



A
Compendium
of
Abstracts
of
PUBLISHED PAPERS

3rd
**Research
Excellence
Awards**

1st JANUARY, 2019 TO
31st DECEMBER, 2019

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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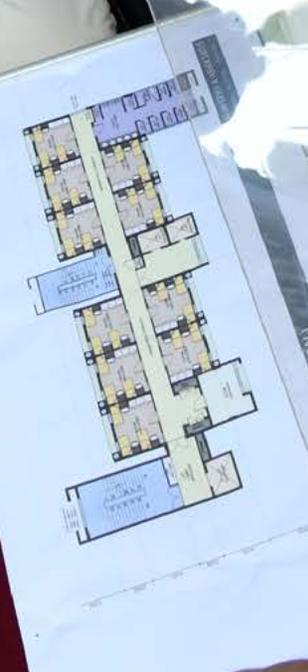


DTU. ORIENTATION 2019



ACADEMIC BUILDING VIEW

SRIHARSHAN LABORATORY



SRIHARSHAN LABORATORY

BOYS HOSTEL

From the Desk of the **VICE CHANCELLOR**



Delhi Technological University (formerly Delhi College of Engineering) has an illustrious history spanning over 78 years. This premier institution is well known world wide 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. The university has awarded 103 Researchers with 82 SCI/SCIE indexed publications and 152 researchers with 107 SCI/SCIE indexed publications in March 2018 and 2019, respectively. In 2019, Research Project Grant has been constituted for the faculty of DTU and 16 projects have been granted to faculty by the University. These initiatives 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 2020 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: 12.03.2020

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.

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.

On behalf of the research award committee,

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

F.DTU/Council/BOM-AC/Notification/31/2018 | 2443

Dated : 12/9/18

NOTIFICATION

The Guidelines for the Award for Published Paper of the Researchers of Delhi Technological University were approved by the Board of Management in its 21st meeting held on 23.11.2016. 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 the Delhi Technological University in its 28th meeting held on 20th July, 2018 on the basis of suggestions from faculty members vide item number 28.6 revised the Guidelines for the Award for Published Paper of the Researchers of Delhi Technological University 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, 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) journal paper of impact factor at least two, and published in the following:

- Nature Journal
- Science
- Harvard Business Review

B) Premier Research Awards

A cash prize of Rs. 1,00,000/- will be awarded along with the certificate of merit. Selection Criteria: The paper must be a journal paper of impact factor at least 3.0, for Institute of Electrical and Electronics Engineers (IEEE) Transactions and one for all others indexed in SCI/ SSCI or SCI expanded and published in the following:

1. Proceedings of Royal Society
2. American Mathematical Society
3. American Physical Society
4. American Society for Civil Engineers (ASCE)
5. American Society for Mechanical Engineers (ASME)
6. IEEE Transactions (TRIF \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

12/5

20. Institute of Physics (IOP) Publishing Ltd.
21. Massachusetts Medical Society
22. International Organization for Standardization (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 and SCI expanded indexed journal not included in the above list having impact factor equal to or more than five shall also be considered for the award.

3. REGULATIONS FOR DIVISION & DISTRIBUTION OF AWARD PRIZE

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

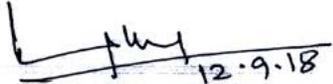
Case 2: If the authors are amongst the faculty member of the university and the university students, then faculty member of the university (whose name appears first in the paper) will decide the individual author's contribution for the purpose of distribution of prize amount.

Case 3: If the first author, corresponding author and other authors are the university students, then the Head of Departments of the first/ corresponding students 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.

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


(Kamal Pathak)
Registrar(In-charge)
Delhi Technological University



Govt. of N.C.T. of Delhi
DELHI TECHNOLOGICAL UNIVERSITY
(Formerly Delhi College of Engineering)
Shahbad Daulatpur, Bawana Road-Delhi-42

F.NO. DTU/IRD/544/2017/2488

Date: 28/02/2020

Minutes of the Meeting Research Excellence Awards 2020

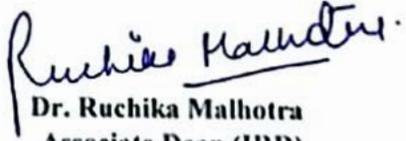
The meeting of the following members was held on 16/01/2020, 17/01/2020, 22/01/2020, 30/01/2020 and 11/02/2020 to consider the applications received from the researchers of the university for grant of research excellence awards 2020. The following members were present:-

1. Prof. A. Trivedi	Chairperson
2. Prof. Vishal Verma	Member
3. Prof. S.G. Warkar	Member
4. Prof. Naokant Deo	Member
5. Prof. Necta Pandey	Member
6. Dr. Pravin Kumar	Member
7. Dr. Mini Sreejeth	Member
8. Dr. Rishu Chaujar	Member
9. Dr. C.P. Singh	Member
10. Dr. Rajeev Mishra	Member
11. Dr. Ruchika Malhotra	Member Secy.

The following recommendations were made by the screening and scrutiny committee and approved by the competent authority:

1. The current/present impact factor, indexing (SCI, SCIE & SSCI) and other information was taken from Clarivate analytics for evaluation of the papers. It is approved that the current/present statistics (payment and indexing information) of the journals will be taken for the purpose of verification by the committee as per the past practice.
2. The committee has considered the year of publication and pagination with respect to the final publication of the paper with volume and issue number.

All the papers were examined in view of the above set minutes.


Dr. Ruchika Malhotra
Associate Dean (IRD)

F.NO. DTU/IRD/544/2017/2488

Date: 28/02/2020

Details for Published Papers for

PREMIER RESEARCH AWARDS

1st January, 2019 – 31st December, 2019

S. No.	Authors	Paper Title	Journal with publication details
DEPARTMENT OF APPLIED CHEMISTRY			
1.	Babita Veer and Ram Singh	Facile Synthesis of 2-Arylimidazo[1,2-a] pyridines catalysed by DBU in aqueous ethanol	<i>Proceedings of the Royal Society A (Proceedings of the Royal Society)</i> , vol. 475, no. 2230, pp. 20190238, 2019.
DEPARTMENT OF APPLIED MATHEMATICS			
2.	C.P. Singh and Simran Kaur	Matter creation cosmology in Brans-Dicke theory: Observational tests and thermodynamic analysis	<i>Physical Review D (American Physical Society)</i> , vol. 100, no. 8, pp. 084057, 2019.
3.	Anu Kumari and Satyabrata Adhikari	Detection of a mixed bipartite entangled state in arbitrary dimension via a structural physical approximation of partial transposition	<i>Physical Review A (American Physical Society)</i> , vol. 100, no. 5, pp. 052323, 2019.
DEPARTMENT OF ELECTRICAL ENGINEERING			
4.	Gitanjali Pandove and Mukhtiar Singh	Robust Repetitive Control Design for a Three-Phase Four Wire Shunt Active Power Filter	<i>IEEE Transactions on Industrial Informatics (IEEE)</i> , vol. 15, no. 5, pp. 2810-2818, 2019.
5.	Vishal Verma and Aditya Narula	Wide Operating Range, Continuous Input Current T-Impedance Boost Converter for PV Application	<i>IEEE Transactions on Industry Applications (IEEE)</i> , vol. 55, no. 6, pp. 7442 – 7451, 2019.

Details of Papers Published for

COMMENDABLE RESEARCH AWARDS

1st January, 2019 – 31st December, 2019

S. No.	Authors	Paper Title	Journal with Publication Details
DEPARTMENT OF APPLIED CHEMISTRY			
1	Anil Kumar , Chen-Hsiung Hung, Shikha Rana and Milind M. Deshmukh	Study of the structure, stability and tautomerisms of meta-benziporphodimethene and N-Confused isomers containing γ -lactam ring	<i>Journal of Molecular Structure (Elsevier)</i> , vol.1187, pp. 138-150, 2019.
2	Anuja Agrawal , Raminder Kaur and Ravinderjit Singh Walia	Investigation on flammability of rigid polyurethane foam-mineral fillers composite	<i>Fire and Materials (Wiley)</i> , vol. 43, no. 8, pp. 917-927, 2019.
3	Meenakshi Gautam and Deenan Santhiya	<i>In-situ</i> mineralization of calcium carbonate in pectin based edible hydrogel for the delivery of protein at colon	<i>Journal Drug Delivery Science and Technology (Elsevier)</i> , vol. 53, pp. 101137-101147, 2019.
4	Meenakshi Gautam and Deenan Santhiya	Pectin/PEG food grade hydrogel blend for the targeted oral co-delivery of nutrients	<i>Colloids and surfaces A: Physicochemical and Engineering Aspects (Elsevier)</i> , vol. 577, pp.637-644, 2019.
5	Sarita S Nair, Sujeet K. Mishra and Devendra Kumar	Recent progress in conductive polymeric materials for biomedical applications	<i>polymers for advanced technologies (Wiley)</i> , vol. 30, no.12, pp. 2932-2953, 2019.
6	Shankar Suman and Ram Singh	Anion selective electrodes: A brief compilation	<i>Microchemical Journal (Elsevier)</i> , vol. 149, pp. 104045, 2019.
7	Poonam Dagar and Ram Singh	Facile one-pot synthesis of 5-amino-1H-pyrazole-4-carbonitriles using alumina-silica-supported MnO ₂ as recyclable catalyst in water	<i>Research on Chemical Intermediates (Springer)</i> , vol. 45, pp. 4531-4542, 2019.
8	Anuja Agrawal, Raminder Kaur and Ravinderjit Singh Walia	Flame retardancy of ceramic-based rigid polyurethane foam composites	<i>Journal of Applied Polymer Science (Wiley)</i> , vol. 136, no. 48, pp. 48250, 2019.

S. No.	Authors	Paper Title	Journal with Publication Details
9	Chandra Mohan Srivastava, Roli Purwar and Anek Pal Gupta	Enhanced potential of biomimetic, silver nanoparticles functionalized <i>Antheraea mylitta</i> (tasar) silk fibroin nanofibrous mats for skin tissue engineering	<i>International Journal of Biological Macromolecules (Elsevier)</i> , vol. 130, pp. 437-453, 2019.
10	Saurabh Mehta and Dharendra Brahmchari	Phosphazene superbase mediated regio and stereoselective iodoaminocyclization of 2-(1-Alkynyl) benzamides for the synthesis of Isoindolin-1-ones	<i>The Journal of Organic Chemistry (ACS)</i> , vol. 84, no. 9, pp. 5492-5503, 2019.
11	Khushbu, Sudhir G. Warkar and Anil Kumar	Synthesis and assessment of carboxymethyl tamarind kernel gum based novel superabsorbent hydrogels for agricultural applications	<i>Polymer (Elsevier)</i> , vol. 182, pp. 121823, 2019.
DEPARTMENT OF APPLIED MATHEMATICS			
12	Aditya Kaushik , Anil K. Vashishth, Vijayant Kumar and Manju Sharma	A modified graded mesh and higher order finite element approximation for singular perturbation problems	<i>Journal of Computational Physics (Elsevier)</i> vol. 395, pp. 275-285, 2019.
13	C. P. Singh and Amit Kumar	Observational constraints on viscous Ricci dark energy model	<i>Astrophysics and Space Science (Springer)</i> vol. 364, no. 6, p. 94, 2019.
14	Abhishek Kumar and Nilam	Mathematical analysis of a delayed epidemic model with nonlinear incidence and treatment rates	<i>Journal of Engineering Mathematics</i> , vol. 115, pp. 1-20, 2019.
15	Abhishek Kumar and Nilam	Stability of a delayed SIR epidemic model by introducing two explicit treatment classes along with nonlinear incidence rate and Holling type treatment	<i>Journal of Computational and Applied Mathematics (Springer)</i> , vol. 38, no. 3, pp.130.(article no), 2019.
16	Konica Goel and Nilam	Stability behavior of a nonlinear mathematical epidemic transmission model with time delay	<i>Nonlinear Dynamics (Springer)</i> , vol. 98, pp. 1501-1518, 2019.
17	Gifty Malhotra, R. Srivastava and H.C.Taneja	Calibration of the risk-neutral density function by maximization of a two-parameter entropy	<i>Physica A: Statistical Mechanics and its Applications (Elsevier)</i> , vol. 513, pp. 45-54, 2019.

S. No.	Authors	Paper Title	Journal with Publication Details
18	Ram Pratap and Neokant Deo	Approximation by genuine Gupta-Srivastava operators	<i>Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas (Springer)</i> , vol. 113, pp. 2495-2505, 2019.
DEPARTMENT OF APPLIED PHYSICS			
19	Sumandeep Kaur, A. S. Rao and M. Jayasimhadri	Color tunability and energy transfer studies of Dy ³⁺ /Eu ³⁺ co-doped calcium aluminozincate phosphor for lighting applications	<i>Materials Research Bulletin (Elsevier)</i> , vol. 116, pp. 79-88, 2019.
20	Nisha Deopa , Shubham Saini, Sumandeep Kaur, Aman Prasad and A. S. Rao	Spectroscopic investigations on Dy ³⁺ ions doped zinc lead alumino borate glasses for photonic device applications	<i>Journal of Rare Earths</i> vol. 37, no. 1, pp. 52-59, 2019.
21	Sumandeep Kaur, A. S. Rao , M.Jayasimhadri, B.Sivaiah and D.Haranath	Synthesis optimization, photoluminescence and thermoluminescence studies of Eu ³⁺ doped calcium aluminozincate phosphor	<i>Journal of Alloys and Compounds (Elsevier)</i> , vol. 802, pp. 129-138, 2019.
22	Pooja Chauhan, Ajeet Kumar and Yogita Kalra	Computational modeling of tellurite based photonic crystal fiber for infrared supercontinuum generation	<i>Optik (Elsevier)</i> , vol.187, pp. 92-97, 2019.
23	Pooja Chauhan, Ajeet Kumar and Yogita Kalra	A dispersion engineered silica-based photonic crystal fiber for supercontinuum generation in near-infrared wavelength region	<i>Optik (Elsevier)</i> , vol. 87, pp. 230-237, 2019.
24	Mrityunjay Kumar Singh and Mohan Singh Mehata	Phase-dependent optical and photocatalytic performance of synthesized titanium dioxide (TiO ₂) nanoparticles	<i>Optik (Elsevier)</i> , vol. 193, pp. 163011, 2019.
25	Nupur Pandey, Mohan Singh Mehata , Nisha Fatma and Sanjay Pant	Efficient fluorescence quenching of 5-aminoquinoline: Silver ion recognition study	<i>Journal of Luminescence (Elsevier)</i> , vol. 205, pp. 475-481, 2019.
26	Harpreet Kaur and M. Jayasimhadri	Color tunable photoluminescence properties in Eu ³⁺ doped calcium bismuth vanadate phosphors for luminescent devices	<i>Ceramics International (Elsevier)</i> , vol. 45, no, 12, pp. 15385-15393, 2019.

S. No.	Authors	Paper Title	Journal with Publication Details
27	Mukesh K. Sahu and M. Jayasimhadri	White light emitting thermally stable bismuth phosphate phosphor $\text{Ca}_3\text{Bi}(\text{PO}_4)_3:\text{Dy}^{3+}$ for solid-state lighting applications	<i>Journal of American Ceramic Society (Wiley)</i> , vol. 102, no. 10, pp. 6087-6099, 2019.
28	Amit K. Vishwakarma, Kaushal Jha and M. Jayasimhadri	Enhancement of luminescent properties in Eu^{3+} doped BaNb_2O_6 nanophosphor synthesized by facile metal citrate gel method	<i>Optical Materials (Elsevier)</i> , vol. 96, pp. 109301, 2019.
29	B.C. Jamalaiah and M. Jayasimhadri	Tunable luminescence properties of $\text{SrAl}_2\text{O}_4:\text{Eu}^{3+}$ phosphors for LED applications	<i>Journal of Molecular structure (Elsevier)</i> , vol. 1178, pp. 394-400, 2019.
30	Kaushal Jha, M. Jayasimhadri , D. Haranath and Kiwan Jang	Influence of modifier oxides on spectroscopic properties of Eu^{3+} doped oxy-fluoro tellurophosphate glasses for visible photonic applications	<i>Journal of Alloys and Compounds (Elsevier)</i> vol. 789, pp. 622-629, 2019.
31	S. Shankar, O. P. Thakur and M. Jayasimhadri	Conductivity behavior and impedance studies in $\text{BaTiO}_3-\text{CoFe}_2\text{O}_4$ magnetoelectric composites	<i>Materials Chemistry and Physics (Elsevier)</i> , vol. 234, pp. 110-121, 2019.
32	Kamal Arora, Saurabh Srivastava, Pratima R. Solanki and Nitin Kumar Puri	Electrochemical Hydrogen Gas Sensing Employing Palladium Oxide/Reduced, Graphene Oxide (PdO-rGO) Nanocomposites	<i>IEEE Sensors Journal (IEEE)</i> , vol. 19, no. 18, pp. 8262 – 8271, 2019.
33	Deepika Sandil, Suresh C. Sharma and Nitin Kumar Puri	Protein-functionalized WO_3 nanorods-based impedimetric platform for sensitive and label-free detection of a cardiac biomarker	<i>Journal of Materials Research (Cambridge University Press)</i> , vol. 34, no. 8, pp. 1331-1340, 2019.
34	Rinku Sharma , Arun Goyal and Man Mohan	Analysis of configuration interaction and convergence with energy levels and radiative data in W XXXIX	<i>Journal of Electron Spectroscopy and Related Phenomena (Elsevier)</i> , vol. 234, pp. 47-56, 2019.
35	Rishu Chaujar	Analog and RF assessment of sub-20 nm 4H-SiC trench gate MOSFET for high frequency applications	<i>AEU - International Journal of Electronics and Communications (Elsevier)</i> , vol. 98, pp. 51-57, 2019.

S. No.	Authors	Paper Title	Journal with Publication Details
36	Rahul Pandey, Anand Prakash Saini and Rishu Chaujar	Numerical simulations: Toward the design of 18.6% efficient and stable perovskite solar cell using reduced cerium oxide based ETL	<i>Vacuum (Elsevier)</i> , vol. 159, pp. 173-181, 2019.
37	Anuj Chhabra, Ajay Kumar and Rishu Chaujar	Sub-20 nm GaAs junctionless FinFET for biosensing application	<i>Vacuum (Elsevier)</i> , vol. 160, pp. 467-471, 2019.
38	Kavita Rani Segwal and Suresh. C. Sharma	A Non-Local Theory of Current-Driven Low-Frequency Models in a Magnetized Strongly Coupled Collisional Dusty Plasma	<i>IEEE Transactions on Plasma Science (IEEE)</i> , vol. 47, no. 7, pp. 3087-3099, 2019.
39	Ravi Gupta and Suresh C. Sharma	Modelling the effects of nitrogen doping on the carbon nanofiber growth via catalytic plasma-enhanced chemical vapour deposition process	<i>Contributions to Plasma Physics (Wiley)</i> , vol. 59, no. 1, pp. 72-85, 2019.
40	Ruchi Sharma and Suresh C. Sharma	Theoretical model for the effect of dust grains on self-filamentation of a gaussian electromagnetic beam in a fully ionized plasma	<i>Contributions to Plasma Physics (Wiley)</i> , vol. 59, no. 2, pp. 211-225, 2019.
41	Manish Kumar, Sagar Khanna, Neha Gupta, Ravi Gupta and Suresh C. Sharma	Numerical Simulation and Parametric Study of Carbon Deposition During Graphene Growth in PECVD System	<i>IEEE Transactions on Nanotechnology (IEEE)</i> , vol. 18, pp. 401-411, 2019.
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43	Tarun Narayan, Saurabh Kumar, Suveen Kumar, Shine Augustine, B. K. Yadav and Bansi D. Malhotra	Protein functionalised self assembled monolayer based biosensor for colon cancer detection	<i>Talanta (Elsevier)</i> , vol. 15 pp. 465-473, 2019.

