Electrical discharge machining (EDM) is a non-conventional method of machining hard materials with intricate shapes. Near-dry electric discharge machining (ND-EDM) is an advanced method of EDM which is eco-friendly and is more efficient in terms of material removal rate (MRR) than traditional EDM. In this research, an approach has been made to perform a new electrical discharge machining operation on EN-31 steel which utilizes metallic powder as an additive along with a gaseous dielectric (for example air) in ND-EDM. This advanced method of machining is known as powder mixed near-dry EDM. This study involves modeling for output process parameter—Material Removal Rate. The mathematical model was developed using the approach of Gaussian heat distribution. FEM modeling was done on ANSYS WORKBENCH 16.0 module. The experiments were performed and comparative study was done between the results obtained by modeling and experiments. The maximum experimental MRR was 7.68 mm³/min, and the error percentage between experimental, mathematical and FEM was under 30%. It was concluded that the modeling was done successfully and results obtained do comply with the methodology of the research.

For details refer to <https://doi.org/10.1007/s11665-020-05110-3>



MR. SUMIT JOSHI

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Mr. Sumit Joshi is a research scholar in the Department of Mechanical Engineering, Delhi Technological University, New Delhi. He holds a Master's degree from Delhi Technological University, New Delhi. 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 and Automation Engineering at Maharaja Agrasen Institute of Technology, Delhi. Mr. Sumit has been involved in research on materials characterization, surface engineering and tribology of Machine Elements. He has authored many research papers in International Journals and Conferences of repute.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Joshi**, N. Yuvaraj, R. Singh and R. Chaudhary, "Microstructural and wear investigations of the Mg/B₄C surface composite prepared through friction stir processing", *Transactions of the Indian Institute of Metals*, vol. 73, no. 12, pp. 3007–3018, 2020. Impact Factor: 1.205.

Microstructural and wear investigations of the Mg/B₄C surface composite prepared through friction stir processing

Sumit Joshi, N. Yuvaraj, Ramesh Chandra Singh and Rajiv Chaudhary

Abstract: Friction stir processing (FSP) is one of the potential fabrication methods that usually modify the microstructural and wear characteristics of the material in the form of surface composite, thus enhancing the surface characteristics, namely hardness and wear resistance. In the present study, B₄C particles were reinforced in the as-cast magnesium alloy (Mg-4Al-3Zn-3Sn-3Pb) matrix surface using FSP to produce the surface composite. The subsequent investigation signified the role of B₄C particles on the microstructural and wear attributes of the magnesium alloy. The microstructural features revealed very fine grain structure and homogeneous dispersion of B₄C particles in the surface composite produced. The reinforcement of hard and brittle B₄C improved the hardness and wear properties of as-cast magnesium alloy. The predominant wear mechanisms identified in as-cast specimens were adhesion and abrasion, which transformed to abrasion and delamination with the addition of B₄C particles.

For details refer to <https://doi.org/10.1007/s12666-020-02102-8>



MR. YASHWANT KOLI

Department of Mechanical Engineering

Mr. Yashwant Koli is a research scholar in Delhi Technological University (DTU) pursuing Ph.D in Mechanical Engineering under the guidance of Dr. N. Yuvaraj (DTU), Prof. Vipin (DTU) and Prof. S. Aravindan (IIT-D). He has successfully completed his Pre-Ph.D on 19/12/2020 on the topic “Mechanical and Microstructural characterization of dissimilar joints obtained by GMAW using Cold Metal Transfer (CMT)” and has published 3 SCI/SCIE, 1 SCOPUS and 12 Conference papers till now. 2 SCI/SCIE papers are under review and 1 SCI/SCIE paper is submitted for major revision. His main area of research includes gas metal arc welding (GMAW), cold metal transfer welding (CMT), wire-arc additive manufacturing (WAAM) and optimization techniques.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **Y. Koli**, N. Yuvaraj, S. Aravindan and Vipin, “Multi-response mathematical modeling for prediction of weld bead geometry of AA6061-T6 using response surface methodology”, *Transactions of the Indian Institute of Metals*, vol. 73, pp. 645–666, 2020. Impact Factor: 1.205.