S. No.	Authors	Paper Title	Journal with Publication Details
44	Niharika Gupta, Venkatesan Renugopalakrishnan, Dorian Liepmann, Ramasamy Paulmurugan and Bansi D. Malhotra	Cell-based biosensors: Recent trends, challenges and future perspectives	<i>Biosensors and Bioelectronics (Elsevier)</i> , vol. 141, pp. 111435, 2019.
45	Jai Gopal Sharma , William D. Clark, Avanish Kumar Shrivastav, Ravi Kumar Goswami, Douglas R. Tocher and Rina Chakrabarti	Production potential of greater duckweed <i>Spirodela polyrhiza</i> (L. Schleiden) and its biochemical composition evaluation	<i>Aquaculture (Elsevier)</i> , vol. 513, pp. 734419, 2019.
46	Jai Gopal Sharma , Neelesh Kumar, Samar Pal Singh, Amarjeet Singh, V. HariKrishna and Rina Chakrabarti	Evaluation of immunostimulatory properties of prickly chaff flower <i>Achyranthes aspera</i> in rohu <i>Labeo rohita</i> fry in pond conditions	<i>Aquaculture (Elsevier)</i> , vol. 505, pp. 183-189, 2019.
47	Chaurasia M , Gupta S, Das A, Dwarakanath B S, Simonsen A, Sharma K	Radiation induces EIF2AK3/ PERK and ERN1/IRE1 mediated pro-survival autophagy	<i>Autophagy (Taylor and Francis)</i> , vol. 15, no. 8, pp. 1391-1406, 2019.
48	Arpita Roy and Navneeta Bharadvaja	Establishment of root suspension culture of <i>Plumbago zeylanica</i> and enhanced production of plumbagin	<i>Industrial Crops and Products (Elsevier)</i> , vol. 137, pp. 419-427, 2019.
49	Meenakshi Dubey, Vandana Jaiswal, Abdul Rawoof, Ajay Kumar, Mukesh Nitin, Sushil Satish Chhapekar, Nitin Kumar, Iiyas Ahmad, Khushbu Islam, Vijaya Brahma and Nirala Ramchiary	Identification of genes involved in fruit development/ripening in <i>Capsicum</i> and development of functional markers.	<i>Genomics (Elsevier)</i> , vol.111, no. 6, pp. 1913-1922, 2019.
50	Sarpras M. Ilyas Ahmad Abdul Rawoof and Nirala Ramchiary	Comparative analysis of developmental changes of fruit metabolites, antioxidant activities and mineral elements content in Bhut jolokia and other <i>Capsicum</i> species	<i>LWT-FOOD Science and Technology (Elsevier)</i> , vol. 105, pp. 363-370, 2019.

S. No.	Authors	Paper Title	Journal with Publication Details
51	Pooja Srivastava , Dipti Kakkar, Pravir Kumar and Anjani Kumar Tiwari	Modified benzoxazolone (ABO-AA) based single photon emission computed tomography (SPECT) probes for 18 kDa translocator protein	<i>Drug Development Research (Wiley)</i> , vol. 80, no. 6, pp. 741-749, 2019.
52	Dhiraj Kumar and Pravir Kumar	An In-Silico Investigation of Key Lysine Residues and Their selection for clearing off A β and Holo-A β PP Through Ubiquitination	<i>Interdisciplinary Sciences: Computational Life Sciences (Springer)</i> , vol. 11, no. 4, pp. 584-596, 2019.
53	Dhiraj Kumar and Pravir Kumar	A β , Tau, and α -Synuclein aggregation and integrated role of PARK2 in the regulation and clearance of toxic peptides	<i>Neuropeptides (Elsevier)</i> , vol. 78, pp. 101971. 2019.
54	Rashmi Ambasta , Rohan Gupta, Dhiraj Kumar, Saurabh Bhattacharya, Aditi Sarkar and Pravir Kumar	Can luteolin be a therapeutic molecule for both colon cancer and diabetes?	<i>Briefings in Functional Genomics (Oxford University Press)</i> , vol. 18, no. 4, pp. 230-239, 2019.
55	Kirti Bhadhadhara and Yasha Hasija	ARD-PRED: an <i>in silico</i> tool for predicting age-related-disorder-associated proteins	<i>Soft Computing (Springer)</i> , vol. 23, no. 5, pp. 1767-1776, 2019.
DEPARTMENT OF CIVIL ENGINEERING			
56	Jyoti Pokhariyal, Anubha Mandal , Shankar G. Aggarwal	Uncertainty Estimation in PM ₁₀ Mass Measurements	<i>MAPAN Journal of Metrology Society of India (Springer)</i> , vol. 34, no. 1, pp. 129-133, 2019.
57	Jyoti Pokhariyal, Anubha Mandal , Shankar G. Aggarwal	Measurement of Benzo(a) pyrene in PM ₁₀ Collected in New Delhi	<i>MAPAN Journal of Metrology Society of India (Springer)</i> , vol. 34, no. 4, pp. 465-471, 2019.
58	Meenakshi Singh , Ashutosh Trivedi and Sanjay Kumar Shukla	Strength enhancement of the subgrade soil of unpaved road with geosynthetic reinforcement layers	<i>Transportation Geotechnics (Elsevier)</i> , vol. 19, pp. 54-60, 2019.
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING			
59	Akshi Kumar and Arunima Jaiswal	Swarm intelligence based optimal feature selection for enhanced predictive sentiment accuracy on twitter	<i>Multimedia Tools and Applications (Springer)</i> , vol. 78, no. 20, pp. 29529-29553, 2019.

S. No.	Authors	Paper Title	Journal with Publication Details
60	Akshi Kumar Geetanjali Garg	Sentiment analysis of multimodal twitter data	<i>Multimedia Tools and Applications (Springer)</i> , vol. 78, no. 17, pp. 24103–24119, 2019.
61	Akshi Kumar and Nitin Sachdeva	Cyberbullying detection on social multimedia using soft computing techniques: a meta-analysis	<i>Multimedia Tools and Applications (Springer)</i> , vol. 78, no. 17, pp. 23973–24010, 2019.
62	Akshi Kumar , Saurabh Raj Sangwan and Anand Nayyar	Rumour veracity detection on twitter using particle swarm optimized shallow classifiers	<i>Multimedia Tools and Applications (Springer)</i> , vol. 78, no. 17, pp. 24083–24101, 2019.
63	Nirmal Panday , O.P. Verma and Amioy Kumar	Nature Inspired Power Optimization in smartphones	<i>Swarm and Evolutionary Computation (Elsevier)</i> , vol. 44, pp. 470-479, 2019.
64	Lokesh Jain and Rahul Katarya	Discover opinion leader in online social network using firefly algorithm	<i>Expert Systems with Applications (Elsevier)</i> , vol. 122, pp. 1-15, 2019.
65	Ruchika Malhotra and Shine Kamal	An empirical study to investigate oversampling methods for improving software defect prediction using imbalanced data	<i>Neurocomputing (Elsevier)</i> , vol. 343, pp. 120-140, 2019.
66	Ruchika Malhotra and Megha Khanna	Dynamic selection of fitness function for software change prediction using Particle Swarm Optimization	<i>Information and Software Technology (Elsevier)</i> , vol. 112, pp. 51-67, 2019.
DEPARTMENT OF ELECTRICAL ENGINEERING			
67	Ajay Kumar , M.M. Triapthi and Rishu Chajur	Sub-30nm In ₂ O ₃ Sn gate electrode recessed channel MOSFET: A biosensor for early stage diagnostics	<i>Vacuum (Elsevier)</i> , vol. 164, pp. 46-52, 2019.
68	Ajay Kumar , Neha Gupta, M.M. Triapthi and Rishu Chajur	RF noise modeling of Black Phosphorus Junctionless Trench MOSFET in strong inversion region	<i>Superlattices and Microstructures (Elsevier)</i> , vol. 125, pp. 72-79, 2019.
69	Prakash Chittora, Alka Singh and Madhusudan Singh	Adaptive EPLL for improving power quality in three-phase three-wire grid-connected photovoltaic system	<i>IET Renewable Power Generation (IET)</i> , vol. 13, no 9, pp. 1595-1602, 2019.

S. No.	Authors	Paper Title	Journal with Publication Details
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71	Ankita Arora and Alka Singh	Design and analysis of functional link artificial neural network controller for shunt compensation	<i>IET Generation Transmission and Distribution (IET)</i> , vol. 13, no. 11, pp. 2280-2289, 2019.
72	Anup Mandpura , Shankar Prakriya and Ranjan K. Mallik	Outage probability of fixed-gain amplify-and-forward two-way relays with multiple co-channel interferers	<i>IET Communications (IET)</i> , vol. 13, no. 6, pp. 649-656, 2019.
73	Imarn Ahmad Quadri , Suman Bhowmick and Dheeraj Joshi	A hybrid teaching-learning-based optimization technique for optimal DG sizing and placement in radial distribution systems	<i>Soft Computing (Springer)</i> , vol. 23, pp. 9899-9917, 2019.
74	Vinod Kumar Yadav , Kanwardeep Singh and Shubham Gupta	Market-oriented transmission expansion planning using non-linear programming and multi-criteria data envelopment analysis	<i>Sustainable Energy, Grids and Networks (Elsevier)</i> , vol. 19, pp. 100234, 2019.
75	Santosh Ghosh, Vinod Kumar Yadav and Vivekananda Mukherjee	Improvement of partial shading resilience of PV array through modified bypass arrangement	<i>Renewable Energy (Elsevier)</i> , vol. 143, pp. 1079-1093, 2019.
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING			
76	Chhavi Dhiman and Dinesh Kumar Vishwakarma	A Robust Framework for Abnormal Human Action Recognition Using R -Transform and Zernike Moments in Depth Videos	<i>IEEE Sensors Journal (IEEE)</i> , vol. 19, no. 13, pp. 5195-5203, 2019.
77	Chhavi Dhiman and Dinesh Kumar Vishwakarma	A Review of state-of-the-art techniques for abnormal human activity recognition	<i>Engineering Applications of Artificial Intelligence (Elsevier)</i> , vol. 77, pp. 21-45, 2019.
78	Gurjit Kaur , Disha Srivastava, Prabhjot Singh and Yaman Parasher	Development of a novel hybrid PDM/OFDM technique for FSO system and its performance analysis	<i>Optics & Laser Technology (Elsevier)</i> , vol. 109, pp. 256-262, 2019.

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79	Rakesh Verma, Neeta Pandey Rajeshwari Pandey	CFOA based low pass and high pass fractional step filter realizations	<i>AEU - International Journal of Electronics and Communications (Elsevier)</i> , vol. 99, pp. 161-176, 2019.
80	Rakesh Verma, Neeta Pandey and Rajeshwari Pandey	Novel CFOA based capacitance multiplier and its application	<i>AEU - International Journal of Electronics and Communications (Elsevier)</i> , vol. 107, pp. 192-198, 2019.
81	Shubham Negi, Poornima Mittal and Brijesh Kumar	Analytical modelling and parameters extraction of multilayered OLED	<i>IET Circuits, Devices & Systems (IET)</i> , vol. 13, no. 8, 1255 – 1261, 2019.
82	Neha Mishra, Poornima Mittal and Brijesh Kumar	Analytical modeling for static and dynamic response of organic pseudo all-p inverter circuits	<i>Journal of Computational Electronics (Springer)</i> , vol. 18, pp. 1490–1500, 2019.
83	Shubham Negi, Poornima Mittal , Brijesh Kumar and Pradeep Kumar Juneja	Organic LED based light sensor for detection of ovarian cancer	<i>Microelectronic Engineering (Elsevier)</i> , vol. 218, pp. 111154, 2019.
84	Priyanka Gupta and Rajeshwari Pandey	A low-power voltage differencing buffered amplifier	<i>International Journal of Circuit Theory and Applications (Wiley)</i> , vol. 47, no. 9, pp. 1402-1416, 2019.
85	Pragati Dahiya and Priyanka Jain	Realization of Second-Order Structure of Recursive Algorithm for Discrete Cosine Transform	<i>Circuits, Systems, and signal processing (Springer)</i> , vol. 38, pp. 791-804, 2019.
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87	Rajiv Kapoor , Rashmi Gupta, Le Hoang Son and Raghvendra Kumar	Iris localization for direction and deformation independence based on polynomial curve fitting and singleton expansion	<i>Multimedia Tools and Applications (Springer)</i> , vol. 78, pp. 19279-19303, 2019.
88	Rajiv Kapoor , Rashmi Gupta, Le Hoang Son, Raghvendra Kumar and Sudan Jha	Fog removal in images using improved dark channel prior and contrast limited adaptive histogram equalization	<i>Multimedia Tools and Applications (Springer)</i> , vol. 78, pp. 23281-23307, 2019.

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89	Rahul Bansal, Sudipta Majumdar and Harish Parthasarathy	Extended Kalman filter based nonlinear system identification described in terms of Kronecker product	<i>AEU - International Journal of Electronics and Communications (Elsevier)</i> , vol. 108, pp. 107-117, 2019.
90	Tej Singh and Dinesh Kumar Vishwakarma	Video benchmarks of human action datasets: a review	<i>Artificial Intelligence Review (Springer)</i> vol. 52, pp. 1107-1154, 2019.
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91	S. Nandakumar, Harsh Pipil, Sanak Ray and Anil Kumar Haritash	Removal of phosphorous and nitrogen from wastewater in Brachiaria-based constructed wetland	<i>Chemosphere (Elsevier)</i> , vol. 233, pp. 216-222, 2019.
92	Sakshi, S. K. Singh and Anil Kumar Haritash	Polycyclic aromatic hydrocarbons: soil pollution and remediation	<i>International Journal of Environmental Science and Technology (Springer)</i> , vol. 16, no. 10, pp. 6489-6512, 2019.
93	Rajeev Kumar Mishra , Abhinav Pandey, Govind Pandey and Amrit Kumar	The effect of odd-even driving scheme on PM _{2.5} and PM _{1.0} emission	<i>Transportation Research Part D: Transport and Environment (Elsevier)</i> , vol. 67, pp. 541-552, 2019.
DEPARTMENT OF INFORMATION TECHNOLOGY			
94	Dinesh Kumar Vishwakarma and Chhavi Dhiman	A unified model for human activity recognition using spatial distribution of gradients and difference of Gaussian kernel	<i>The Visual Computer (Springer)</i> vol. 35, no. 11, pp. 1595-1613, 2019.
95	Dinesh Kumar Vishwakarma and Tej Singh	A visual cognizance based multi-resolution descriptor for human action recognition using key pose	<i>AEU - International Journal of Electronics and Communications (Elsevier)</i> , vol.107, pp. 157-169, 2019.
96	Dinesh Kumar Vishwakarma , Deepika Varshney and Ashima Yadav	Detection and veracity analysis of fake news via scrapping and authenticating the web search	<i>Cognitive Systems Research (Elsevier)</i> , vol. 58, pp. 217-229, 2019.
97	Gaurav Tripathi, Kuldeep Singh and Dinesh Kumar Vishwakarma	Convolutional neural networks for crowd behaviour analysis: a survey	<i>The Visual Computer (Springer)</i> , vol. 35, no. 5, pp.753-776, 2019.

S. No.	Authors	Paper Title	Journal with Publication Details
98	Rajni Sethi and S. Indu	Adaptive enhancement of underwater images using multi-objective PSO	<i>Multimedia Tools and Applications (Springer)</i> , vol. 78, no. 22, pp. 31823–31845, 2019.
99	Seba Susan and Amitesh Kumar	SSO _{Maj} -SMOTE-SSO _{Min} : Three-step intelligent pruning of majority and minority samples for learning from imbalanced datasets	<i>Applied Soft Computing (Elsevier)</i> , vol. 78, pp. 141-149, 2019.
100	Seba Susan and Juli Keshari	Finding significant keywords for document databases by two-phase Maximum Entropy Partitioning	<i>Pattern Recognition Letters (Elsevier)</i> , vol. 125, pp. 195-205, 2019.
101	Seba Susan and Madasu Hanmandlu	Smaller feature subset selection for real-world datasets using a new mutual information with Gaussian gain	<i>Multidimensional Systems and Signal Processing (Springer)</i> , vol. 30, no. 3. pp. 1469-1488, 2019.
102	Srishti Vashishtha and Seba Susan	Fuzzy rule based unsupervised sentiment analysis from social media posts	<i>Expert Systems with Applications (Elsevier)</i> , vol. 138, pp. 112834, 2019.
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104	Ankit Sonthalia and Naveen Kumar	Hydroprocessed vegetable oil as a fuel for transportation sector: A review	<i>Journal of the Energy Institute (Elsevier)</i> , vol. 92, no. 1, pp 1-17, 2019.
105	Anuj Kumar Jain and Vikas Rastogi	Commentary on, Discussion on a novel approach to study the effects of asymmetric stiffness on parametric instabilities of multi-rotor-system	<i>Journal of Sound and Vibration (Elsevier)</i> , vol. 413, pp. 159-172, 2019.
106	Naveen Kumar and Mukul Tomar	Influence of nanoadditives on ignition characteristics of Kusum (<i>Schleichera oleosa</i>) biodiesel	<i>International Journal of Energy Research (Wiley)</i> , vol. 43, no. 8, pp. 3223-3226, 2019.
107	Paras Kumar , Harish Hirani and Atul Kumar Agrawal	Effect of gear misalignment on contact area: Theoretical and experimental studies	<i>Measurement (Elsevier)</i> , vol. 132, pp. 359-368, 2019.

S. No.	Authors	Paper Title	Journal with Publication Details
108	Saurabh Agrawal and Rajesh Kumar Singh	Analyzing disposition decisions for sustainable reverse logistics: Triple Bottom Line approach	<i>Resources, Conservation and Recycling (Elsevier)</i> , vol. 150, pp. 104448, 2019.
109	Sushila Rani , A. K. Agrawal and V. Rastogi	Vibration analysis for detecting failure mode and crack location in first stage gas turbine blade	<i>Journal of Mechanical Science and Technology (Springer)</i> , vol. 33, pp. 1-10, 2019.
UNIVERSITY SCHOOL OF MANAGEMENT & ENTREPRENEURSHIP			
110	Rajesh Sharma	Breast cancer incidence, mortality and mortality-to-incidence ratio (MIR) are associated with human development, 1990–2016: evidence from Global Burden of Disease Study 2016	<i>Breast Cancer (Springer)</i> , vol. 26, pp. 428-445, 2019.
111	Rajesh Sharma	The burden of prostate cancer is associated with human development index: evidence from 87 countries, 1990–2016	<i>EPMA Journal (Springer)</i> , vol. 10, pp. 137-152, 2019.

Details of

PATENTS AWARDED

Department of Computer Science and Engineering

1st January, 2019 – 31st December, 2019

Inventors	Title of Patent and Patent number	Assignee	Date of Patent
Sachin Kumar Agrawal and Kapil Sharma	Beam forming method for a transmitting antenna and a device thereof - US, 10,326,508, B2	Delhi Technological University, Samsung Electronics Co. Ltd.	June 18, 2019
Sachin Kumar Agrawal and Kapil Sharma	Beam forming method for a transmitting antenna and a device thereof - US, 10,454,553, B2	Delhi Technological University, Samsung Electronics Co. Ltd.	October 22, 2019



DR. ANIL KUMAR

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Dr. Anil Kumar is an Associate professor at the Department of Applied Chemistry, Delhi Technological University (formerly Delhi College of Engineering), Delhi, India. He received his master's and doctorate degree in chemistry from the University of Roorkee, Roorkee (Now IIT Roorkee) and Indian Institute of Technology, Kanpur, India, respectively. He has received Academia Sinica fellowship, Taiwan, from 2007-2009 and Schulich post-doctoral fellowship, Technion, IIT Haifa, Israel 2009-2010. His research interests are in coordination chemistry, porphyrinoid based bio-inorganic chemistry. He has published 30 research papers in national, international journals and conferences. He has guided 03 Ph.D. students.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. Kumar**, C. H. Hung, S. Rana and M. M. Deshmukh, "Study of the structure, stability and tautomerisms of meta-benziporphodimethene and N-Confused isomers containing γ -lactam ring", *Journal of Molecular Structure*, vol. 1187, pp. 138-150, 2019. Impact Factor: 2.220.

Study on the structure, stability and tautomerisms of *meta*-benziporphodimethene and N-Confused isomers containing γ -lactam ring

Anil Kumar, Chen-Hsiung Hung, Shikha Rana and Milind M. Deshmukh

Abstract: The structures and relative energies of 11,16-bis(phenyl)-6,6,21,21-tetramethyl-*meta*-benzi-6,21-porphodimethene (1) and its N-confused akin containing a γ -lactam ring (2 and 3) have been calculated using density functional theory (DFT) method. The DFT calculation was also carried out on thia- and oxa-analog of 1. The optimized structure reveals that thia-*meta*-benziporphodimethene has a more symmetrical conformation than the oxa- and aza-analog. The tautomerisms in these compounds were investigated. The γ -lactam ring close to the adjacent sp^3 hybridized carbon was found to be more stable. The energy difference between the *meta*-benziporphodimethene and inverted isomers range from 4 to 10 kcal/mol. Higher energy difference was calculated between the isomers with or without γ -lactam ring. The energy difference between o-up isomers containing γ -lactam ring is relatively low in comparison to those which have oxidized pyrrole and inverted pyrrole ring at different positions. But the energy difference between those isomers having oxidized pyrrole and inverted pyrrole ring at different positions is comparable. It has been found that o-up isomers are more favorable than o-down isomers. In contrast, in case of inverted isomers of 1, the inverted pyrrole having nitrogen towards down side is more stable. The structure of thia analog without inner hydrogen atom is more symmetrical in comparison to their oxa and aza analogues.

For details refer to <https://doi.org/10.1016/j.molstruc.2019.03.064>

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Dr. Anuja Agrawal has completed her Ph.D. and M. Tech. in Polymer Technology (Gold Medallist) from Delhi Technology University, Delhi, India. Her areas of interest are polymers and optimization. She has published many research papers in reputed peer reviewed journals and international conferences. She is a member of The Society of Polymer Science, India and Asian Polymer Association.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **A. Agrawal**, R. Kaur and R. S. Walia, “Investigation on flammability of rigid polyurethane foam-mineral fillers composite”, *Fire and Materials*, vol. 43, no. 8, pp. 917-927, 2019. Impact Factor: 1.173.
2. **A. Agrawal**, R. Kaur and R. S. Walia, “Flame Retardancy of Ceramic Based Rigid Polyurethane Foam Composites,” *Journal of Applied Polymer Science*, vol. 136, no.8, pp. 48250, 2019. Impact Factor- 2.188.

Investigation on flammability of rigid polyurethane foam-mineral fillers composite

Anuja Agrawal, Raminder Kaur and Ravinderjit Singh Walia

Abstract: This study investigates the incorporation of castor oil-based rigid polyurethane foam with mineral fillers feldspar or kaolinite clay in order to enhance the mechanical, thermal, and flame retardant properties. Influence of mineral fillers on the mechanical strength was characterized by compressive strength and flexural strength measurement. Thermogravimetric analysis (TGA) was performed to diagnose the changes in thermal properties, while cone calorimeter test was performed to ascertain the flame retardancy of the mineral filler-incorporated rigid polyurethane foam composites. Results showed that the foams incorporated with mineral filler demonstrated up to 182% increase in compressive strength and 351% increase in flexural strength. Thermal stability of these composite foams was also found to be enhanced on the incorporation of kaolinite clay filler with an increase in 5% weight loss temperature ($T_{5\%}$) from 192°C to 260°C. Furthermore, peak heat release rate (PHRR), total heat release (THR), smoke production rate (SPR), and total smoke release (TSR) were also found to decreased on the incorporation of mineral filler in the rigid polyurethane foam. So mineral fillers are ascertained as a potential filler to enhance the mechanical, thermal, and flame retardant behaviors of bio-based rigid polyurethane foam composites.

For details refer to <https://doi.org/10.1002/fam.2751>

Flame retardancy of ceramic-based rigid polyurethane foam composites

Anuja Agrawal, Raminder Kaur and Ravinderjit Singh Walia

Abstract: In this work, ceramic fillers zirconia and alumina powder were incorporated in the rigid polyurethane foams derived from modified castor oil and their impact on the mechanical, thermal, and fire performances of composite foams have been analyzed. It was observed that the addition of ceramic filler showed improved mechanical and thermal properties and best properties were shown by 6% zirconia with compressive strength of 6.61 MPa and flexural strength of 5.72 MPa. Zirconia also demonstrated an increase in $T_{5\%}$ up to 2600C. Cone calorimetry shows a decrease in peak of heat release from 118 to 84 kW m⁻² and 94 kW m⁻² by the incorporation of alumina and zirconia powder, respectively. Furthermore, total heat release (THR), smoke production rate (SPR), and total smoke release (TSR) were also found to decrease remarkably on the incorporation of ceramic fillers. So, these fillers have a great potential as an additive to incorporate good mechanical, thermal, and fire properties in bio-based rigid PU foams.

For details refer to <https://doi.org/10.1002/app.48250>



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Department of Applied Chemistry

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). She is also the 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	02

1. M. Gautam and **D. Santhiya**, "In-situ mineralization of calcium carbonate in pectin based edible hydrogel for the delivery of protein at colon", *Journal of Drug Delivery Science and Technology*, vol. 53, pp. 101137-101147, 2019. Impact Factor: 2.606.
2. M. Gautam and **D. Santhiya**, "Pectin/PEG food grade hydrogel blend for the targeted oral co-delivery", *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, vol. 577, pp. 637-644, 2019. Impact Factor: 3.131

***In-situ* mineralization of calcium carbonate in pectin based edible hydrogel for the delivery of protein at colon**

Meenakshi Gautam and **Deenan Santhiya***

Abstract: Protein administration through oral route remains to be an attractive strategy due to lesser pain, greater convenience and increased patient compliance, thus promoting its pharmaceutical research. Oral delivery, however, suffers from high susceptibility to digestive enzymes in the gastrointestinal tract. Hence, developing colon-specific protein delivery systems, especially with high bioavailability, becomes essential. In this study, calcium carbonate microparticles were *in-situ* mineralized in pectin/poly(ethylene glycol) (PEG) hydrogel blend to protect and release protein drug at the colon site. Further, bovine serum albumin (BSA) as a model drug was loaded during the fabrication of pectin/PEG blend containing *in-situ* mineralized calcium carbonate particles. The interaction of loaded BSA with calcium carbonate by physical forces was evidenced by FTIR analysis. BSA could also be visualized around the mineralized calcium carbonate by TEM throughout the hydrogel matrix. Rheological studies on the oral delivery vehicle revealed dynamic nature of the hydrogel, an essential property required for drug carriers for its interaction with the target site. *In-vitro* swelling and protein release studies of pectin based hydrogel indicated the potentiality of the drug carrier in releasing protein at the colon site. The conformational stability of the released BSA from the hydrogel blend (PPCB) was confirmed by SDS-PAGE and CD spectropolarimetry.

For details refer to <https://doi.org/10.1016/j.jddst.2019.101137>

**Corresponding Author*

Pectin/PEG food grade hydrogel blend for the targeted oral co-delivery of nutrients

Meenakshi Gautam and Deenan Santhiya*

Abstract: Food grade oral delivery vehicles for the targeted delivery of nutrients are currently fabricated by adapting pharmaceutical approaches to promote human health. In this study, Ca^{2+} with vitamin D / Fe^{2+} with vitamin C were entrapped in edible pectin/PEG polymer blend matrix to obtain hydrogels namely PPCaD and PPFcC. Thermogravimetric analysis (TGA) and Fourier transform infrared spectroscopy (FTIR) analysis of pectin based hydrogels confirmed the existence of metal ion content in the hydrogel matrix and their corresponding interaction with the pectin matrix through electrostatic and hydrogen bonding. Rheological measurements revealed a higher elastic nature of PPCaD compared to PPFcC and were in good agreement with the swelling studies. *In-vitro* release studies concluded that the lowest release of metal ion and vitamin from the corresponding hydrogel samples in simulated gastric fluid (SGF) was observed at pH 1.2 for 3 h. It indicated that protection of nutrients from the gastric environment was conferred by the hydrogels. The release studies carried out in the next 3 h in simulated intestinal fluid (SIF) at pH 6.8 indicated not only the highest swelling of the hydrogel samples but also the highest co-release of nutrients at the intestinal site.

For details refer to <https://doi.org/10.1016/j.colsurfa.2019.06.027>

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Dr. D. Kumar is working as a Professor in the Department of Applied Chemistry, Delhi Technological University, Delhi. He has worked as Head of the Department of Biotechnology, and Department of Applied Chemistry at Delhi Technological University, Delhi. 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.D., 83 M.E./M.Tech projects and published 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

1. S. S. Nair, S.K. Mishra and **D. Kumar**, “Recent Progress in Conductive Polymeric Materials for Biomedical Applications”, *Polymers for Advanced Technologies*, vol. 30, no. 12, pp. 2932-2953, 2019. Impact Factor 2.162.

Recent Progress in Conductive Polymeric Materials for Biomedical Applications, Polymers for Advanced Technologies

S.S. Nair, S.K. Mishra and **D. Kumar***

Abstract: Advanced polymeric materials undoubtedly constitute one of the most promising classes of new materials due to their intriguing electronic, optical, and redox properties. The incredible progress in this area has been driven by the development of novel synthetic procedures owing to the emergence of nanotechnology and by the large array of applications. In particular, hybridization of polymeric materials with nanomaterials has allowed the production of promising functional materials with tailored properties and functionalities for targeted biomedical applications. Consequently, sufficient researchers have carried out imperative studies on these advanced polymeric materials over the last decade. Beyond scientific and fundamental interest, such advanced materials are conspicuous from technological perspectives as well. In this review, we accentuate the proliferation of advanced polymeric materials in diverse biomedical applications.

For details refer to <http://doi.org/10.1002/pat.4725>

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BIOGRAPHY

DR. RAM SINGH

Department of Applied Chemistry

Dr. Ram Singh belongs to a village Chandauli of the Sitamarhi district, Bihar, India. He did his schooling from Sainik School Tilaiya. He received his B.Sc., M.Sc. and Ph.D. from University of Delhi. He worked at CEMDE and Department of Chemistry, University of Delhi, before joining Delhi Technological University in July 2010. At present, he is Associate Professor in the Department of Applied Chemistry, DTU. He is working in the field of medicinal and natural product chemistry. He has published over 75 research papers in peer-reviewed journals, authored 8 books, 16 book chapters, 31 Modules for ePG-Pathshala and contributed in more than 90 conferences. He has supervised 4 Ph.D. and 10 M Tech students. His research has been funded by DST, CSIR, and DRDO. He is on Editorial Advisory Board of various journals of repute and Life Member of various societies.

Award Summary & Publications Details

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

1. B. Veer and **R. Singh**, “Facile Synthesis of 2-Arylimidazo[1,2-a]pyridines catalyzed by DBU in Aqueous ethanol”, *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences*, vol. 475, no. 2230, pp. 20190238, 2019. Impact Factor: 2.818.
2. S. Suman and **R. Singh**, “Anion selective electrodes: A brief compilation”, *Microchemical Journal*; vol. 149, pp. 104045, 2019. Impact Factor: 3.206.
3. Poonam and **R. Singh**, Facile one-pot synthesis of highly functionalized pyrazoles using Alumina-Silica-supported MnO₂ as recyclable catalyst in water, *Research on Chemical Intermediates*; vol. 45, no. 9, pp. 4531-4542, 2019. Impact Factor: 2.064.

Facile synthesis of 2-arylimidazo[1,2-a]pyridines catalysed by DBU in aqueous ethanol

Babita Veer and **Ram Singh***

Abstract: A facile protocol for the synthesis of 2-arylimidazo[1,2-a]pyridines was developed using two-component cyclization of substituted 2-aminopyridines and substituted phenacyl bromides in 65–94% yield. The reaction was DBU catalysed using green solvent, aqueous ethanol (1:1 v/v) at room temperature. The atom economy of the products was calculated to be 66.25–73.41%. The developed protocol successfully exhibits a broad substrate scope, less reaction time, high to moderate yield and multigram scale synthesis.

For details refer to <https://doi.org/10.1098/rspa.2019.0238>

Anion selective electrodes: A brief compilation

Shankar Suman and **Ram Singh***

Abstract: The ions are the integral part of environment including the human system. Their imbalance always leads to negative outcomes. Imbalance in environment results environmental pollutions whereas imbalance in human body results in number of diseases. Hence the qualitative and quantitative determination of these ions is always focus of research. This compilation is going to focus only the negatively charged ions (anions) such as thiocyanate, iodide, triiodide, nitrite, nitrate, salicylate, sulphate, chloride, bromide, fluoride, phosphate, dichromate and perchlorate detection with the help of anion selective electrodes. The review covers type of ionophores, their specified anion selectivity, detection limit and response time.

For details refer to <https://doi.org/10.1016/j.microc.2019.104045>

**Corresponding Author*

Facile one-pot synthesis of 5-amino-1H-pyrazole-4-carbonitriles using alumina–silica-supported MnO₂ as recyclable catalyst in water

Poonam Dagar and **Ram Singh***

Abstract: A novel, facile, one-pot, multicomponent protocol for the synthesis of 5-amino-1H-pyrazole-4-carbonitrile derivatives has been developed using alumina–silica-supported MnO₂ as recyclable catalyst in water and sodium dodecyl benzene sulphonate at room temperature. The cyclo-condensation of substituted benzaldehydes, malononitrile and phenyl hydrazine gave the 5-amino-1,3-diphenyl-1H-pyrazole-4-carbonitriles in 86–96% yield.

For details refer to [10.1007/s11164-019-03847-8](https://doi.org/10.1007/s11164-019-03847-8)

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Dr. Raminder Kaur is an Assistant professor in the Department Applied Chemistry, Delhi Technological University (formerly Delhi College of Engineering), Delhi, India. She received her doctorate degree in Chemical Engineering from Indian Institute of Technology, Delhi (IITD). She has received her M.Tech degree in Polymer Technology from Department of Chemical Engineering, Panjab University, Chandigarh, Punjab and her B.Tech degree in Chemical Engineering from Beant College of Engineering and Technology, Gurdaspur, Punjab. Her research interests include Reaction Engineering, Bio-based Polymeric Materials and Composites, Conducting Polymers, Pollution Abatement Technologies. She has published over 30 research papers in international journals, one book chapter and about 40 papers in national and international conferences. She has worked/presently working on a different research project funded by CSIR, DRDO and DTU. She has received ‘Research Excellence Award’ from DTU for year 2017 and 2018. She is a fellow of IEChe, The Society of Polymer Science, India and Asian Polymer Association, Materials Research Society of India, Society for Materials Chemistry and Indian Society of Analytical Scientists. She is reviewer of many journals of international repute.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. A. Agrawal, **R. Kaur** and R. S. Walia, “Flame Retardancy of Ceramic Based Rigid Polyurethane Foam Composites”, *Journal of Applied Polymer Science*, vol. 136, no.8, pp. 48250, 2019. Impact Factor: 2.188.
2. A. Agrawal, **R. Kaur** and R. S. Walia, “Investigation on flammability of rigid polyurethane foam-mineral fillers composite”, *Fire and Materials*, vol. 43, no. 8, pp. 917-927, 2019. Impact Factor: 1.173

Flame retardancy of ceramic-based rigid polyurethane foam composites

Anuja Agrawal, **Raminder Kaur*** and Ravinderjit Singh Walia

Abstract: In this work, ceramic fillers zirconia and alumina powder were incorporated in the rigid polyurethane foams derived from modified castor oil and their impact on the mechanical, thermal, and fire performances of composite foams have been analyzed. It was observed that the addition of ceramic filler showed improved mechanical and thermal properties and best properties were shown by 6% zirconia with compressive strength of 6.61 MPa and flexural strength of 5.72 MPa. Zirconia also demonstrated an increase in T5% up to 260°C. Cone calorimetry shows a decrease in peak of heat release from 118 to 84 kW m⁻² and 94 kW m⁻² by the incorporation of alumina and zirconia powder, respectively. Furthermore, total heat release (THR), smoke production rate (SPR), and total smoke release (TSR) were also found to decrease remarkably on the incorporation of ceramic fillers. So, these fillers have a great potential as an additive to incorporate good mechanical, thermal, and fire properties in bio-based rigid PU foams.

For details refer to <https://doi.org/10.1002/app.48250>

Investigation on flammability of rigid polyurethane foam-mineral fillers composite

Anuja Agrawal, **Raminder Kaur*** and Ravinderjit Singh Walia

Abstract: This study investigates the incorporation of castor oil -based rigid polyurethane foam with mineral fillers feldspar or kaolinite clay in order to enhance the mechanical, thermal, and flame retardant properties. Influence of mineral fillers on the mechanical strength was characterized by compressive strength and flexural strength measurement. Thermogravimetric analysis (TGA) was performed to diagnose the changes in thermal properties, while cone calorimeter test was performed to ascertain the flame retardancy of the mineral filler -incorporated rigid polyurethane foam composites. Results showed that the foams incorporated with mineral filler demonstrated up to 182% increase in compressive strength and 351% increase in flexural strength. Thermal stability of these composite foams was also found to be enhanced on the incorporation of kaolinite clay filler with an increase in 5% weight loss temperature (T5%) from 192°C to 260°C. Furthermore, peak heat release rate (PHRR), total heat release (THR), smoke production rate (SPR), and total smoke release (TSR) were also found to decreased on the incorporation of mineral filler in the rigid polyurethane foam. So mineral fillers are ascertained as a potential filler to enhance the mechanical, thermal, and flame retardant behaviors of bio-based rigid polyurethane foam composites.

For details refer to <https://doi.org/10.1002/fam.2751>

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Dr. Roli Purwar is currently working as an Associate Professor in the discipline of Polymer Science and Chemical Technology, Department of Applied Chemistry, Delhi Technological University. In addition to academics she is holding position of Assistant Director of International affairs. She has Joined Delhi Technological University 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” and “Formulation for improving the impact properties of recycled polypropylene” and transferred to industries. Three patents (2 Indian and 1 US) are in her credit. Recently 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 Conferences. She has supervised 01 Ph.D. and 10 M.Tech thesis.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. C. M. Srivastava, **R. Purwar** and A. P. Gupta, “Enhanced potential of biomimetic, silver nanoparticles functionalized *Antheraea mylitta* (tasar) silk fibroin nanofibrous mats for skin tissue engineering”, *International Journal of Biological Macromolecule*, vol. 130, pp. 437–453, 2019. Impact Factor: 4.784.

Enhanced potential of biomimetic, silver nanoparticles functionalized *Antheraea mylitta* (tasar) silk fibroin nanofibrous mats for skin tissue engineering

Chandra Mohan Srivastava, **Roli Purwar*** and Anek Pal Gupta

Abstract: In the present study, we have successfully prepared tasar fibroin nanofibrous mats using 1butyl3methylimidazolium acetate for skin tissue engineering. The prepared tasar nanofibrous mat was further coated by silver nanoparticles (AgNPs) in situ using dandelion (*Tridax procumbens*) leaf extract. The kinetic of silver nanoparticles formation was studied by UV-VIS spectrophotometer. The prepared silver nanoparticles were further confirmed by XRD and TEM. The coating of tasar nanofibrous mat with silver nanoparticles was confirmed by EDX and EDX mapping techniques. The physical, mechanical, antimicrobial and biological properties of these silver nanoparticles coated tasar nanofibrous mat were determined in order to check its suitability for skin tissue engineering and wound dressing applications.

For details refer to <https://doi.org/10.1016/j.ijbiomac.2018.12.255>

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BIOGRAPHY

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Dr. Saurabh Mehta obtained his Ph.D. in Organic Chemistry from Iowa State University, Ames, Iowa, USA in 2009. He previously obtained his M.Phil. degree in Industrial Methods of Chemical Analysis from IIT Roorkee in 2001. He has also worked in the pharmaceutical industry for approximately 3 years. Dr. Mehta has been working as an Assistant Professor in the Department of Applied Chemistry, Delhi Technological University, since July 2010. He was a visiting researcher (2014-15) at the Miller School of Medicine, University of Miami, FL, USA. His research interests include Synthetic Organic Chemistry (especially the development of new methodologies for the synthesis of medicinally important heterocyclic compounds), Cheminformatics and Chemical Biology. He is also interested in antibacterial and anticancer Drug Discovery. Dr. Mehta's H-index is 12. His research work has been published in several highly reputed international journals.

Award Summary & Publications Details

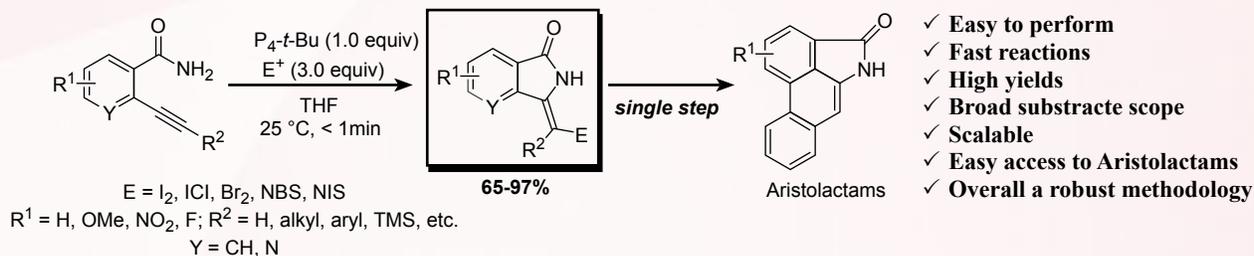
Category Title	No. of Publications
Commendable Research Award	01

1. **S. Mehta** and D. Brahmchari, "Phosphazene Superbase-mediated Regio- and Stereoselective Iodoaminocyclization of 2-(1-Alkynyl) benzamides for the Synthesis of Isoindolin-1-ones", *The Journal of Organic Chemistry*, vol. 84, no. 9, pp. 5492-5503, 2019., Impact Factor: 4.745.

Phosphazene Superbase-mediated Regio- and Stereoselective Iodoaminocyclization of 2-(1-Alkynyl)benzamides for the Synthesis of Isoindolin-1-ones

Saurabh Mehta and Dharendra Brahmchari

Abstract:



Phosphazene superbase $P_4-t\text{-Bu}$ mediated iodoaminocyclization of 2-(1-alkynyl)benzamides is reported. The reaction works under ambient conditions and instantaneously results in the synthesis of isoindolin-1-ones in 65–97% yields, in a regio- and stereoselective manner. The exclusive formation of products with *Z*-geometry (across the exo $C=C$ bond) has been confirmed through X-ray crystallography. The methodology also provides an easy access to aristolactams, an important class of natural products. This has been successfully demonstrated by synthesizing two aristolactam derivatives (including Cepharanone B).