Multi-response mathematical modeling for prediction of weld bead geometry of AA6061-T6 using response surface methodology

Yashwant Koli, N. Yuvaraj, S. Aravindan and Vipin

Abstract: In the present paper, multi-response mathematical model is established for prediction of weld bead geometry in cold metal transfer (CMT), MIG pulse synergic (MIG P), and MIG manual (MIG M) welding of AA6061-T6 using ER4043 (AlSi5%) as a filler material. Central composite face-centered design under response surface methodology is employed to develop the design matrix for conducting the experiments. The developed model is employed in finding the optimal process parameters for good weld bead aesthetics. Current (I) and welding speed (S) are opted as input process parameters for response output such as penetration, dilution, and heat input. This model is proficient to forecast the main effects and interactive effects of two factors of the opted welding process parameters. Results show that higher current values with low welding speeds result in deeper penetration, high amount of dilution with higher heat input, and vice versa. With lower heat input, CMT has high dilution and penetration with respect to MIG pulse synergic and standard MIG welding. Repeatability of CMT process is much higher as compared to the other two processes. The optimal process parameters are 92.518 A and 7.50 mm/s for CMT, 109.418 A and 10.873 mm/s for MIG P, and 110.847 A and 11.527 mm/s for MIG M with 61.11%, 68.80%, and 72.6% desirability, respectively. Predicted output values generated from regression model equation obtained from welding process parameters are very close and sometimes overlaid on actual output that obviously demonstrates the suitability of the second-order regression equations. A good amount of penetration and dilution with low heat input is required for better joint efficiency.

For details refer to <https://doi.org/10.1007/s12666-020-01883-2>



DR. RAJESH SHARMA

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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 been listed among world's top 2% scientists by Stanford University.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **R. Sharma**, "An examination of colorectal cancer burden by socioeconomic status: evidence from GLOBOCAN 2018", *EPMA Journal*, vol. 11, no. 1, pp. 95–117, 2020. Impact Factor: 4.901.
2. **R. Sharma**, "Descriptive epidemiology of incidence and mortality of primary liver cancer in 185 countries: evidence from GLOBOCAN 2018", *Japanese Journal of Clinical Oncology*, vol. 50, no. 12, pp. 1370-1379, 2020. Impact Factor: 1.914.

An examination of colorectal cancer burden by socioeconomic status: evidence from GLOBOCAN 2018

Rajesh Sharma

Abstract:

Aim and background

Colon and rectum (colorectal) cancer cause substantial mortality and morbidity worldwide. The management and control of a complex disease such as cancer cannot rely on the old strategy of “one disease one medicine” and must make a transition into new-age practices involving predictive, preventive, and personalized medicine (PPPM) at its core. Adoption of PPPM approach to cancer management at the policy level requires quantification of cancer burden at the country level. For this purpose, we examine the burden of colorectal cancer in 185 countries in 2018. Based on results, we discuss the opportunities presented by PPPM and challenges to be encountered while adopting PPPM for the treatment and prevention of colorectal cancer.

Data and methods

Age- and sex-wise estimates of colorectal cancer were procured from the GLOBOCAN 2018. The country- and region-wise burden of colorectal cancer in 185 countries was examined using all-age and age-standardized incidence and mortality estimates. Human development index (HDI) was employed as the indicator of socioeconomic status of a country. Mortality-to-incidence ratio (MIR) was employed as the proxy of 5-year survival rate.

Results

Globally, colorectal cancer claimed an estimated 880,792 lives (males 484,224; females 396,568) with 1.85 million new cases (males 1.03 million; females 823,303) were estimated to be diagnosed in 2018. Globally, the age-standardized incidence rate (ASIR) was 19.7/100,000, whereas age-standardized mortality rate (ASMR) recorded to be 16.3/100,000 in 2018. Age-standardized rates were the highest in developed countries led by Hungary with ASIR of 51.2/100,000 followed by South Korea with ASIR of 44.5/100,000. ASMR followed the patterns of ASIR with the highest ASMR recorded by Hungary (21.5 per 100,000) and Slovakia (20.4 per 100,000). Globally, MIR stood at 0.48, and among the countries recording more than 1000 cases, Nepal registered the highest MIR of 0.83 and the lowest was recorded by South Korea (0.27). The age-standardized rates exhibited nonlinear association with HDI, whereas MIR was negatively associated with HDI.

Conclusion

Colorectal cancer causes a substantial burden worldwide and exhibit a positive association with the socioeconomic status. With the aid of improving screening modalities, preventable nature of the disease (due to dietary and lifestyle risk factors) and improving treatment procedures, the burden of CRC can largely be curtailed. The high burden of CRC in developing countries, therefore, calls for effective prevention strategies, cost-effective screening, and early-stage detection, cost-effective predictive, and personalized treatment regime.