For details refer to <https://doi.org/10.1021/acs.joc.9b00452>



PROF. S. G. WARKAR

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Dr. S. G. Warkar is a Professor in the 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. He has received his M.Sc. Degree in Chemistry from Department of Chemistry, Nagpur University, India and B.Sc. Degree from Nagpur University, India. His research interests include Engineering Materials and Polymeric Hydrogels. He has published over 7 research papers in International journals 5 papers in National and International conferences. He has received ‘Research Excellence Award’ from DTU for year 2018. 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, **S. G. Warkar** and A. Kumar, “Synthesis and assessment of carboxymethyl tamarind kernel gum based novel superabsorbent hydrogels for agricultural applications”, *Polymer*, vol. 182, pp. 121823, 2019. Impact Factor- 3.771.

Synthesis and assessment of carboxymethyl tamarind kernel gum based novel superabsorbent hydrogels for agricultural applications

Khushbu, **Sudhir G. Warkar*** and Anil Kumar

Abstract: The novel superabsorbent hydrogels (SAH) were fabricated by interpenetrating carboxymethyl tamarind kernel gum with sodium-acrylate. The synthesis of SAH was verified by characterization using Fourier-transform infrared spectroscopy, thermo-gravimetric analysis, scanning electron microscopy and swelling studies under various solutions. The hydrogel formed was found out to be degradable (soil burial biodegradation test). Maximum water holding capacity, bulk density, porosity and water retention capacity of soil were evaluated to see the effects on soil by the hydrogel treatment. The hydrogel which absorbs up to 648 ml/g, post inclusion to soil, and showed significant enhancement in the moisture absorption (35%), porosity (7%) and water retention capacity compared to the untreated (control) soil. The effects of the hydrogel were also seen on the growth of chickpea plants. The synthesized SAH displayed promising potential as soil conditioner for agricultural applications.

For details refer to <https://doi.org/10.1016/j.polymer.2019.121823>

**Corresponding Author*

**DR. ADITYA KAUSHIK***Department of Applied Mathematics*

Dr. Aditya Kaushik has been working as an Associate Professor in the Department of Applied Mathematics, DTU. 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**, A. K. Vashishth, V. Kumar and M. Sharma, “A modified graded mesh and higher order finite element approximation for singular perturbation problems”, *Journal of Computational Physics*, vol. 395, pp. 275-285, 2019. Impact factor: 2.845.

A modified graded mesh and higher order finite element approximation for singular perturbation problems

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

Abstract: A singularly perturbed convection diffusion problem is solved numerically using finite element method based on higher order polynomials. More precisely, we introduce a modified graded mesh generated using some implicitly defined functions. Higher order parameter uniform convergence is obtained in ϵ -weighted energy norm. Moreover, the error estimates obtained are optimal in the sense that they are free from logarithmic factor. A number of test examples are taken into account and a rigorous comparative analysis is presented. Moreover, we compare the proposed method with others found in the literature.

For details refer to <https://doi.org/10.1016/j.jcp.2019.04.073>



DR. CHANDRA PRAKASH SINGH
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Dr. Chandra Prakash Singh is an Associate Professor 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 78 research papers in refereed International (63) and National (15) journals of repute. He has attended and presented 25 research papers in National and International Conferences. He has also delivered many invited talk lectures in the National and International Conferences. He has guided four Ph.D. and three Ph D. students are working under his supervision. He is the reviewer of many journals like, European Physical Journal C, Astrophysics and Space Science, Indian Journal of Physics, Modern Physics Letters A, etc. He has a rich experience of teaching of 21 years in the subject of Pure and Applied Mathematics. Recently, Dr. Singh has been elected for Fellow of Royal Astronomical Society (FRAS), UK.

Award Summary & Publications Details

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

1. **C. P. Singh** and S. Kaur, "Matter creation cosmology in Brans-Dicke theory- Observational Tests and Thermodynamic analysis", *Physical Review D*, vol. 100, no. 8, pp. 084057, 2019. Impact Factor: 4.368.
2. **C. P. Singh** and A. Kumar, "Observational constraints on viscous Ricci dark energy model", *Astrophysics and Space Science*, vol. 364, no. 6, pp. 94, 2019. Impact Factor: 1.681.

Matter creation cosmology in Brans-Dicke theory: observational tests and thermodynamic analysis

C. P. Singh and Simran Kaur

Abstract: A matter-dominated model with gravitationally induced matter creation is proposed in the framework of Brans-Dicke theory. We obtain the main cosmological functions such as the scale factor of the universe, the Hubble expansion rate and deceleration parameter analytically. We explore the viability of the model to explain the present accelerated expansion of the universe. In this scenario the present cosmic acceleration is supposed to drive only by the negative creation pressure associated with the matter component. The evolution of such model is tested by statistical analysis of latest SNe, OHD and BAO probes. We study and plot the trajectories of the evolution of the universe with best estimated values of the model parameters. It is observed that the expanding universe begins with Big-Bang followed by a smooth transition from decelerated phase to accelerated phase. The ages of the universe obtained by SNe+OHD and SNe+OHD+BAO in this model are in good agreement with the age predicted by Lambda CDM model. We analyse the model with statefinder diagnostic and find that the model is different from Lambda CDM model but approaches to Lambda CDM in future. The model shows the quintessence behaviour.

For details refer to <https://doi.org/10.1103/PhysRevD.100.084057>

Observational constraints on viscous Ricci dark energy model

C. P. Singh and Amit Kumar

Abstract: In this paper, Ricci dark energy (RDE) model with bulk viscosity is studied to observe the cosmic accelerating expansion phenomena. It is thought that the negative pressure caused by bulk viscosity can play the role of a dark energy component. We assume that the total bulk viscosity coefficient is proportional to the velocity and acceleration of the expansion of the universe in the form, $\xi = \xi_0 + \xi_1 H + \xi_2 qH$, where ξ_0 , ξ_1 and ξ_2 are the constants. We show that the model corresponds to early deceleration and then a smooth transition into an accelerated epoch. We analyze the model with statefinder and $Om(z)$ diagnostics and find that the model is different from standard CDM model at present but approaches to CDM in late time. We constrain the model using latest observational data namely Ia Supernovae data (SN Ia), observed Hubble parameter dataset (OHD) and baryon acoustic oscillations (BAO) measurement to evaluate the best estimated values of all bulk viscous parameters. It is claimed that the non-viscous RDE model suffers the age problem. However, we find that viscous RDE alleviates the age problem. The viscous Ricci dark energy model is compatible to explain the present accelerated expansion of the universe.

For details refer to <https://doi.org/10.1007/s10509-019-3583-3>



DR. NILAM

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Dr. Nilam is faculty in the Department of Applied Mathematics, Delhi Technological University having an experience of more than 15 years and research in teaching. Her research interest is Mathematical Modelling and Simulation using MATLAB and Mathematica. She did her doctorate from IIT Roorkee in 2004. She has published twenty research papers in reputed international journals. She has delivered many invited talks at national and international level.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. A. Kumar and **Nilam**, “Mathematical analysis of a delayed epidemic model with nonlinear incidence and treatment rates”, *Journal of Engineering Mathematics*, vol. 115, pp. 1-20, 2019. Impact factor: 1.146.
2. A. Kumar and **Nilam**, “Stability of a delayed SIR epidemic model by introducing two explicit treatment classes along with nonlinear incidence rate and Holling type treatment”, *Computational and Applied Mathematics*, vol. 38, pp. 130, 2019. Impact factor: 1.260.
3. K. Goel and **Nilam**, “Stability behavior of a nonlinear mathematical epidemic transmission model with time delay”, *Nonlinear Dynamics*, vol. 98, pp. 1501–1518, 2019. Impact factor: 4.604.

Mathematical analysis of a delayed epidemic model with nonlinear incidence and treatment rates

Abhishek Kumar and Nilam*

Abstract: In the case of an outbreak of an epidemic, psychological or inhibitory effects and various limitations on treatment methods play a major role in controlling the impact of the epidemic on society. The Monod–Haldane functional-type incidence rate is taken to interpret the psychological or inhibitory effect on the population with time delay representing the incubation period of the disease. The Holling type III saturated treatment rate is considered to incorporate the limitation in treatment availability to infective individuals. This novel combination of the Monod–Haldane incidence rate and Holling type III treatment rate is applied herein to a time-delayed susceptible–infected–recovered epidemic model to incorporate these important aspects. The mathematical analysis shows that the model has two equilibrium points, namely disease-free and endemic. Detailed dynamical analysis of the model is performed using the basic reproduction number R_0 , center manifold theory, and Routh–Hurwitz criterion. The results show that the disease can be eradicated when the basic reproduction number is less than unity, while the disease will persist when the basic reproduction number is greater than unity. The Hopf bifurcation at endemic equilibrium is addressed. Furthermore, the global stability behavior of the equilibria is discussed. Finally, numerical simulations are performed to support the analytical findings.

For details refer to <https://doi.org/10.1007/s10665-019-09989-3>

**Corresponding Author*

Stability of a delayed SIR epidemic model by introducing two explicit treatment classes along with nonlinear incidence rate and Holling type treatment

Abhishek Kumar and Nilam*

Abstract: In this article, we analyze the stability of a time-delayed susceptible–infected–recovered (S–I–R) epidemic model by introducing two explicit treatment classes (or compartments) along with nonlinear incidence rate. The treatment classes are named as a pre-treated class (T1) and post-treated class (T2). The pre-treatment and post-treatment rates are being considered as Holling type I and Holling type III, respectively. Long-term qualitative analysis has been carried out after incorporating incubation time delay (τ) into the incidence rate. The model analysis shows that the model has two equilibrium points, named as disease-free equilibrium (DFE) and endemic equilibrium (EE). The disease-free equilibrium is locally asymptotically stable when the basic reproduction number (R_0) is less than one and unstable when R_0 is greater than one for time lag $\tau \geq 0$ and when $R_0=1$ by Castillo-Chavez and Song theorem, the disease-free equilibrium changes its stability from stable to unstable and the model exhibits transcritical bifurcation. Furthermore, some conditions for stability of the endemic equilibrium are obtained. Finally, numerical simulations are presented to exemplify the analytical studies.

For details refer to <https://doi.org/10.1007/s40314-019-0866-9>

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Stability behavior of a nonlinear mathematical epidemic transmission model with time delay

Kanica Goel and Nilam*

Abstract: In this article, we study a time-delayed susceptible–infected–recovered mathematical model along with nonlinear incidence rate and Holling functional type II treatment rate for epidemic transmission. The mathematical study of the model demonstrates that the model exhibits two equilibria, to be specific, disease-free equilibrium (DFE) and endemic equilibrium (EE). We obtain the basic reproduction number R_0 and investigate that the model is locally asymptotically stable at DFE if $R_0 < 1$ and unstable if $R_0 > 1$ for the time lag $\nu > 0$. The stability of DFE at $R_0 = 1$ is also investigated for the time lag $\nu \geq 0$, and we show that for $\nu > 0$, the DFE is linearly neutrally stable, whereas for $\nu = 0$, the model exhibits backward bifurcation whereby the DFE will coexists with two endemic equilibria, when $R_0 < 1$. We also investigate the stability of the model at the EE and find that oscillatory solution may appear via Hopf bifurcation, taking the delay as a bifurcation parameter. Further, global stability of the model equilibria has also been analyzed. Finally, numerical simulations have been presented to illustrate the analytical studies.

For detail refer to <https://doi.org/10.1007/s11071-019-05276-z>

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Dr. R. Srivastava is working as a Professor in the Department of Applied Mathematics, Delhi Technological University. He obtained the M.Sc. degree in Mathematics with Gold Medal, and Ph.D. degree in Mathematics from Gorakhpur University, Uttar Pradesh. He has a teaching experience of 29 years. His current area of interest is Financial Mathematics.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. G. Malhotra, **R. Srivastava** and H. C. Taneja, “Calibration of the risk-neutral density function by maximization of a two-parameter entropy”, *Physica A: Statistical Mechanics and its Applications*, vol. 513, pp. 45-54, 2019. Impact factor: 2.500.

Calibration of the risk-neutral density function by maximization of a two-parameter entropy

Gifty Malhotra, **R. Srivastava*** and H. C. Taneja

Abstract: In the present work, a two-parameter entropy is maximized to calibrate the risk-neutral probability density function of the future asset price using options data subject to the expectation and the variance constraint. In the variance constraint, the volatility is assumed to be mean-reverting and following a quadratic path. The desired power law distribution is verified for the density function obtained, and it contains both the entropy parameters giving an additional degree of freedom. The calibrated density function is used to price the European call options for different strikes. The results thus obtained are discussed for the one-parameter Renyi and Tsallis entropies.

For details refer to <https://doi.org/10.1016/j.physa.2018.08.148>

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**MR. RAM PRATAP***Department of Applied Mathematics*

Mr. Ram Pratap is a research scholar in the Department of Applied Mathematics, Delhi Technological University. He is pursuing Ph.D. in the field of approximation theory under the supervision of Prof. Naokant Deo. He gained his master's degree in Mathematics from IIT Roorkee. He has published five research papers in reputed international journals.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **R. Pratap** and Naokant Deo, "Approximation by genuine Gupta-Srivastava operators", *Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas*, vol. 113, pp. 2495-2505, 2019. Impact Factor: 1.028.

Approximation by genuine Gupta–Srivastava operators

Ram Pratap and Naokant Deo

Abstract: In the present paper, we consider new operators, which is defined by Gupta and Srivastava (Eur J Pure Appl Math 11(3):575–579, 2018). They considered a general sequence of positive linear operators and gave the modified form of their previous operators (Neer et al. in Math Comput Model 37:1307–1315, 2003). As these operators preserve linear functions, we call these operators as genuine Gupta–Srivastava operators. Here we discuss some basic properties, direct results and rate of convergence of functions of bounded variation and weighted approximation.

For details refer to <https://doi.org/10.1007/s13398-019-00633-4>

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Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01

1. A. Kumari and **S. Adhikari**, “Detection of a mixed bipartite entangled state in arbitrary dimension via a structural physical approximation of partial transposition”, *Physical Review A*, vol. 100, no. 5, pp. 052323, 2019. Impact Factor: 2.907.

Detection of a mixed bipartite entangled state in arbitrary dimension via a structural physical approximation of partial transposition

Anu Kumari and **Satyabrata Adhikari***

Abstract: It is crucial to know whether the quantum state generated in the experiment is entangled. In the literature, this topic was studied extensively and researchers proposed different approaches for the detection of a mixed bipartite entangled state in arbitrary dimension. Proceeding in this line of research, we propose three different criteria for the detection of mixed bipartite negative partial transpose (NPT) entangled state in arbitrary dimension. Our criteria are based on the method of structural physical approximation (SPA) of partial transposition (PT). We show that the proposed criteria for the detection of a NPT entangled state can be realized experimentally. Two of the proposed criteria are given in terms of the concurrence of the given state in arbitrary dimension so it is essential to find out the concurrence. Thus, we provide lower and upper bounds of concurrence of the quantum state under investigation in terms of average fidelity of two quantum states, and hence these bounds can be realized experimentally. Moreover, we show how to perform a SPA map on a qutrit-qubit system and then explicitly calculate the matrix elements of the density matrix describing the SPA-PT of the qutrit-qubit system. We then illustrate our criteria for the detection of entanglement by considering a class of qubit-qubit system and a class of qutrit-qubit system.

For details refer to <https://doi.org/10.1103/PhysRevA.100.052323>

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Prof. Rao is working as a faculty in the Department of Applied Physics, Delhi Technological University (DTU), 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	03

1. S. Kaur, **A. S. Rao** and M. Jayasimhadri, “Color tunability and energy transfer studies of Dy³⁺/ Eu³⁺ co-doped calcium aluminosilicate phosphor for lighting applications”, *Materials Research Bulletin*, vol. 116, pp. 79-88, 2019. Impact Factor: 3.355.
2. N. Deopa , S. Saini, S Kaur, A. Prasad and **A. S. Rao**, “Spectroscopic investigations on Dy³⁺ ions doped zinc lead alumino borate glasses for photonic device applications”, *Journal of Rare Earths*, vol. 37, no. 1, pp. 52-59, 2019. Impact Factor: 2.846.
3. S. Kaur, **A. S. Rao**, M.Jayasimhadri, B.Sivaiah and D. Haranath, “Synthesis optimization, photoluminescence and thermoluminescence studies of Eu³⁺ doped calcium aluminosilicate phosphor”, *Journal of Alloys and Compounds*, vol. 802, pp. 129-138, 2019. Impact Factor: 4.175.

Color tunability and energy transfer studies of Dy³⁺/Eu³⁺ co-doped calcium aluminozincate phosphor for lighting applications

Sumandeep Kaur, **A. S. Rao*** and M. Jayasimhadri

Abstract: Dy³⁺ doped and Dy³⁺/Eu³⁺ co-doped calcium aluminozincate (CAZ) phosphor synthesized by Pechini sol-gel method. Structural and morphological analysis were carried out by using X-ray diffractometer (XRD) and field emission scanning electron microscope (FE-SEM). The photoluminescent (PL) spectra were recorded and energy transfer mechanism between Dy³⁺ and Eu³⁺ ions were studied using Dexter and Reisfeld's approximation. The colorimetric properties were studied by evaluating CIE coordinates and correlated color temperature (CCT). The energy transfer mechanism was analysed by applying Inokuti-Hirayama (I-H) model on decay curves as well. The thermoluminescence (TL) glow curve analysis reveals two trap centres in the present host. The obtained results indicate that the CCT can be tuned from warm to cool region and color tunability can also be achieved in Dy³⁺/Eu³⁺ co-activated CAZ phosphor by varying the excitation wavelength or activator concentration in the host lattice and hence can be effectively utilized in white light emitting diodes (wLEDs).

For details refer to <https://doi.org/10.1016/j.materresbull.2019.04.022>

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Spectroscopic investigations on Dy³⁺ ions doped zinc lead alumino borate glasses for photonic device applications

Nisha Deopa, Shubham Saini, Sumandeep Kaur, Aman Prasad and **A. S. Rao***

Abstract: This paper presents the structural, optical absorption, photoluminescence (PL) and decay spectral properties of Dy³⁺ ions doped zinc lead alumino borate (ZPAB) glasses to elucidate their possible usage in photonic devices such as w-LEDs and lasers. A broad hump shown by the XRD spectrum recorded for an un-doped ZPAB glass confirms its non-crystalline nature. The Judd-Ofelt (J-O) intensity parameter evaluated from the measured oscillator strengths of the absorption spectral features were used to estimate various radiative parameters and also to understand the nature of bonding between Dy³⁺ ions and oxygen ligands. Under 350 nm excitation, the as-prepared glasses are exhibiting two emission bands $^4F_{9/2} \rightarrow ^6H_{15/2}$ (blue), and $^4F_{9/2} \rightarrow ^6H_{13/2}$ (yellow) at 483 and 575 nm, respectively. From the PL spectra, the Y/B ratio values, CIE chromaticity color coordinates and color correlated temperature (CCT) were evaluated. The experimental lifetimes measured from the decay profiles are decreasing with increase in Dy³⁺ ions concentration in these glasses which may be attributed to the cross-relaxation and non-radiative multiphonon relaxation process. Decay profiles observed for higher concentration were well fitted to Inokuti-Hirayama (I-H) model to understand the energy transfer process and subsequent decrease in experimental lifetimes. The higher values of radiative parameters, emission cross-sections, quantum efficiency, optical gain and gain band width suggest the suitability of 0.5 mol% of Dy³⁺ ions in these ZPAB glasses for the photonic device application.

For details refer to <https://doi.org/10.1016/j.jre.2018.04.013>

**Corresponding Author*

Synthesis optimization, photoluminescence and thermoluminescence studies of Eu^{3+} doped calcium aluminozincate phosphor

Sumandeep Kaur, **A. S. Rao***, M. Jayasimhadri, B. Sivaiah and D. Haranath

Abstract: Dy^{3+} doped and $\text{Dy}^{3+}/\text{Eu}^{3+}$ co-doped calcium aluminozincate (CAZ) phosphor synthesized by Pechini sol-gel method. Structural and morphological analysis were carried out by using X-ray diffractometer (XRD) and field emission scanning electron microscope (FE-SEM). The photoluminescent (PL) spectra were recorded and energy transfer mechanism between Dy^{3+} and Eu^{3+} ions were studied using Dexter and Reisfeld's approximation. The colorimetric properties were studied by evaluating CIE coordinates and correlated color temperature (CCT). The energy transfer mechanism was analysed by applying Inokuti-Hirayama (I-H) model on decay curves as well. The thermoluminescence (TL) glow curve analysis reveals two trap centres in the present host. The obtained results indicate that the CCT can be tuned from warm to cool region and color tunability can also be achieved in $\text{Dy}^{3+}/\text{Eu}^{3+}$ co-activated CAZ phosphor by varying the excitation wavelength or activator concentration in the host lattice and hence can be effectively utilized in white light emitting diodes (wLEDs).

For details refer to <https://doi.org/10.1016/j.materresbull.2019.04.022>

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BIOGRAPHY

DR. AJEET KUMAR

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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. He received M.Sc. degree from the Indian Institute of Technology Roorkee, India, in 2004, and the Ph.D. degree from the Indian Institute of Technology 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. P. Chauhan, **A. Kumar** and Y. Kalra, “Computational modeling of tellurite based photonic crystal fiber for infrared supercontinuum generation”, *Optik*, vol. 187, pp. 92–97, 2019. Impact Factor: 1.914.
2. P. Chauhan, **A. Kumar** and Y. Kalra, “A dispersion engineered silica-based photonic crystal fiber for supercontinuum generation in near-infrared wavelength region”, *Optik*, vol. 187, pp. 230–237, 2019. Impact Factor: 1.914.