For details refer to <https://doi.org/10.1007/s13167-019-00185-y>

Descriptive epidemiology of incidence and mortality of primary liver cancer in 185 countries: evidence from GLOBOCAN 2018

Rajesh Sharma

Abstract:

Purpose

This study aims to examine the burden of primary liver cancer in 185 countries in 2018.

Methods

The estimates of incidence, mortality and prevalence of primary liver cancer were procured from GLOBOCAN 2018. The development status of a country was measured using the human development index—a composite indicator of income per capita, education and life expectancy.

Results

Globally, primary liver cancer resulted in an estimated 781 631 deaths at age-standardized mortality rate of 8.5/100 000, and 841 080 cases were estimated to be diagnosed in 2018. Males accounted for 596 574 cases and 548 375 deaths, which is more than twice the burden of primary liver cancer in females (cases: 244 506; deaths: 233 456). The global age-standardized incidence rate was 9.3/100 000 in 2018, varying from Morocco (1.1/100 000) to Mongolia (93.7/100 000). There were remarkable variations in terms of age-standardized mortality rate, too, which ranged from 1/100 000 in Nepal to 75.4/100 000 in Mongolia. East Asia was the top region contributing 55.6% of global cases and 54.7% of global deaths.

Conclusions

Since majority of the primary liver cancer burden pertains to hepatocellular carcinoma and screening approaches are yet to be fully proven, the policy focus must be on prevention approaches through the hepatitis-B vaccine, early detection of hepatitis-C infection, reduced alcohol consumption, obesity control, reduced aflatoxin exposure and containment of other modifiable risk factors.

For details refer to <https://doi.org/10.1093/jjco/hyaa130>

STANDARDIZED CITATION INDICATOR BASED HONOUR

Three Scientist 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*.



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Specialization:
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DR. RUCHIKA MALHOTRA

Specialization:
Artificial Intelligence & Image Processing

Based upon the recent findings by Ioannidis JPA, Boyack KW, Baas J (2020), Updated science-wide author databases of standardized citation indicators, PLoS Biology, vol. 18, no. 10, e3000918. <https://doi.org/10.1371/journal.pbio.3000918>



PATENT INVERTOR'S PROFILES

DR. SACHIN KUMAR AGRAWAL

Dr. S. K. Agrawal is Ph.D. in Artificial Intelligent (AI) wireless solutions from Delhi Technological University. He is having Master's degree in Signal processing (SP) from Netaji Subhas Institute of Technology, India. He has worked as a researcher at Telecommunications Research Centre (TRC), University of Limerick (UL) Ireland and Indian Institute of Technology (IIT) Delhi. He has also worked with Computer Patent Annuities (CPA) Global, National Atmospheric Research Laboratory (NARL), Department of Space, (Govt. of India) India and ASC Zee Networks, DTH R&D India. He has published various research papers in international conferences and journals in the domain of wireless communications and intelligent solutions along with best paper award. He has invented several novel features which are protected as several national and international patents. He has extensive experience in research and intellectual property (IP) domain.



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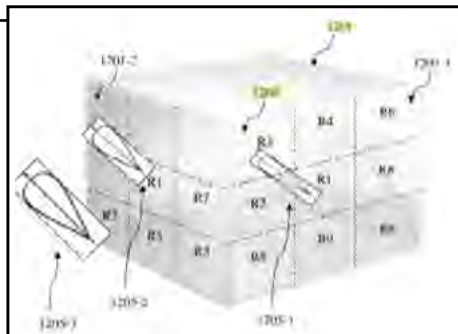
Dr. Kapil Sharma is IEEE senior member and head of Information Technology Department, Delhi Technological University, Delhi, India. He was born in Haryana, India. In 2011, he has completed Doctors Degree in Computer Science and Engineering under the Faculty of Engineering and Technology at the M. D. 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.

US10673503: Method and device for performing beam forming

Sachin Kumar Agrawal and Kapil Sharma

Abstract: A method and a device for performing beam forming are provided. The method includes determining plural obstruction free beam windows (OFBWs). Ranking values are determined for the OFBWs based on a ranking parameter. X OFBWs are selected from the plural OFBWs based on the ranking values that are determined, where X is a natural number determined randomly by a randomizer. One or more beams are formed based on the selected X OFBWs.