Computational modeling of tellurite based photonic crystal fiber for infrared supercontinuum generation

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

Abstract: In this paper, we have numerically designed a golden spiral photonic crystal fiber using tellurite glass for supercontinuum generation. Dispersion engineering technique has been used for the optimization of geometrical parameters of the fiber. At a pump wavelength of 1.35 μm , the proposed fiber offers the high value of nonlinear coefficient as $884 \text{ W}^{-1} \cdot \text{km}^{-1}$ and low effective mode area as $3.79 \mu\text{m}^2$. An ultra-broadband supercontinuum spectrum ranging 1000 – 5500 nm has been generated with a bandwidth of 4500 nm using designed fiber of length 5.5-centimeters long pumped with few femtosecond laser sources in the infrared wavelength region.

For detail refer to <https://doi.org/10.1016/j.ijleo.2019.03.106>

A dispersion engineered silica-based photonic crystal fiber for supercontinuum generation in near-infrared wavelength region

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

Abstract: We report computational modeling of photonic crystal fibers in silica glass for near-infrared supercontinuum generation. Optical parameters like chromatic dispersion, nonlinearity and the effective area of the fundamental mode have been computed and tailored by using a full vectorial finite element method. At pump wavelength of 1300 nm, a flat-top dispersion profile has been obtained with very low dispersion value $+0.6402 \text{ ps/nm/km}$ in the anomalous region. The reported structure offers high nonlinear coefficient $26.27 \text{ W}^{-1} \cdot \text{km}^{-1}$ with effective mode area $4.78 \mu\text{m}^2$ at the pump wavelength. An ultra-broadband supercontinuum spanning, from 0.67 μm up to 2.4 μm can be easily achieved by the proposed fiber of 37 cm length using a 63 fs secant laser pulse source with 8 kW peak power in the near-infrared wavelength region. Such type of fiber can be advantageous in the field of near-infrared spectroscopy, optical communication, gas sensing, medical, frequency metrology, optical coherence tomography, and food quality control.

For detail refer to <https://doi.org/10.1016/j.ijleo.2019.03.107>

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Dr. Mohan Singh Mehata is working as an Assistant Professor in the Department of Applied Physics, Delhi Technological University. He received his Ph.D. from Kumaun University (1995-2002), U.K. He has received research fellowship of Michigan Technological University, USA (2003), DST Young Scientist fellowship (2004), of Hokkaido University, Japan, Postdoctoral fellowship (2004-05), UCOST-Young Scientist award (2007), Japan Society for the Promotion of Science (JSPS) Postdoctoral Fellowship (2007-09), Carnegie Mellon University Research Associate, (2009-10), USA. He is recipient of Visiting Professorship of Chinese Academy of Science (CAS) China (2014-15) and National Chiao Tung University, Taiwan (2019). He is author and co-author of more than 84 research papers and conference proceedings including 7 as a single author and 3 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 2-D 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	02

1. M. K. Singh and **M.S. Mehata**, "Phase-dependent optical and photocatalytic performance of synthesized titanium dioxide (TiO₂) nanoparticles", *Optik*, vol. 193, pp. 163011, 2019. Impact Factor: 1.914.
2. N. Pandey, **M.S. Mehata**, N. Fatma and S. Pant, "Efficient fluorescence quenching of 5-aminoquinoline: Silver ion recognition study", *Journal of Luminescence*, vol. 205, pp. 475-48, 2019. Impact Factor: 2.961.

Phase-dependent optical and photocatalytic performance of synthesized titanium dioxide (TiO₂) nanoparticles

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

Abstract: Titanium dioxide (TiO₂) nanoparticles (NPs) were prepared by the sol-gel method with titanium isopropoxide as a precursor at different annealing temperatures. The analysed X-ray diffraction (XRD) patterns, Raman and Fourier transform infrared spectra characteristics demonstrated the structural transformation from amorphous to anatase and further to rutile phase while increasing annealing temperature. In addition, a mixed phase of TiO₂ NPs is formed, which consists of both the phases. The absorption and photoluminescence (PL) spectra of mixed and rutile phases are shifted towards longer wavelength region. Furthermore, the photocatalytic performance of the different type of TiO₂ NPs was examined through the degradation of a dye, rhodamine B (RhB) under UV radiation, and by measuring changes in absorption and PL spectra. The anatase phase structure shows higher photocatalytic activity than the rutile phase. However, the mix phase has the highest photocatalytic activity among all the structures, which degraded RhB entirely with a faster rate. On the other hand, the rutile phase is unable to take part in this process. Thus, the mix phase of TiO₂ NPs is highly useful for industrial and environmental applications.

For details refer to <https://doi.org/10.1016/j.ijleo.2019.163011>

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Efficient fluorescence quenching of 5-aminoquinoline: Silver ion recognition study

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

Abstract: Fluorescence (FL) quenching of 5-aminoquinoline (5AQ) by Ag⁺ ions has been studied in acetonitrile (ACN) using steady-state and time-resolved fluorescence techniques. In the absence of Ag⁺ ions, FL shows a single band assigned to the intramolecular charge transfer (ICT) state. The FL intensity of 5AQ gradually reduces on the successive addition of Ag⁺ ions to the solution containing 5AQ. The decrease of FL intensity is nearly ~17 fold in the presence of 60mM Ag⁺ ions. Together with the decrease in FL intensity, the FL band maximum is redshifted. The Stern-Volmer plot has been employed to determine the quenching constant. The nature of quenching has been stated based on the decrease of FL intensity and lifetime in the presence of metal ions. Also, the Benesi-Hildebrand relation has been used to explore the binding mechanism between 5AQ and Ag⁺ ions. Thus, 5AQ displays high affinity for Ag⁺ ions over other competitive metal ions (Cu²⁺, Ca²⁺, Pb²⁺, Fe²⁺, Li⁺, K⁺). Therefore, the present system emerges to be quite important in sensing of Ag⁺ ions in an aprotic environment in a concentration range of 4 μM to 60 mM.

For details refer to <https://doi.org/10.1016/j.jlumin.2018.09.062>

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Dr. M. Jayasimhadri is an Assistant Professor in the Department of Applied Physics, Delhi Technological University, Delhi, India. He has more than 14 years of teaching and research experience. He 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. Four 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 95 research papers in Internationally reputed Scopus Indexed Journals and also presented more than 110 research papers work in several national and international conferences. His h-index as reported by Google Scholar is 33 and Citations are 2731.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	06

1. H. Kaur, **M. Jayasimhadri**, “Color tunable photoluminescence properties in Eu^{3+} doped calcium bismuth vanadate phosphors for luminescent devices”, *Ceramics International*, vol. 45, pp. 15385-15393, 2019. Impact Factor: 3.450.
2. M. K. Sahu, **M. Jayasimhadri**, “White light emitting thermally stable bismuth phosphate phosphor $\text{Ca}_3\text{Bi}(\text{PO}_4)_3:\text{Dy}^{3+}$ for solid-state lighting applications”, *Journal of the American Ceramic Society*, vol. 102, pp. 6087-6099, 2019. Impact Factor: 3.094.
3. A. K. Vishwakarma, Kaushal Jha, **M. Jayasimhadri**, “Enhancement of luminescent properties in Eu^{3+} doped BaNb_2O_6 nanophosphor synthesized by facile metal citrate gel method”, *Optical Materials*, Vol. 96, pp. 109301, 2019. Impact Factor: 2.687.
4. B. C. Jamalaiah, **M. Jayasimhadri**, “Tunable luminescence properties of $\text{SrAl}_2\text{O}_4:\text{Eu}^{3+}$ phosphors for LED applications”, *Journal of Molecular structure*, vol. 1178, pp. 394-400, 2019. Impact Factor: 2.120.
5. K. Jha, **M. Jayasimhadri**, D. Haranath, Kiwan Jang, “Influence of modifier oxides on spectroscopic properties of Eu^{3+} doped oxy-fluoro tellurophosphate glasses for visible photonic applications”, *Journal of Alloys and Compounds*, vol. 789, pp. 622-629, 2019. Impact Factor: 4.175.
6. S. Shankar, O.P. Thakur, **M. Jayasimhadri**, “Conductivity behavior and impedance studies in $\text{BaTiO}_3\text{-CoFe}_2\text{O}_4$ magnetoelectric composites”, *Materials Chemistry and Physics*, vol. 234, pp. 110-121, 2019. Impact Factor: 2.781.

Color tunable photoluminescence properties in Eu^{3+} doped calcium bismuth vanadate phosphors for luminescent devices

Harpreet Kaur and **M. Jayasimhadri***

Abstract: Single phase Eu^{3+} activated calcium bismuth vanadate (CaBiVO_5) phosphors have been successfully synthesized using solid state reaction method. X-ray diffraction (XRD) analysis confirms the pure phase formation and scanning electron microscope (SEM) micrographs exhibit inhomogeneous particle formation with irregular morphology of Eu^{3+} doped CaBiVO_5 (CBV) phosphor. The photoluminescence excitation (PLE) spectrum indicates significant absorption in the ultraviolet (UV) and near ultraviolet (n-UV) spectral region for un-doped CBV sample, whereas Eu^{3+} doped CBV phosphors reveal various sharp absorption bands in n-UV and blue region along with host absorption bands. Trivalent europium activated CBV phosphors under 342 nm excitation exhibit dominant red emission peak at 613 nm wavelength accompanied by weak broadband originating from VO_4 groups, whereas the phosphors under 464 nm excitation, exhibit similar emission profile with most intense one centered at 613 nm by excluding host emission bands. The energy transfer mechanisms and the probable cause for concentration quenching beyond 4.0 mol% of Eu^{3+} ions concentration have been discussed in detail. The CIE chromaticity coordinates for the optimized phosphor, (0.551, 0.398) and (0.639, 0.358), situated in the reddish-orange and red region under 342 and 464 nm excitations, respectively. The CIE coordinates calculated based on the emission spectra measured under 464 nm excitation are close to the commercial phosphor $\text{Y}_2\text{O}_2\text{S}:\text{Eu}^{3+}$ ($x = 0.622$ and $y = 0.351$). All the above mentioned results support the utilization of Eu^{3+} doped CBV phosphor as a potential red emitting component for luminescent devices.

For details refer to <https://doi.org/10.1016/j.ceramint.2019.05.034>

**Corresponding Author*

White light emitting thermally stable bismuth phosphate phosphor $\text{Ca}_3\text{Bi}(\text{PO}_4)_3:\text{Dy}^{3+}$ for solid-state lighting applications

Mukesh Kumar Sahu and **M. Jayasimhadri***

Abstract: White light emitting dysprosium-doped $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ phosphor was successfully synthesized via co-precipitation method for the first time and the structural, vibrational, morphological, and luminescent properties have been investigated for solid-state lighting applications. X-ray diffraction (XRD) and structural refinement studies reveal that the synthesized phosphors consist of single phase with cubic structure. The field emission scanning electron microscopy (FE-SEM) images reveal that the as-synthesized phosphor has micron size particle with an irregular shape. Under near-ultraviolet (n-UV) and blue excitation, the phosphor exhibits white light emission via a combination of blue (~484 nm) and yellow (~575 nm) emission bands. The optimized concentration of Dy^{3+} ions is 6.0 mol % after which the concentration quenching takes place. The process of energy transfer between Dy^{3+} ions is due to dipole-dipole interaction, which was confirmed by applying Dexter's theory. The CIE chromaticity coordinates for the optimized phosphor were (0.329, 0.377), and they lie in the white light region. The emission intensity remains to be 83.41% at 373 K to that of at room temperature, which indicates good thermal stability. The above mentioned results demonstrate that $\text{Ca}_3\text{Bi}(\text{PO}_4)_3$ is a potential phosphor for solid-state lighting applications.

For details refer to <https://doi.org/10.1111/jace.16479>

**Corresponding Author*

Enhancement of luminescent properties in Eu^{3+} doped BaNb_2O_6 nanophosphor synthesized by facile metal citrate gel method

Amit K. Vishwakarma, Kaushal Jha and **M. Jayasimhadri***

Abstract: Eu^{3+} doped BaNb_2O_6 nanophosphors were successfully synthesized using facile metal citrate gel (MCG) method. Thermo-gravimetric analysis (TGA) - differential scanning calorimetric (DSC), X-ray diffraction (XRD), field emission scanning electron microscopy (FE-SEM) and photoluminescence spectra were employed to characterize the synthesized phosphors. TGA-DSC reveals that the sample initiate to crystallize at $900\text{ }^\circ\text{C}$, and the XRD confirms that the pure BaNb_2O_6 phase was obtained at $1000\text{ }^\circ\text{C}$. FE-SEM images indicate that the BaNb_2O_6 : Eu^{3+} powder consist of fine and sphere-shaped grains with the size of around $60\text{--}70\text{ nm}$. Under the excitation of n-UV (395 nm) and blue (466 nm), the BaNb_2O_6 : Eu^{3+} phosphor exhibits the characteristic emission bands of Eu^{3+} corresponding to ${}^5\text{D}_0 \rightarrow {}^7\text{F}_J$ ($J = 0, 1, 2, 3, 4$) transitions. The emission spectrum exhibits three-fold enhancement in intensity relative to the bulk phosphor. The optimum concentration was observed as $12\text{ mol}\%$ of Eu^{3+} ions in BaNb_2O_6 host. The Judd-Ofelt intensity parameters Ω_J ($J = 2, 4$) for Eu^{3+} doped BaNb_2O_6 nanophosphors were calculated. The evaluated chromaticity coordinates are very close to the commercial phosphor $\text{Y}_2\text{O}_2\text{S}:\text{Eu}^{3+}$ and NTSC standard phosphors. The decay curve analysis has been measured for the synthesized phosphor. The experimental results suggest that $\text{Eu}^{3+}:\text{BaNb}_2\text{O}_6$ phosphor synthesized by MCG method is promising candidate for solid state lighting applications.

For details refer to <https://doi.org/10.1016/j.optmat.2019.109301>

**Corresponding Author*

Tunable luminescence properties of SrAl₂O₄:Eu³⁺ phosphors for LED applications⁺

B.C. Jamalaiah and M. Jayasimhadri*

Abstract: The Sr_(1-x)Al₂O₄: xEu³⁺ (0 ≤ x ≤ 5.0%) phosphors were synthesized by solid state reaction method. They crystallized in monoclinic structure and well consistent with that of JCPDS No.34–0379. Thermal and compositional analysis was described in detail. The photoluminescence excitation spectra were recorded monitoring the emission at 612 nm corresponding to the Eu³⁺: ⁵D₀ → ⁷F₂ transition. The photoluminescence excitation spectrum of undoped SrAl₂O₄ consists of a broad band with maximum at 278 nm, while the Eu³⁺-doped phosphors contain similar broad band of lower intensity and Eu³⁺ characteristic bands. The photoluminescence properties were analyzed by exciting the studied phosphors at 278 nm (within the host) and at 395 nm (within the Eu³⁺) wavelengths. The SrAl₂O₄:Eu³⁺ phosphors show bluish-pink luminescence at 278 nm excitation and concentration dependent luminescence at 395 nm excitation. The local site symmetry of the host material around the Eu³⁺ ions was studied by calculating the Judd-Ofelt intensity parameters using the Eu³⁺: ⁵D₀ → ⁷F_J (J = 1, 2 and 4) transitions. The experimental results show that the SrAl₂O₄: Eu³⁺ phosphors are potential for solid state lighting and display devices.

For details refer to <https://doi.org/10.1016/j.molstruc.2018.10.060>

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Influence of modifier oxides on spectroscopic properties of Eu^{3+} doped oxy-fluoro tellurophosphate glasses for visible photonic applications⁺

Kaushal Jha, **M. Jayasimhadri*** and D. Haranath, Kiwan Jang

Abstract: Oxy-fluoro tellurophosphate glasses with molar composition $(40-x) \text{P}_2\text{O}_5$ -20 TeO_2 -20 ZnF_2 -20 RO -x Eu_2O_3 (where R = Ca, Sr, and Ba and $x = 1$) were prepared by melt quenching technique. The structural, optical, and photoluminescent properties were studied for the prepared glass. The Fourier transform infrared (FT-IR) studies revealed the presence of poly-phosphate structure and maximum depolymerization was observed for BaO network modifier mixed glass. The band gap and Urbach energy values were calculated based on the absorption spectra. The intense emission peak was observed at 613 nm (${}^5\text{D}_0 \rightarrow {}^7\text{F}_2$) under the excitation of 392 nm, which matches well with the emission of commercial near ultraviolet (n-UV) LED chips. The highest emission intensity and quantum efficiency were observed for BaO network modifier mixed glass. Based on these results, BaO network modifier glass samples with molar composition $(40-x) \text{P}_2\text{O}_5$ -20 TeO_2 -20 ZnF_2 -20 BaO -x Eu_2O_3 ($x = 3, 5, 7,$ and 9) were prepared to optimize the emission intensity. The optimized doping concentration of Eu_2O_3 was 5 mol% and the Commission International de l'Eclairage (CIE) chromaticity coordinates fall in the red region. The interaction among Eu^{3+} ions was dipole-dipole in nature, which was confirmed by Dexter theory and Inokuti-Hirayama (I-H) model. The above results suggest the applicability of the glass as a potential red photoluminescent material in photonic devices.

For details refer to <https://doi.org/10.1016/j.jallcom.2019.02.277>

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+Eligible for Certificate only

Conductivity behavior and impedance studies in BaTiO₃-CoFe₂O₄ magnetoelectric composites⁺

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

Abstract: Two phase magneto-dielectric composite of Barium titanate and Cobalt ferrite (BT-CFO) has been prepared via solid state reaction technique. The structure has been investigated by Raman spectroscopy and confirms the presence of composite phase. Electrical properties of BT-CFO composites were studied thoroughly in 100 Hz to 1 MHz frequency range and in 50 °C–450 °C temperature range. The dielectric measurements reveal Maxwell-Wagner polarization and thermal activated relaxation process arising from movement of defects and ions in BT and BT-CFO composites. Particularly BT-5CFO composite exhibited a surprising low dielectric loss ≈ 0.3 over the frequency range of 100 Hz-1MHz and promises industrial application. The thermal variation of Impedance parameters reveals the resistive nature of the composites and the presence of two thermally activated relaxation mechanism present in BT and BT-CFO composites. The modulus studies confirm the non-Debye type relaxation processes prevalent in BT-CFO composites. The electrical conduction mechanism occurs through over-lapping large polaron tunneling (OLPT) in BT and through non-overlapping small polaron tunneling (NSPT) at low temperatures to correlated barrier hopping (CBH) at high temperatures in BT-CFO composites. The addition of CFO in BT localizes the polarons and enhances the conductivity. The magneto-dielectric coupling effect (% MD) is found to have a maximum value of 1.2 in magnitude at 7 kOe for BT-5CFO composite and increases with the amount of CFO in BT-CFO composite. These results could be beneficial in enhancing the properties of BT-CFO based systems.

For details refer to <https://doi.org/10.1016/j.matchemphys.2019.05.095>

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Dr. Nitin Kumar Puri is currently working as an Associate Professor in the discipline of Engineering Physics, Department of Applied Physics, Delhi Technological University. He is associated with DTU from last 9.5 years and has teaching and research experience of more than fifteen years. He has his doctorate degree in Experimental Atomic Physics from Cyclotron Laboratory, Panjab University, Chandigarh. He has worked as an Engineer in R & D division in HongHua Company Ltd, China. He has been awarded various research grants of approximately Rupees One Crore from different funding agencies viz: SERB-DST, BRNS, UGC-DAE (Govt. of India). He has delivered many invited talks and has more than 110 research publications in peer-reviewed journals and conferences of national and international repute.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. K. Arora, S. Srivastava, P. R. Solanki and **N. K. Puri**, “Electrochemical Hydrogen Gas Sensing Employing Palladium Oxide/Reduced Graphene Oxide (PdO-rGO) Nanocomposites”, *IEEE Sensors Journal*, vol. 19, no. 18, pp. 8262-8271, 2019. Impact factor: 3.076.
2. D. Sandil, S. C. Sharma and **N. K. Puri**, “Protein-functionalized WO₃ nanorods–based impedimetric platform for sensitive and label-free detection of a cardiac biomarker”, *Journal of Materials Research*, vol. no. 34, no. 8, 2019, pp. 1331-13402. Impact factor: 1.982.

Electrochemical Hydrogen Gas Sensing Employing Palladium Oxide/Reduced Graphene Oxide (PdO-rGO) Nanocomposites

Kamal Arora, Saurabh Srivastava, Pratima R. Solanki and **Nitin K. Puri***

Abstract: This research work aims at proposing cheap, facile, sensitive, and selective assembly of three electrode electrochemical hydrogen (H_2) gas sensor which operates on room temperature in ambient conditions. Palladium oxide-reduced graphene oxide (PdO-rGO) nanocomposite have been synthesized using insitu chemical sol-gel method and modified Hummer's method. The phase, structure, particle size, and bonding information have been obtained using X-ray diffraction (XRD) analysis, transmission electron microscopy (TEM), Fourier Transform Infrared (FTIR) spectroscopy, and Ultraviolet-Visible (UV-Vis) absorption spectroscopy. Palladium oxide (PdO) nanoparticles of size ranging from 30 to 35 nm have been successfully attached with uniform 2D network of reduced graphene oxide (rGO) sheets which offers a large surface area for H_2 adsorption. The thin film of nanocomposite have been fabricated on conducting Indium tin oxide (ITO) glass substrates using electrophoretic deposition (EPD) process and is employed as working electrode (WE) in indigenously developed three-electrode cell. Thin film surface morphology have been observed using Scanning Electron Microscopy (SEM) and it shows agglomerates of PdO nanoparticles with multiple randomly stacked rGO nanosheets uniformly spread across the surface of the film. The amperometric response of the assembled electrochemical sensor has been recorded for the detection of 10 to 80 percent concentration of hydrogen gas using potentiostat/galvanostat autolab. The sensitivity of the sensor is found out to be $0.462 \mu A/\% H_2$ concentration and sensing calibration curve shows a uniform linear response. The stability and selectivity of the sensor has been enhanced using H_2 insensitive reference electrode (RE) and solid polymer electrolyte gas permeable membrane, respectively, which will aid new dimensions in designing robust H_2 sensor at room temperature.

For details refer to <https://doi.org/10.1109/JSEN.2019.2918360>

**Corresponding Author*

Protein-functionalized WO₃ nanorods–based impedimetric platform for sensitive and label-free detection of a cardiac biomarker

Deepika Sandil, Suresh C. Sharma and **Nitin K. Puri***

Abstract: We report the development of a sensitive and a label-free electrochemical immunosensing platform for the detection of cardiac biomarker troponin I (cTnI) using tungsten trioxide nanorods (WO₃ NRs). The low-temperature hydrothermal technique was employed for the controlled synthesis of WO₃ NRs. Thin films of 3-aminopropyltriethoxy saline (APTES)-functionalized WO₃ NRs were deposited on indium tin oxide (ITO)-coated glass substrate (0.5 cm × 1 cm) using electrophoretic deposition technique. The covalent immobilization of cTnI antibody onto functionalized WO₃ NRs electrode was accomplished using EDC-NHS [1-(3-(dimethylamino)-propyl)-3-ethylcarbodiimide hydrochloride and N-hydroxysulfosuccinimide] chemistry. The structural and morphological characterizations of WO₃ NRs and functionalized WO₃ NRs were studied using X-ray diffraction, field emission scanning electron microscopy, transmission electron microscopy, Fourier transform infrared spectroscopy, and electrochemical techniques. The impedimetric response study of the proposed immunosensor demonstrates high sensitivity [6.81 KΩ mL·cm²] in a linear detection range of 0.01–10 ng/mL. The excellent selectivity, good reproducibility, and long-term stability of the proposed immunosensing platform indicate WO₃ NRs as a suitable platform for the development of a point-of-care biosensing device for cardiac detection.

For details refer to <https://doi.org/10.1557/jmr.2018.481>

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

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **R. Sharma**, A. Goyal and Manmohan, “Analysis of configuration interaction and convergence with energy levels and radiative data in W XXXIX”, *Journal of Electron Spectroscopy and Related Phenomena*, vol. 234, pp. 47-56, 2019. Impact Factor: 1.343.

Analysis of configuration interaction and convergence with energy levels and radiative data in W XXXIX

Rinku Sharma, Arun Goyal and Manmohan

Abstract: Fine structure energies and radiative data namely, transition wavelength, transitions rates, oscillator strength and line strength have been presented for lowest 123 levels of Kr-like W (WXXXIX) by using Multi-Configuration Dirac-Fock (MCDF) method. We have systematically analysed configuration interaction (CI) and convergence in radiative data and Dirac-Coulomb as well as Breit and Quantum electrodynamics (QED) effects of excitation energies. We demonstrate that inclusion of CI and convergence in excitation energies are crucial to attain the accuracy in atomic data. We have also discussed the evaluation of results from two independent codes GRASP and FAC based on MCDF and Distorted Wave (DW). We show that magnetic multipole transitions (M1, M2) are dominant in the contribution of lifetime of $4s^2(^1S_0)4p^5(^2P_1)4f^1(^2F_1)^3D_1$ and $4s^1(^2S_1)4p^5(^2P_1)4d^2(^3F_2)^3D_2^o$. The present results are complete, extensive and in good agreement with other results.

For details refer to <https://doi.org/10.1016/j.elspec.2019.05.011>



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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 and M.Tech courses. She is M.Sc. Electronics (Gold Medalist) (2003-2005), Ph.D (Electronics) (2006-2009) from Delhi University and received Shanti Devi Bhargava Memorial Medal (2006) for excellence in academics in M.Sc. Electronics (2003-2005). 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 microwave circuits; and Solar Cell Modeling and Design. She has authored or co-authored more than 250 papers in various reputed international and national journals and conferences. She has supervised around 13 M.Tech students and 6 Ph.D. students. She has been awarded the Premier Research Award and Commendable Research Award for excellence in research, Delhi Technological University, 2018. She has also been awarded Commendable Research Award for excellence in research, DTU, 2019. She has supervised several National and International research projects. She is also the Principal Investigator of Faculty Research Project based on FinFETS sponsored and awarded by DTU in 2019.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	05

1. **R. Chaujar**, “Analog and RF assessment of sub-20 nm 4H-SiC trench gate MOSFET for high frequency applications”, *AEU-International Journal of Electronics and Communications*, vol. 98, Pages 51-57, January 2019. Impact Factor: 2.853.
2. A. Chhabra, A. Kumar and **R. Chaujar**, “Sub-20 nm GaAs junctionless FinFET for biosensing application”, *Vacuum*, vol. 160, pp. 467-471, 2019. Impact Factor: 2.525.
3. R. Pandey, A. P. Saini and **R. Chaujar**, “Numerical simulations: Toward the design of 18.6% efficient and stable perovskite solar cell using reduced cerium oxide based ETL”, *Vacuum*, vol.169, pp.173-181, 2019. Impact Factor: 2.525.
4. A. Kumar, N. Gupta, M.M.Tripathi and **R. Chaujar**, “RF Noise Modeling of Black Phosphorus Junctionless Trench MOSFET in Strong Inversion Region”, *Superlattices and Microstructures*, vol.125, pp.72-79, 2019. Impact Factor: 2.385.
5. A. Kumar, M. M. Tripathi and **R. Chaujar**, “Sub-30nm In₂O₅Sn gate electrode recessed channel MOSFET: A biosensor for Early Stage Diagnostics”, *Vacuum*, vol. 164, pp. 46-52, 2019. Impact Factor: 2.525.

Analog and RF assessment of sub-20 nm 4H-SiC trench gate MOSFET for high frequency applications

Rishu Chaujar

Abstract: In this work, 4H-SiC Trench Gate (Recessed Channel) (4H-SiC-RC) MOSFET structure is demonstrated to have superior analog and RF Figure of Merits (FOMs) by numerical simulation. The integration of 4H-SiC with phosphorene contact on to the trench region results in higher drain current (2.3 mA) and outstanding switching ratio (10^{16}) owing to reduced off-current which leads to the lower sub-threshold slope (SS). Other electrical parameters such as electric field, electron mobility, and electron velocity are remarkably improved in 4H-SiC-RC MOSFET. Further, the high-frequency RF FOMs have also been studied, and it is observed that cut-off frequency (f_T) gets doubled and maximum oscillator frequency (f_{MAX}) increased by five times in the proposed design as compared to conventional design. Thus, the 4H-SiC-RC design is suitable for high switching, high power, and high-frequency application.

For details refer to <https://doi.org/10.1016/j.aeue.2018.10.035>

Numerical simulations: Toward the design of 18.6% efficient and stable perovskite solar cell using reduced cerium oxide based ETL

Rahul Pandey, Anand Prakash Saini and **Rishu Chaujar***

Abstract: This work presents an extensive study of one of the potential alternatives in electron transport material (ETM) for perovskite solar cell (PSC). Reduced cerium oxide (CeOx) as an electron transport layer (ETL) is studied for different composition of oxygen and analysis with [6,6]-phenyl-C61-butyric acid methyl ester (PCBM) interface layer thickness if stacked in between CeOx ETL and perovskite layer has also been done. A detailed investigation has been carried out, incorporating the mobility of CeOx due to small polaron hopping mechanism at the different composition of x, the effect of variation in doping concentration for CeOx and PCBM have also been studied and the optimum efficiency 18.2% is obtained for PSC. Furthermore, to improve the shortcomings in terms of hysteresis and moisture stability, a device is proposed incorporating carbon nanotube (CNT) layer stacked between perovskite and hole transport layer (HTL) which shows 18.6% conversion efficiency.

For details refer to <https://doi.org/10.1016/j.vacuum.2018.10.033>

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Sub-20 nm GaAs junctionless FinFET for biosensing application

Anuj Chhabra, Ajay Kumar and **Rishu Chaujar***

Abstract: This work proposes a dielectric modulated GaAs junctionless FinFET as a biological sensor in the sub-20 regime. In the proposed biosensor, HfO_2 ($\kappa = 25$) is used as a base oxide which is found to have improved the switching ratio (three times) of the device. For immobilizing the biomolecules, a Nano-cavity (18 nm) is embedded between gate and source/drain. For the detection of biomolecules, electrical characteristics such as switching ratio, energy band profile and change in surface potential have been studied and thereafter, sensitivity has been evaluated which has been improved by 80%. Change in current is recorded for different materials due to change in gate capacitance owing to different biomolecules: Protein ($\kappa = 8$), streptavidin ($\kappa = 2.1$), biotin ($\kappa = 2.63$). Higher sensitivity is observed for protein biomolecules (1.07) as compared to streptavidin (1.015) and biotin (1.045). The sensitivity is compared to with the absence of biomolecules (assumed as the vacuum) as well. Furthermore, modulation of the cavity gap length was also investigated, revealing that its increase (from 8 to 18 nm) significantly enhanced the sensitivity of the proposed biosensor. All the results pave way for biomolecule detection with the existing CMOS technology.

For details refer to <https://doi.org/10.1016/j.vacuum.2018.12.007>

RF Noise Modeling of Black Phosphorus Junctionless Trench MOSFET in Strong Inversion Region

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

Abstract: In this paper, RF noise modeling of Black Phosphorus Junctionless Trench (BP-JL-T) MOSFET has been investigated in strong inversion region. The simulated and modeled results are simultaneously compared with Conventional Trench (CT) MOSFET at THz frequency range. By using analytical expressions from RF equivalent schematic, few RF figure-of-merits (FOMs) have been evaluated. It is found that RF noise parameters such as noise resistance (R_n), minimum noise figure (NF_{min}), optimum source susceptance (B_{opt}) and conductance (G_{opt}) are reduced to more than 200%. Modeled results reveal that BP-JL-T-MOSFET minimizes RF noise thus, providing the detailed insight to RF engineers for microwave applications/RFIC design.

For details refer to <https://doi.org/10.1016/j.spmi.2018.10.025>.

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Sub-30nm In₂O₅Sn gate electrode recessed channel MOSFET: A biosensor for Early Stage Diagnostics

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

Abstract: This paper presents a technology computer-aided design (TCAD) analysis of an ultrasensitive In₂O₅Sn gate (transparent gate) recessed channel (TGRC) metal-oxide-semiconductor field effect transistor (MOSFET) as a biosensor for early-stage disease diagnostics. The key parameters such as sensitivity, switching ratio, and threshold voltage shift have been compared with the conventional MOSFET. For immobilizing the protein molecules, a cavity has been embedded in the gate insulator region due to which gate capacitance changes owing to the accumulation of protein molecules which reflects the deviation in threshold voltage. Higher sensitivity (1.542) is achieved for protein at a very low drain bias (0.2 V) in comparison to streptavidin and APTES ((3-Aminopropyl) triethoxysilane). Moreover, the cavity gap variation (from 8 to 15 nm) and oxide thickness limitation has also been observed for the device as a biosensor. All the results pave 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 (CMOS) technology.

For details refer to <https://doi.org/10.1016/j.vacuum.2019.02.054>

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BIOGRAPHY

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Dr. Suresh C. Sharma is working as a Professor with the Department of Applied Physics, Delhi Technological University, Delhi. More recently, 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 a 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	04

1. K. Segwal and **S. C. Sharma**, "A Non-Local Theory of Current Driven Low Frequency Modes in a Magnetized Strongly Coupled Collisional Dusty Plasma", *IEEE Transaction on Plasma Science*, vol. 47, no. 7, pp. 3087-3099, 2019. Impact Factor: 1.325.
2. Ruchi Sharma and **Suresh C. Sharma**, "Theoretical model for the effect of dust grains on self-filamentation of Gaussian electromagnetic beam in fully ionized plasma", *Contributions to Plasma Physics*, vol. 59, no. 1, pp. 72-85, 2019. Impact Factor: 1.234.
3. R. Gupta and **Suresh C. Sharma**, "Modelling the effects of nitrogen doping on the carbon nanofiber growth via catalytic PECVD process", *Contributions to Plasma Physics*, vol. 59, no. 2, pp. 211-225, 2019. Impact Factor: 1.234.
4. M. Kumar, S. Khanna, N. Gupta, R. Gupta and **Suresh C. Sharma**, "Numerical simulation and parametric study of carbon deposition during graphene growth in PECVD system", *IEEE Transactions on Nanotechnology*, vol. 18, pp. 401-411, 2019. Impact Factor: 2.292.

A Nonlocal Theory of Current-Driven Low-Frequency Modes in a Magnetized Strongly Coupled Collisional Dusty Plasma

Kavita Segwal and **Suresh C. Sharma***

Abstract : The nonlocal theoretical model developed to observe current-driven low-frequency electrostatic modes in a collisional magnetized strongly coupled dusty plasma, in the strongly coupled kinetic regime $\omega\tau_m \gg 1$ (i.e., wave frequency is much larger than the dust particle relaxation time) led to a new set of equations for dispersion relation, frequency, and the growth rate. The theoretical investigations on a cylindrical magnetized strongly coupled dusty plasma led to a current driven ion dust hybrid like longitudinal dust wave propagating nearly along radial direction and a peculiar transverse shear dust wave mode along axial direction. Dispersion properties of both longitudinal dust acoustic modes and transverse shear modes are modified in the presence of ion and dust currents and the effective perpendicular wave number provided by finite geometry of strongly coupled magnetized dusty plasma. The magnetic field has a destabilizing effect on the growth of longitudinal wave modes, while the dependence of transverse modes on the strength of magnetic field is not prominent. Transverse shear modes are characterized as the short wavelength modes with a long wavelength cutoffs. A comparison of nonlocal effects with local effects shows that in bounded magnetized strongly coupled dusty plasmas, the longitudinal wave modes need a large magnetic field and weak collisional regime to support the excitation of dust wave modes, whereas the transverse modes are a consequence of viscous and collisional damping.

Index Terms—Longitudinal modes.

For details refer to <https://doi.org/10.1109/TPS.2019.2906035>

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Theoretical model for the effect of dust grains on self-filamentation of Gaussian electromagnetic beam in fully ionized plasma

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

Abstract: A theoretical model for the effect of dust grains on the self-filamentation of a Gaussian electromagnetic beam propagating in a fully ionized plasma has been developed by employing the energy balance of the plasma constituents, perturbed electron and ion concentrations, and temperature. In this model, neutral atom ionization, re-integration and accumulation of electrons and ions, photoelectric emission of electrons from the surface of dust grains, as well as elastic and charging collisions have also been considered. The effective dielectric constant in the presence of dust grains has been constructed. The effect of temporal growth of dust grains on various plasma parameters for different values of the dust density has been explored. The variation of the beam width with the normalized channel of propagation has been observed for distinct dust densities and dust charge states. It is observed that the non-linearity induced by the effective dielectric constant in the presence of dust grains increases the self-filamentation of the beam, thus enhancing the effective critical power with the dust density. Some of the outcomes of our approach are in line with experimental observations. These outcomes may be useful for explaining space and laboratory plasma experiments as well as for future studies in complex plasmas.

For details refer to <https://doi.org/10.1002/ctpp.201800058>

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Modelling the effects of nitrogen doping on the carbon nanofiber growth via catalytic plasma-enhanced chemical vapour deposition process

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

Abstract: An analytical model is developed to describe the effects of nitrogen doping on the growth of the carbon nanofibers (CNFs) and to elucidate the growth mechanism of nitrogen-contained carbon nanofibers (N-CNFs) on the catalyst substrate surface through the plasma-enhanced chemical vapour deposition (PECVD) process. The analytical model accounts for the charging of CNFs, kinetics of all plasma species (electrons, ions, and neutrals) in the reactive plasma, generation of carbon species on the catalyst nanoparticle surface due to dissociation of hydrocarbons, CNF growth due to diffusion and precipitation of carbon species, and various other processes. First-order differential equations have been solved for glow discharge plasma parameters for undoped CNFs (CNF growth in C_2H_2/H_2 plasma) and nitrogen-doped CNFs (N-CNF growth in C_2H_2/NH_3 plasma). Our investigation found that nitrogen-doped CNFs exhibit lower tip diameters and smaller heights compared to the undoped CNFs. In addition, we have estimated that nitrogen-doped CNFs have more enhanced field emission characteristics than the undoped CNFs. Moreover, we have also observed that N-CNFs' growth rate increases and tip diameter decreases as the C_2H_2/NH_3 gas ratio decreases. The theoretical results of the present investigation are consistent with the existing experimental observations.

For details refer to <https://doi.org/10.1002/ctpp.201700138>

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Numerical Simulation and Parametric Study of Carbon Deposition During Graphene Growth in PECVD System⁺

Manish Kumar, Sagar Khanna, Neha Gupta, Ravi Gupta, Member and **Suresh C. Sharma***

Abstract: The aim of the present work is to understand the carbon deposition during graphene growth in plasma enhanced chemical vapor deposition (PECVD) system containing Ar/C₂H₂/H₂ gas mixture and to optimize the process parameters for the enhanced growth of graphene. In this regard many numerical simulations have been carried out using two-dimensional axis-symmetrical inductively coupled plasma (ICP) module in COMSOL multi physics 5.2a simulation software. From the simulation outcomes, it is found that the electron density, electron energy density, electric potential and collisional power losses decrease with an increase in temperature. The number densities of various dominant ions were found to decrease and number densities of dominant neutrals were found to increase with an increase in temperature. During the carbon deposition, the formation of non-uniform horizontal graphene layer has been observed along the substrate and vertically oriented graphene sheet has been observed at the edges of the substrate. It is found that the thickness of horizontal graphene along the substrate and height of vertical graphene at the edges of the substrate increases with an increase in gas temperature. Moreover, the reduction in the carbon deposition on the substrate (growth of parallel graphene) and enhanced growth of vertical graphene sheet have been observed on applying substrate biasing. Our numerical simulation results are in good agreement with existing experimental observations and confirms the adequacy of the computational and simulation approach.

For details refer to <https://doi.org/10.1109/TNANO.2019.291017>

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Dr. Bansi D. Malhotra is currently a SERB (Govt. of India) Distinguished Fellow and Adjunct Professor at Department of Biotechnology, Delhi Technological University. He received his PhD from the University of Delhi, Delhi in 1980. Dr. Malhotra has published 318 refereed papers in international journals (Citations > 20,222; h-index: 77, Web Source: https://scholar.google.co.in/citations?hl=en&user=qUX3ux8AAAAJ&view_op=list_works&sortby=pubdate#), has filed 12 patents (in India and overseas), and has co-authored text books on “Nanomaterials for Biosensors: Fundamentals and Applications” and “Biosensors: Fundamentals and Applications”. He is a recipient of the National Research Development Corporation Award 2005 for invention on ‘Blood Glucose Biochemical Analyzer’ and is a Fellow of the Indian National Science Academy, the National Academy of Sciences, India and Academician of Asia Pacific Academy of Materials (APAM).

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. S. Kumar, Md. Umar, A. Saifi, S. Kumar, S. Augustine, S. Srivastava and **B. D. Malhotra**, “Electrochemical paper based cancer biosensor using iron oxide nanoparticles decorated PEDOT:PSS,” *Analytica Chimica Acta*, vol. 1056, pp. 135-145, 2019. Impact factor: 5.256.
2. T. Narayan, S. Kumar, S. Kumar, S. Augustine, B. K. Yadav and **B. D. Malhotra**, “Protein functionalized self assembled monolayer based biosensor for colon cancer detection,” *Talanta*, vol. 201, pp. 465-473, 2019. Impact Factor: 4.916.
3. N. Gupta, V. Renugopalakrishnan, D. Liepmann, R. Paulmurugan and **B. D. Malhotra**, “Cell-based biosensors: Recent trends, challenges and future perspectives,” *Biosensors and Bioelectronics.*, vol. 141, pp. 111435, 2019. Impact factor: 9.518.