 US010673503B2	
(12) United States Patent Agrawal et al.	(10) Patent No.: US 10,673,503 B2 (45) Date of Patent: Jun. 2, 2020
(54) METHOD AND DEVICE FOR PERFORMING BEAM FORMING	(56) References Cited
(71) Applicants: SAMSUNG ELECTRONICS CO., LTD. , Suwon-si (KR); DELHI TECHNOLOGICAL UNIVERSITY , Delhi (IN)	U.S. PATENT DOCUMENTS
(72) Inventors: Sachin Kumar Agrawal , Ghaziabad (IN); Kapil Sharma , Delhi (IN)	8,487,813 B2 7/2013 Leiba et al. 8,532,647 B2* 9/2013 Shin H04B 7/0617 455/422.1
(73) Assignees: SAMSUNG ELECTRONICS CO., LTD. , Suwon-si (KR); DELHI TECHNOLOGICAL UNIVERSITY , Delhi (IN)	8,948,327 B2 2/2015 Kludt et al. 9,078,142 B1 7/2015 Zhan et al. 9,246,216 B2* 1/2016 Harel H04B 7/0404 9,288,007 B2 3/2016 Jover 9,331,754 B2* 5/2016 Kwon H04B 7/0408 9,497,702 B2 11/2016 Joung et al. (Continued)
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.	FOREIGN PATENT DOCUMENTS
(21) Appl. No.: 16/110,793	WO 2016/114604 A1 7/2016
(22) Filed: Aug. 23, 2018	OTHER PUBLICATIONS
(65) Prior Publication Data US 2019/0068264 A1 Feb. 28, 2019	Martin Euchner "Overview of ITU, ITU-T, and ITU-T Study group 17" ITU Regional Workshop for the CIS countries and Georgia on Complex aspects of cybersecurity in infocommunications, Jun. 15-17, 2016 (25 pages) [retrieved from www.rec.org.ru/1_euchner.pptx]. (Continued)
(30) Foreign Application Priority Data Aug. 23, 2017 (IN) 201711029904	<i>Primary Examiner</i> — Ayaz R Sheikh <i>Assistant Examiner</i> — Faiyazkhan Ghafoerkhan (74) <i>Attorney, Agent, or Firm</i> — Sughrue Mion, PLLC



For details refer to : <https://patents.google.com/patent/US10673503B2/en?q=US10673503B2>

IN343616: Beam forming method for a transmitting antenna and a device thereof

Sachin Kumar Agrawal and Kapil Sharma

Abstract: The present invention relates to method and device for beam forming in cellular communication systems. In accordance with one embodiment, the method comprises creating a virtual three-dimensional shape around the transmitting antenna; selecting at least one face from amongst a plurality of faces of the virtual three-dimensional shape based on a first set of parameters; creating one or more grids on the at least one selected face; selecting at least one grid from amongst the one or more grids as an optimum grid based on a second set of parameters; and forming at least one beam based on said at least one optimum grid thus selected.

 INTELLECTUAL PROPERTY INDIA PATENTS DESIGNS TRADE MARKS GEOGRAPHICAL INDICATIONS	 सत्यमेव जयते	क्रमांक : 011125399 SL No :
भारत सरकार GOVERNMENT OF INDIA पेटेंट कार्यालय THE PATENT OFFICE पेटेंट प्रमाणपत्र PATENT CERTIFICATE (Rule 74 Of The Patents Rules)		
पेटेंट सं. / Patent No.	343616	
आवेदन सं. / Application No.	201711016629	
फाइल करने की तारीख / Date of Filing	11/05/2017	
पेटेंटी / Patentee	1.Samsung Electronics Co., Ltd. 2.Delhi Technological University	
<p>प्रमाणित किया जाता है कि पेटेंटी को उपरोक्त आवेदन में यथाप्रकटित "BEAM FORMING METHOD FOR A TRANSMITTING ANTENNA AND A DEVICE THEREOF" नामक आविष्कार के लिए, पेटेंट अधिनियम, १९७० के उपबंधों के अनुसार आज तारीख 11th day of May 2017 से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।</p> <p>It is hereby certified that a patent has been granted to the patentee for an invention entitled "BEAM FORMING METHOD FOR A TRANSMITTING ANTENNA AND A DEVICE THEREOF" as disclosed in the above mentioned application for the term of 20 years from the 11th day of May 2017 in accordance with the provisions of the Patents Act, 1970.</p>		

For details refer to: <https://ipindiaservices.gov.in/PatentSearch/PatentSearch/ViewApplicationStatus>



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