Electrochemical paper based cancer biosensor using iron oxide nanoparticles decorated PEDOT:PSS

Saurabh Kumar, Mohammad Umar, Anas Saifi, Suveen Kumar, Shine Augustine,
Saurabh Srivastava and **Bansi D. Malhotra***

Abstract: We report results of the studies relating to the fabrication of a label-free, flexible, light weight and disposable conducting paper based immunosensing platform comprising of poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) and nanostructured iron oxide ($n\text{Fe}_2\text{O}_3@$ PEDOT:PSS) nanocomposite for detection of carcinoembryonic antigen (CEA), a cancer biomarker. The effect of various solvents such as sorbitol, ethanol, propanol, n-methyl-2-pyrrolidone (NMP) and dimethyl sulfoxide (DMSO) on the electrical conductivity of Whatman filter paper (WP) modified with $n\text{Fe}_2\text{O}_3@$ PEDOT:PSS/WP was investigated. The electrical conductivity of the PEDOT:PSS/WP electrode was found to be enhanced by two orders of magnitude (from 6.8×10^{-4} to $1.92 \times 10^{-2} \text{ Scm}^{-1}$) after its treatment with DMSO. Further, $n\text{Fe}_2\text{O}_3$ doped PEDOT:PSS/WP electrode exhibited the electrical conductivity as $2.4 \times 10^{-2} \text{ Scm}^{-1}$. Besides this, the incorporation of iron oxide nanoparticles ($n\text{Fe}_2\text{O}_3$) into PEDOT:PSS/WP resulted in improved electrochemical performance and signal stability. This $n\text{Fe}_2\text{O}_3@$ PEDOT:PSS/WP based platform was used for immobilization of the anti-carcinoembryonic antigen (anti-CEA) protein for quantitative estimation of cancer biomarker (CEA). The results of electrochemical response studies revealed that this conducting paper based immunoelectrode had a sensitivity of $10.2 \mu\text{Ang}^{-1}\text{mLcm}^{-2}$ in the physiological range ($4\text{--}25 \text{ ngmL}^{-1}$) and shelf life of 34 days. Further, the proposed immunoelectrode was validated with conventional ELISA for the detection of CEA in serum samples of cancer patients.

For details refer to <https://doi.org/10.1016/j.aca.2018.12.053>

**Corresponding Author*

Protein functionalized self assembled monolayer based biosensor for colon cancer detection

Tarun Narayan, Saurabh Kumar, Suveen Kumar, Shine Augustine, B. K. Yadav and
Bansi D. Malhotra*

Abstract: We report results of the studies relating to the fabrication of a surface plasmon resonance (SPR) based label-free immunosensor for real-time monitoring of endothelin-1 (ET-1), a colon cancer biomarker. A gold disk modified with a self-assembled monolayer (SAM) of 11-mercaptoundecanoic acid (11-MUA) was functionalised via covalent immobilization of monoclonal anti-ET-1 antibodies using EDC-NHS (1-(3-(dimethylamine)-propyl)-3-ethylcarbodiimide hydrochloride, N-hydroxy succinimide) chemistry. This immunosensing platform (ethanolamine/anti-ET-1/11-MUA/Au) was characterized via atomic force microscopy (AFM), contact angle (CA) and Fourier transform infrared (FT-IR) spectroscopic techniques. The fabricated SPR electrode was further used to detect ET-1 in the broad concentration range 2–100 pg mL⁻¹, with a detection limit of 0.3 pg mL⁻¹ and remarkable sensitivity of 2.18 m²pg⁻¹mL. The adsorption mechanism was studied using monophasic model and the values of association (k_a) and dissociation (k_d) constants for anti-ET-1 and ET-1 binding were calculated to be $4.4 \pm 0.4 \times 10^5 \text{ M}^{-1} \text{ s}^{-1}$ and $2.04 \pm 0.0003 \times 10^{-3} \text{ s}^{-1}$, respectively. The results obtained via analysis of serum samples of colorectal cancer patients were found to be in good agreement with those obtained from enzyme-linked immunosorbent assay (ELISA) technique. Further, electrochemical studies were performed to prove the efficacy of the fabricated platform as a point of care device for the detection of ET-1.

For details refer to <https://doi.org/10.1016/j.talanta.2019.04.039>

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Cell-based biosensors: Recent trends, challenges and future perspectives

Niharika Gupta, Venkatesan Renugopalakrishnan, Dorian Liepmann, Ramasamy Paulmurugan and **Bansi D. Malhotra***

Abstract: Existing at the interface of biology and electronics, living cells have been in use as biorecognition elements (bioreceptors) in biosensors since the early 1970s. They are an interesting choice of bioreceptors as they allow flexibility in determining the sensing strategy, are cheaper than purified enzymes and antibodies and make the fabrication relatively simple and cost-effective. And with advances in the field of synthetic biology, microfluidics and lithography, many exciting developments have been made in the design of cell-based biosensors in the last about five years. 3D cell culture systems integrated with electrodes are now providing new insights into disease pathogenesis and physiology, while cardiomyocyte-integrated microelectrode array (MEA) technology is set to be standardized for the assessment of drug-induced cardiac toxicity. From cell microarrays for high-throughput applications to plasmonic devices for anti-microbial susceptibility testing and advent of microbial fuel cell biosensors, cell-based biosensors have evolved from being mere tools for detection of specific analytes to multi-parametric devices for real time monitoring and assessment. However, despite these advancements, challenges such as regeneration and storage life, heterogeneity in cell populations, high interference and high costs due to accessory instrumentation need to be addressed before the full potential of cell-based biosensors can be realized at a larger scale. This review summarizes results of the studies that have been conducted in the last five years toward the fabrication of cell-based biosensors for different applications with a comprehensive discussion on the challenges, future trends, and potential inputs needed for improving them.

For details refer to <https://doi.org/10.1016/j.bios.2019.111435>

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BIOGRAPHY

PROF. JAI GOPAL SHARMA

Department of Biotechnology

Prof. Jai Gopal Sharma has been working in the Department of Biotechnology, Delhi Technological University Delhi, India. He has completed his Masters in Zoology from the Meerut University and Ph.D. from University of Delhi. He went to Kyoto University, Japan as Post-Doctoral Fellow and conducted research in radiation biology. He continued the study in India as a Senior Research Associate (CSIR). Then he joined Ministry of Science and Technology, Government of India as Scientist. He has completed 7 National and International Collaborative projects funded by different agencies such as CSIR, DBT, UGC, DST, BBSRC (United Kingdom). His areas of interest are Aquaculture, Fish Nutrition, Industrial and Environmental Biotechnology, Water Quality Management, Radiation Biology, UV-B Radiation, Aquatic Ecology, Biosensor, Bioremediation, Bio-energy, Microbiology, Water Pollution, Nano-biotechnology, Gene Expression, Water Chemistry, Environmental Impact Assessment, Chromatography, Amino Acid, Fatty Acid, Bio fuel, Medicinal and Aromatic Plants. As his area of expertise is diverse, he is exploring the new compounds and amino acids from Medicinal and Aromatic Plants that can have potential benefits for human health and the screening and identification of immune relevant functional genes in fish.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **J. Sharma**, William D. Clark, Avani Kumar Shrivastav, Ravi Kumar Goswami, Douglas R. Tocher and Rina Chakrabarti, "Production potential of greater duckweed *Spirodela polyrrhiza* (L. Scheilden) and its biochemical composition evaluation", *Aquaculture*, vol. 513, pp. 734-741, 2019. Impact Factor: 3.022.
2. **J. Sharma**, Neelesh Kumara, Samar Pal Singh, Amarjeet Singh, V. Hari Krishna and Rina Chakrabarti, "Evaluation of immunostimulatory properties of prickly chaff flower *Achyranthes aspera* in rohy labeo rohita fry in pond conditions", *Aquaculture*, vol. 505, pp. 183-189, 2019. Impact Factor: 3.022.

Production potential of greater duckweed *Spirodela polyrhiza* (L. Scheiden) and its biochemical composition evaluation

Jai Gopal Sharma, William D. Clark, Avanish Kumar Shrivastav, Ravi kumar Goswami, Douglas R. Tocher and Rina Chakrabarti.

Abstract: The culture technique of greater duckweed *Spirodela polyrhiza* (L. Schleiden) was standardized in outdoor tanks using three different manures: manure 1 - cattle manure, poultry droppings and mustard oil cake, manure 2 - urea, potash and triple superphosphate and manure 3 - cattle manure, urea, potash and triple superphosphate. Significantly ($p < .05$) higher production was recorded in manure 1 compared to others. Manure 1 was subsequently selected for pond culture. In ponds, the production of duckweed was $2020 \pm 150 \text{ kg ha}^{-1} \text{ month}^{-1}$ dry weight basis. Protein content was significantly higher ($p < .05$) in duckweed cultured in manure 1. The amino acid profile study showed the presence of essential (37.4%), non-essential (58.2%) and free (4.5%) amino acids. Leucine, isoleucine and valine contributed 51.4% of total essential amino acids. Duckweed contained 7% lipid and α -linolenic acid (36–37%) was the major fatty acid. The study showed the nutritional value of duckweed as an animal feed ingredient.

For details refer to <https://doi.org/10.1016/j.aquaculture.2019.734419>

Evaluation of immunostimulatory properties of prickly chaff flower *Achyranthes aspera* in rohu *Labeo rohita* fry in pond conditions

Jai Gopal Sharma, Neelesh Kumara, Samar Pal Singh, Amarjeet Singh, V. HariKrishna and Rina Chakrabarti

Abstract: The immunostimulatory properties of seeds and leaves of *Achyranthes aspera* (Linn.) was evaluated in rohu *Labeo rohita* in the pond conditions. Rohu fry (1.9 ± 0.08 g) were introduced in nine hapas (25 hapa⁻¹) set inside a pond. Two test diets enriched with 0.5% seeds (D1) and leaves (D2) of *A. aspera* and control diet (D3) were fed for 60 days. Then fish were immunized with chicken-RBC and blood and tissue samples were collected on days-7, 14 and 21 after immunization. The average weight was significantly ($p < .05$) higher in D1 diet fed rohu compared to other two feeding regimes. Specific growth rate and feed conversion ratio were maximum and minimum in D1 diet fed rohu. Serum lysozyme, myeloperoxidase and nitric oxide synthase levels were significantly ($p < .05$) higher in D1 diet fed rohu compared to others. This group was followed by D2 diet fed rohu. Significantly ($p < .05$) lower thiobarbituric acid reactive substances (TBARS) and carbonyl protein levels were found in D1 fed rohu compared to others. TBARS and carbonyl protein levels were also lower in D2 diet fed rohu compared to the control one. There were significant ($p < .05$) up-regulation of lysozyme C, lysozyme G and tumor necrosis factor- α (TNF- α) in hepatopancreas of rohu fed with D1 diet compared to others. This group was followed by the D2 diet fed rohu. The expression of lysozyme C was higher compared to lysozyme G regardless of feeding regimes. In enriched diets fed rohu, the expression of interleukin 10 (IL-10) was significantly ($p < .05$) lower compared to the control fish. Toll like receptor 4 (TLR-4) was significantly ($p < .05$) higher in D1 and D2 diets fed rohu compared to other two feeding regimes on day-7 and day-21 after immunization, respectively. Seeds and leaves enhanced the growth, induced the immune system of rohu and gave protection against oxidative stress in pond conditions. Seeds are more efficient compared to the leaves. The information generated from the field study has practical utility.

For details refer to <https://doi.org/10.1016/j.aquaculture.2019.02.065>



DR. MADHURI CHAURASIA

Department of Biotechnology

Dr. Madhuri Chourasia has been awarded Ph.D. degree from Department of Biotechnology, Delhi Technological University under the joint supervision of Dr. Asmita Das, Assistant Professor, Department of Biotechnology and Dr. Kulbhushan Sharma, Scientist D, INMAS, DRDO. She received ICMR fellowship, Govt. of India. She is currently working as Postdoc Fellow at Department of Biomolecular Sciences, Weizmann Institute of science, Israel. The main emphasis of the research work was to explore the Autophagic signaling pathway, its downstream targets during radiation exposed conditions for modification of untransformed and cancerous cells by establishing a better understanding of autophagy and to find out the molecules involved in linking autophagy, ER stress, and apoptosis.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **M. Chaurasia** , S. Gupta, A. Das, B. S. Dwarakanath, A. Simonsen and K. Sharma, “ Radiation induces EIF2AK3/PERK and ERN1/IRE1 mediated pro-survival autophagy”, *Autophagy*, vol. 15, no. 8, pp. 1391-1406, 2019. Impact Factor: 11.059.

Radiation induces EIF2AK3/PERK and ERN1/IRE1 mediated pro-survival autophagy

Madhuri Chaurasia, Swapnil Gupta, Asmita Das, B.S. Dwarkanath, Anne Simonsen and Kulbhushan Sharma

Abstract: Cellular effects of ionizing radiation include oxidative damage to macromolecules, unfolded protein response (UPR) and metabolic imbalances. Oxidative stress and UPR have been shown to induce macroautophagy/autophagy in a context-dependent manner and are crucial factors in determining the fate of irradiated cells. However, an in-depth analysis of the relationship between radiation-induced damage and autophagy has not been explored. In the present study, we investigated the relationship between radiation-induced oxidative stress, UPR and autophagy in murine macrophage cells. A close association was observed between radiation-induced oxidative burst, UPR and induction of autophagy, with the possible involvement of EIF2AK3/PERK (eukaryotic translation initiation factor 2 alpha kinase 3) and ERN1/IRE1 (endoplasmic reticulum [ER] to nucleus signaling 1). Inhibitors of either UPR or autophagy reduced the cell survival indicating the importance of these processes after radiation exposure. Moreover, modulation of autophagy affected lethality in the whole body irradiated *C57BL/6* mouse. These findings indicate that radiation-induced autophagy is a pro-survival response initiated by oxidative stress and mediated by EIF2AK3 and ERN1.

For details refer to <https://doi.org/10.1080/15548627.2019.1582973>



DR. NAVNEETA BHARADVAJA

Department of Biotechnology

Dr. Navneeta Bharadvaaj is working as an Assistant Professor in the Department of Biotechnology, Delhi Technological University since 2010. Her research area is Plant Biotechnology and Phytoremediation. Her group is engaged in enhancing pharmaceutically important compounds in cultures, selection of elite accessions for high yield of Secondary Metabolites of industrial importance etc.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. A. Roy and N. **Bharadvaaj**, "Establishment of root suspension culture of *Plumbago zeylanica* and enhanced production of plumbagin", *Industrial Crops and Products*, vol. 137, pp. 419-427, 2019. Impact Factor: 4.191.

Establishment of root suspension culture of *Plumbago zeylanica* and enhanced production of plumbagin

Arpita Roy and Navneeta Bharadvaja*

Abstract: Plumbagin found in the roots of *Plumbago zeylanica* L. possesses various biological activities like anticancer, antibacterial, anti-inflammatory, etc. In this investigation, roots were initiated from *P. zeylanica* nodal explants, highest root number (24.1 ± 0.73) was achieved in Murashige and Skoog MS media + 1 mg/L indole-3-butyric acid (IBA) whereas maximum root length (3.33 ± 0.53 cm) was observed in MS media + 2 mg/L indole-3-acetic acid (IAA). MS liquid medium containing 1 mg/L IBA was used for establishing root suspension culture. Optimization of culture parameters reveals that half strength liquid MS media + 3% sucrose + 2 g/L inoculum density resulted in highest plumbagin production. Application of different concentrations of abiotic (yeast extract and malt extract) and biotic elicitors (methyl jasmonate and salicylic acid) enhanced plumbagin content significantly. Up to threefold increase in plumbagin concentration was achieved by treating the root suspension culture with 150 mg/L yeast extract. Results indicate that utilization of elicitor can enhance plumbagin production as well as other phytochemicals in *P. zeylanica* root culture.

For details refer to <https://doi.org/10.1016/j.indcrop.2019.05.007>

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DR. NIRALA RAMCHIARY
Department of Biotechnology

Dr. Nirala Ramchiary is working as an Associate Professor in the Department of Biotechnology, Delhi Technological University since 2018. Prior to joining DTU he worked as Assistant Professor, School of Life Sciences, Jawaharlal Nehru University and Gauhati University, Assam, Postdoctoral Research Scientist in Plant Genomics Institute, Chungnam National University, Daejeon, South Korea. He did his Ph.D. from the Department of Genetics, Delhi University. He is recipient of several national and international fellowships. His current research interest are (i) Understanding and metabolic engineering of the fiery hot pungency Biosynthesis in Ghost Chili (ii) Comparative, Functional and Evolutionary Genomics of Ghost chilli and other Capsicum species, and iii) dissecting gene- metabolite-protein network of secondary metabolites of few medicinal plants.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. M. Dubey, V. Jaiswal, A. Rawoof, A. Kumar, M. Nitin, S. S. Chhapekar, N. Kumar, I. Ahmad, K. Islam, V. Brahma and **N. Ramchiary**, "Identification of genes involved in fruit development/ripening in Capsicum and development of functional markers", *Genomics*, vol.111, no. 6, pp. 1913-1922, 2019. Impact Factor: 3.160.
2. M. Sarpras, I. Ahmad, A. Rawoof and **N. Ramchiary**, "Comparative analysis of developmental changes of fruit metabolites, antioxidant activities and mineral elements content in Bhut jolokia and other Capsicum species", *LWT-FOOD Science and Technology*, vol. 105, pp. 363-370, 2019, Impact Factor: 3.714.

Identification of genes involved in fruit development/ripening in *Capsicum* and development of functional markers

Meenakshi Dubey, Vandana Jaiswal, Abdul Rawoof, Ajay Kumar, Mukesh Nitin, Sushil Satish Chhapekar, Nitin Kumar, Ilyas Ahmad, Khushbu Islam, Vijaya Brahma and **Nirala Ramchiary***

Abstract: The molecular mechanism of the underlying genes involved in the process of fruit ripening in *Capsicum* (family Solanaceae) is not clearly known. In the present study, we identified orthologs of 32 fruit development/ripening genes of tomato in *Capsicum*, and validated their expression in fruit development stages in *C. annuum*, *C. frutescens*, and *C. chinense*. In silico expression analysis using transcriptome data identified a total of 12 out of 32 genes showing differential expression during different stages of fruit development in *Capsicum*. Real time expression identified gene *LOC107847473* (ortholog of *MADS-RIN*) had substantially higher expression (>500 folds) in breaker and mature fruits, which suggested the non-climacteric ripening behaviour of *Capsicum*. However, differential expression of *Ethylene receptor 2-like (LOC107873245)* gene during fruit maturity supported the climacteric behaviour of only *C. frutescens* (hot pepper). Furthermore, development of 49 gene based simple sequence repeat (SSR) markers would help in selection of identified genes in *Capsicum* breeding.

For details refer to <https://doi.org/10.1016/j.ygeno.2019.01.002>

*Corresponding Author

Comparative analysis of developmental changes of fruit metabolites, antioxidant activities and mineral elements content in Bhut jolokia and other *Capsicum* species

Sarpras M. Ilyas Ahmad Abdul Rawoof and **Nirala Ramchiary***

Abstract: Humans are directly or indirectly dependent on plant foods for their nutritional health. Hence it is important to characterize the macro and micro nutrients and mineral-elements of commonly consumed dietary vegetables like Capsicum (Chilli). In the present study global metabolites, total ascorbic acid, phenols, flavonoids, capsaicinoids, mineral-elements and antioxidant activities were determined on different developmental stages of Capsicum fruits (immature, breaker and mature) belonging to three Capsicum species namely Capsicum chinense, C. frutescens, and C. annum. The results obtained from the present study showed the maturity dependent increase in the sugar and fatty acid metabolites, capsaicinoids, ascorbic acid and phenol content, and antioxidant activities. Similarly, essential mineral-elements also increased during the fruit maturation in C. chinense, however, contrasting results was observed in C. annum. In addition to that some health beneficial compounds such as antibacterial and antifungal metabolites exclusively observed in matured C. chinense. These interesting observations have opened the possibility to understand and manipulate biosynthesis of macro/micronutrients and mineral elements in order to improve nutritional quality of Capsicum (Chilli) species.

For details refer to <https://doi.org/10.1016/j.lwt.2019.02.020>

**Corresponding Author*



DR. POOJA SRIVASTAVA

Department of Biotechnology

Dr. Pooja Srivastava has done Ph. D. in Biotechnology from Delhi Technology University. She has done her integrated M. Sc. in Chemistry from IIT Kharagpur, M.Tech in Material Science from IIT Kanpur and MBA from Purdue University, USA. Dr. Srivastava is Scientist “D” and Member Secretary of specialist panel ‘Soldier Health and Drug Development’ of Life Sciences Research Board’ at INMAS, DRDO, New Delhi. Currently, her work area involves diagnostic radiopharmaceutical and bio-materials for tactical combat casualty care. She has 10 publications in international journals and presented work in several conferences. She received Laboratory Technology group award for significant contribution towards implementation of Quality management system and director’s commendation (Group award) for contribution in the area of Project Management. She has been awarded membership in Beta Gamma Sigma, the International honor society for collegiate school of Business, Purdue University.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

- P. Srivastava**, D. Kakkar, P. Kumar and A. Tiwari, “Modified benzoxazolone (ABO-AA) based SPECT probes for 18 kDa translocator protein”, *Drug Development and Research*, vol. 80, no. 6, pp. 741-749, 2019. Impact Factor: 1.742.

Modified benzoxazolone (ABO-AA) based SPECT probes for 18 kDa translocator protein

Pooja Srivastava, Dipti Kakkar, Pravir Kumar and Anjani Kumar Tiwari

Abstract: Acetamidobenzoxazolone (ABO) has been modified to ABO-AA, 2-(2-(5-bromo/chloro benzoxazolone)acetamide)-3-(1H-indol-3-yl) propionate to improve pharmacokinetics and lipophilicity ($\log p = 2.04$). The final compound was synthesized in better yield and in fewer steps than previously reported MBIP-Br (70% vs. 62%). Computational docking confirmed binding of MBIP-Cl with translocator protein (TSPO) as well as with mutant TSPO (-8.99 for PDB: 4RYQ and -9.30 for PDB: 4UC1, respectively). Ex-vivo biodistribution and scintigraphy showed that ^{99m}Tc -MBIP-Cl is better than ^{99m}Tc -MBIP-Br in terms of uptake in TSPO-rich organs and release kinetics 0-120 min postinjection. At 15 min, uptake was 2.75-fold (12.91%ID/g vs. 4.69%ID/g) in lung and seven-fold (5.16%ID/g vs. 0.72%ID/g) in heart for ^{99m}Tc -MBIP-Cl compared to that of ^{99m}Tc -MBIP-Br which gives warrant to utilize this single photon emission computed tomography agent in higher animals.



PROF. PRAVIR KUMAR
Department of Biotechnology

Dr. Pravir Kumar is working as a Professor in the Department of Biotechnology and Dean Alumni Affairs at Delhi Technological University. 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. He is an editorial board member in the prestigious Journal of Alzheimer's disease, and reviewers of 35 leading Elsevier, Springer, BMC, Bentham, Oxford and other reputed journals.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. Dhiraj Kumar and **Pravir Kumar**, "A β , Tau, and α -Synuclein aggregation and integrated role of PARK2 in the regulation and clearance of toxic peptides", *Neuropeptides*, vol. 78, pp. 101971, 2019. Impact Factor: 2.407.
2. Dhiraj Kumar, **Pravir Kumar**, "An *In-Silico* Investigation of Key Lysine Residues and Their Selection for Clearing off A β and Holo-A β PP through Ubiquitination". *Interdisciplinary Science: computational life science*, vol. 11, no. 4, pp. 584-596, 2019. Impact Factor: 1.418.

A β , Tau, and α -Synuclein aggregation and integrated role of PARK2 in the regulation and clearance of toxic peptides

Dhiraj Kumar and **Pravir Kumar***

Abstract: Alzheimer's and Parkinson's diseases are one of the world's leading causes of death. >50 million people throughout the world are suffering with these diseases. They are two distinct progressive neurodegenerative disorders affecting different regions of the brain with diverse symptoms, including memory and motor loss respectively, but with the advancement of diseases, both affect the whole brain and exhibit some common biological symptoms. For instance, >50% PD patients develop dementia in their later stages, though it is a hallmark of Alzheimer's disease. In fact, latest research has suggested the involvement of some common pathophysiological and genetic links between these diseases, including the deposition of pathological A β , Tau, and α -synuclein in both the cases. Therefore, it is pertinent to diagnose the shared biomarkers, their aggregation mechanism, their intricate relationships in the pathophysiology of disease and therapeutic markers to target them. This would enable us to identify novel markers for the early detection of disease and targets for the future therapies. Herein, we investigated molecular aspects of A β , Tau, and α -Synuclein aggregation, and characterized their functional partners involved in the pathology of AD and PD. Moreover, we identified the molecular-crosstalk between AD and PD associated with their pathogenic proteins- A β , Tau, and α -Synuclein. Furthermore, we characterized their ubiquitination enzymes and associated interaction network regulating the proteasomal clearance of these pathological proteins.

For details refer to <https://doi.org/10.1016/j.npep.2019.101971>

**Corresponding Author*

An In-Silico Investigation of Key Lysine Residues and Their Selection for Clearing off A β and Holo-A β PP Through Ubiquitination

Dhiraj Kumar and **Pravir Kumar***

Abstract: Malicious progression of neurodegeneration is a consequence of toxic aggregates of proteins or peptides such as amyloid beta (A β) reported in Alzheimer's disease (AD). These aggregates hinder the electrochemical transmission at neuronal junctions and thus deteriorate neuronal-health by triggering dementia. Electrostatic and hydrophobic interactions among amino-acid residues are the governing principle behind the self-assembly of aforesaid noxious oligomers or agglomerate. Interestingly, lysine residues are crucial for these interactions and for facilitating the clearance of toxic metabolites through the ubiquitination process. The mechanisms behind lysine selectivity and modifications of target proteins are very intriguing process and an avenue to explore the clearance of unwanted proteins from neurons. Therefore, it is fascinating for the researchers to investigate the role of key lysine, their selectivity and interactions with other amino acids to clear-off toxic products in exempting the progression of Neurodegenerative disorders (NDDs). Herein, (1) we identified the aggregation prone sequence in A β 40 and A β 42 as 'HHQKLVFFAE' and 'SGYEVHHQKLVFFAEDVG/KGAIIGLMVGGV' respectively with critical lysine (K) at 16 and 28 for stabilizing the aggregates; (2) elucidated the interaction pattern of A β PP with other Alzheimer's related proteins BACE1, APOE, SNCA, APBB1, CASP8, NAE1, ADAM10, and PSEN1 to describe the pathophysiology; (3) found APOE as commonly interacting factor between amyloid beta and Tau for governing AD pathogenesis; (4) reported K224, K351, K363, K377, K601, K662, K751, and K763 as potential putative lysine for facilitating A β PP clearance through ubiquitination thereby arresting A β formation; and (5) observed conserved glutamine (Q), glutamic acid (E), and alpha-helical conformation as few crucial factors for lysine selectivity in the ubiquitination of A β PP.

For details refer to <https://doi.org/10.1007/s12539-018-0307-2>

**Corresponding Author*



DR. RASHMI K. AMBASTA

Department of Biotechnology

Dr. Rashmi K Ambasta has worked as CSIR Scientific Pool Officer (Under scientist Pool Scheme) in Department of Biotechnology, Delhi Technological University. She has obtained her Master's degree from the Department of Zoology, Centre of Excellence and Centre of Advanced study (Biochemistry and Molecular Biology) BHU, Varanasi. She has completed her Ph.D. from J.W. Goethe University, Frankfurt, Germany in 2004. Dr. Ambasta later moved to Boston, USA for her NIH funded postdoctoral training and has worked as Associate Professor in VIT, Vellore, Tamil Nadu, India. She has been awarded with several awards like SERB young scientist, CSIR-SRA, IISC-RA, Biomedical writing certification from University of Pennsylvania, USA, Elsevier Outstanding reviewer certification from TIV. She is an active reviewer of prestigious journals and life member of SBTI, SNCI, IACR. Her research interest is in the field of "Drug screening for Cancer and Diabetes". Her h-index of is 16 as per Google Scholar.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **R. K. Ambasta**, R. Gupta, D. Kumar, S. Bhattacharya, A. Sarkar and P. Kumar. "Can luteolin be a therapeutic molecule for both colon cancer and diabetes?" *Briefing in Functional Genomics*, vol. 18, no. 4, pp. 230-239, 2019. Impact Factor: 3.133.

Can luteolin be a therapeutic molecule for both colon cancer and diabetes

Rashmi K. Ambasta, Rohan Gupta, Dhiraj Kumar, Saurabh Bhattacharya, Aditi Sarkar and Pravir Kumar

Abstract: Diabetes and colon cancer are the leading cause of mortality worldwide. According to World Health Organization, the number of patients with diabetes and cancer is going to be elevated by 50% in 2020. However, several flavonoids have been known to be useful in reducing the chance of cancer/diabetes but the hunt of a single biomolecule that can act as therapeutic and preventive molecules for future epidemic continues. In this review, we aim to perform an illustration of all researches done that target molecular signaling using luteolin in cancer/diabetes and predicted target protein using PharmMapper. The search confirms that luteolin can be a remedial molecule for both cancer and diabetes via acting on variety of signaling pathway. Furthermore, we also intend to illustrate/compare the predicted and verified molecular modes of action of luteolin. Fluorescence in situ hybridization analysis confirms the expression of CCND1 in colon cancer while immunofluorescence analysis confirms the CDK4 in diabetes. Finally, an effort has been made to map docking of marker protein-luteolin at a particular site using docking software. This review gives a holistic overview about luteolin as a therapeutic molecule for cancer/diabetes via acting on multiple signaling cascade such as p53, Wnt, eNOS, iNOS, SOD and MMP9, with especial emphasis on the cyclin-CDK pathway. Altogether, the review concludes that luteolin can be a molecule for the therapy of both cancer and diabetes by acting on broad signaling pathway.

For details refer to <https://doi.org/10.1093/bfpg/ely036>



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Dr. Yasha Hasija is an Associate Professor at Department of Biotechnology, Delhi Technological University (DTU). She completed her Ph.D. from Institute of Genomics and Integrative Biology, CSIR and University of Pune. She has published several papers in national and international journals of high repute and has been awarded several prestigious awards, including the Department of Science and Technology Award for attending the meeting of Nobel Laureates and Students in Lindau in 2002 and Human Gene Nomenclature Award at the Human Genome Meeting-2010 held at Montpellier, France. She is the Project Investigator of several sponsored research projects from Govt. agencies including DST-SERB, CSIR-OSDD and DBT. She is also the Editorial Board Member of several International Journals. She has served as an invited expert and has delivered invited technical and memorial talks at several prestigious universities including Punjab Technical University, G.G.S. Indraprastha University and Delhi University. She is an active researcher supervising B.Tech. (Biotechnology), M.Tech. (Bioinformatics), M.Tech. (Biomedical Engineering) and Ph.D. students at DTU. Her broad areas of research include genome informatics, genome annotation, microbial informatics, integration of genome-scale data for systems biology and personalized genomics.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. K. Bhadhadhara and **Y. Hasija**, “ARD-PRED: an *in silico* tool for predicting age-related-disorder-associated proteins”, *Soft Computing*, vol. 23, no. 5, pp 1767–1776, 2019. Impact factor: 1.58.

ARD-PRED: an *in silico* tool for predicting age-related-disorder-associated proteins

Kirti Bhadhadhara and Yasha Hasija*

Abstract: Interactions among various proteins largely govern cellular processes, and this leads to numerous efforts toward extraction of information related to the proteins, their interactions and the function which is determined by these interactions. The main concern of the study is to present interface analysis of age-related-disorder (ARD)-related proteins to shed light on details of the interactions. It also emphasizes on the importance of using structures in network studies. A major goal in the post-genomic era is to identify and characterize disease susceptibility of genes and to apply this knowledge to disease prevention and treatment. Attempts have been made to integrate biological knowledge of Gene Ontology and Kyoto Encyclopedia of Genes and Genomes pathways into the genomics field. Many gene set analysis methods have been used to detect disease-related risk pathways. The present study combines the network-centered approach with three-dimensional structures to comprehend the biology behind ARDs. Interface properties of the interacting complexes have been used as descriptors to classify age-related associated proteins and non-age-related associated proteins. Machine learning has been used to generate a classifier which is used to predict potential age-related proteins. The ARD-PRED tool achieved an overall accuracy in terms of precision score 81.5, recall score 81.2, accuracy value 79 and ROC Area score 89.6, F-measure 81.1. The tool has been made online at <http://genomeinformatics.dtu.ac.in/ARD-PRED/>. The present work would comprehend ongoing research in the field of ARDs and would also significantly improve the understanding of the molecular mechanism of age-related diseases.

For more details refer to <https://doi.org/10.1007/s00500-018-3154-5>

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Dr. Anubha Mandal has done B.Tech (Chemical Engineering) from NIT Durgapur, West Bengal. She has done Integrated Ph.D. from IIT-Delhi. She is presently working as Scientist “C”, UGC (Professor Grade) in Department of Civil Engineering, Delhi Technological University. Dr. Mandal is known for her valuable contribution on Air Pollution, particularly in the field of Indoor Air Pollution. She has published a large number of papers in both Indian and International journals and has presented her research work in various national and International conferences. She has visited USA, UK, Japan, China, France, Germany, Netherlands and South Africa for attending and presenting her research work.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. J. Pokhariyal, **A. Mandal** and S. G. Aggarwal, “Uncertainty Estimation in PM₁₀ Mass Measurements”, MAPAN-Journal of Metrology Society of India, *MAPAN Journal of Metrology Society of India*, vol. 34, no. 1, pp. 129-133, 2019..Impact factor:1.250
2. J. Pokhariyal, **A. Mandal** and S. G. Aggarwal, “Measurement of Benzo(a)pyrene in PM₁₀ Collected in New Delhi”, *MAPAN Journal of Metrology Society of India* vol. 34, no. 4, pp. 465-471, 2019.Impact factor:1.250

Uncertainty Estimation in PM₁₀ Mass Measurements

Jyoti Pokhariyal, **A. Mandal*** and S. G. Aggarwal

Abstract: Mass measurements of particles in the atmosphere are important for regulatory and scientific purposes. In nearly all of the countries, particulates $\leq 10 \mu\text{m}$ in aerodynamic size (PM₁₀) are one of the most significant parameters of National Ambient Air Quality Standards (NAAQS). In India, as given in NAAQS, the PM₁₀ regulatory limit is $60 \mu\text{g m}^{-3}$ which is based on the annual mean weight of samples (minimum 104) annually at a specific site taken for two/three days in a week for 24 h. In this paper, the components of uncertainty involved in the filter-based sampling of PM₁₀ along with the gravimetric determination of mass have been calculated. As per the EPA guidelines, PM₁₀ mass was monitored for a year at NPL (National Physical Laboratory), New Delhi from January 2014 to January 2015. The 24-h time-weighted mean mass concentration ($n = 104$) for one-year measurement varied from 32.5 to $480.2 \mu\text{g m}^{-3}$. During the study, high mass loading was observed in the month of December to February. In general, the flow rate of the sampling has been reported to be major uncertainty component in size-segregated PM sampling. In this work, the flow rate of the sampling (90.4%) and charge effect of the filter (6.7%) had the major contribution in the total uncertainty budget of PM₁₀ mass measurement. Rest of the uncertainty components, e.g., balances (0.39%) and conditioning of filter (2.39%), had the least contribution.

For details refer to <https://doi.org/10.1007/s12647-018-0285-1>

**Corresponding Author*

Measurement of Benzo(a)pyrene in PM₁₀ Collected in New Delhi

J. Pokhariyal, **A. Mandal*** and S. G. Aggarwal

Abstract: Polyaromatic hydrocarbons (PAH) are the compound which consists of multiple benzene rings bonded in straight, groups or angular forms. They are also found in atmospheric aerosols. In the atmosphere, they can be emitted primarily as a result of incomplete combustion of natural sources (fossil fuels, forest fires, smoke etc.) or anthropogenic sources (coal burning, vehicular emissions, smoke, etc.) or secondarily by atmospheric processes. Depending on the anthropogenic sources, PAHs may occur in significant concentration in urban and industrial ambient air, i.e., bounded with particulate matter (PM). A particle whose aerodynamic diameter is $\leq 10\mu\text{m}$ is called PM₁₀. Benzo(a)pyrene (BaP) is among the most toxic and carcinogenic PAHs. Both PM₁₀ and BaP are among the 12 criteria pollutants listed in Indian National Ambient Air Quality Standards (NAAQS). In this paper, BaP concentration in PM₁₀ collected in a representative site of New Delhi was studied during the year 2014–2015. The average concentration of BaP is varied from 0.04 to 25.7 ng m⁻³. The uncertainty components in measurements were also estimated along with statistical analysis. The most significant uncertainty component is the purity of the BaP standard which has the highest uncertainty contribution as 77%.

For details refer to [http://doi.org/ 10.1007/s12647-019-00316-w](http://doi.org/10.1007/s12647-019-00316-w)

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Meenakshi Singh is a research scholar in Civil Engineering Department of Delhi Technological University, New Delhi, India. She did her M.Tech. from National Institute of Technology, Kurukshetra in 2013 previously she worked as Assistant Professor in Ajay Kumar Garg Engineering College, Ghaziabad. Her research interests are: application of geosynthetics in geotechnical and highway engineering, pavement design, application of soft computing tools in transportation engineering.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **M. Singh**, A. Trivedi A and S. K. Shukla, “Strength enhancement of the subgrade soil of unpaved road with geosynthetic reinforcement layers”, *Transportation Geotechnics*, vol. 19, pp. 54-60, 2019. Impact Factor: 2.385.

Strength enhancement of the subgrade soil of unpaved road with geosynthetic reinforcement layers

Meenakshi Singh, Ashutosh Trivedi and Sanjay Kumar Shukla

Abstract: Geosynthetic reinforcement layers are often used to improve the performance of pavement structures. The performance of an unpaved road is routinely measured in terms of the California bearing ratio (*CBR*), which is an index of strength of subgrade soil of unpaved road. In the present study, an experimental investigation was carried out to evaluate the performance of the subgrade soil by placing a single layer and double layers of geosynthetic reinforcements (Glasgrid, Tenax 3D grid and Tenax multimat) horizontally at varying depths from the top surface of subgrade soil. Through a series of *CBR* tests in the laboratory, an attempt was made to determine the optimum depth of the reinforcement layer. The single layer of reinforcement has been placed at the middle, one-third and one-fourth of the height of the *CBR* specimen from the top surface of the soil in the *CBR* mould. The double layers of reinforcement were placed at one-fourth of the specimen height from the top surface and the bottom surface. The results show the significant contribution in terms of increased *CBR* value of the soil, resulting in reduced design thickness of the pavement layers above the subgrade soil. It has been observed that for a single layer reinforcement the Tenax 3D grid performs better than other geosynthetics used in this study while the Tenax multimat performs best for double layers. The results indicate that for the maximum benefit, the Tenax 3D grid reinforcement should be placed in between $0.3H$ and $0.36H$ where H is the height of the soil specimen. For Glasgrid and Tenax multimat reinforcements, the maximum effect of reinforcement is obtained when they are placed between $0.41H$ and $0.62H$.

For details refer to <https://doi.org/10.1016/j.trgeo.2019.01.007>



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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 more than 11 years. She has received her Ph.D. in Computer Engineering from Faculty of Technology, University of Delhi in 2011. She completed her Master of Technology with honours in Computer Science & Engineering from Guru Gobind Singh Indraprastha University, Delhi in 2005. She received her Bachelor of Engineering degree with distinction in Computer Science & Engineering from Maharishi Dayanand University, India in 2003. She has presented several papers in international conferences and published work in peer-reviewed and science cited journals. She is a recipient of “commendable research award for excellence in research” at Delhi Technological University, 2018 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 titled ‘A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development’, Springer.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	04

1. **A. Kumar** and A. Jaiswal, “Swarm intelligence based optimal feature selection for enhanced predictive sentiment accuracy on twitter”, *Multimedia Tools and Applications*, Springer, vol. 78, pp. 29529–29553, 2019. <https://doi.org/10.1007/s11042-019-7278-0>. Impact Factor: 2.101.
2. **A. Kumar** and G. Garg “Sentiment analysis of multimodal twitter data”, *Multimedia Tools and Applications*, vol. 78, pp. 24103–24119, 2019., Impact Factor: 2.101.
3. **A. Kumar** and N. Sachdeva, “Cyberbullying detection on social multimedia using soft computing techniques: a meta-analysis”, *Multimedia Tools and Applications*, vol. 78, pp. 23973–24010, 2019. Impact Factor: 2.101.
4. **A. Kumar**, S. R. Sangwan and A. Nayyar, “Rumour veracity detection on twitter using particle swarm optimized shallow classifiers”, *Multimedia Tools and Applications*, vol. 78, pp. 24083–24101, 2019. Impact Factor: 2.101.

Swarm intelligence based optimal feature selection for enhanced predictive sentiment accuracy on twitter

Akshi Kumar and Arunima Jaiswal

Abstract: A lot of uncertainty is generally associated with the micro-blog content, primarily due to the presence of noisy, heterogeneous, structured or unstructured data which may be high-dimensional, ambiguous, vague or imprecise. This makes feature engineering for predicting the sentiment arduous and challenging. Population-based meta-heuristics, especially the ones inspired by nature have been proposed in various pertinent studies for feature selection because of their probability to accept a less optimal solution and averting being stuck in local optimal solutions. This research demonstrates the use of two such swarm intelligence algorithms, namely, binary grey wolf and binary moth flame for feature optimization to enhance the sentiment classification performance accuracy. The study is conducted on tweets from two benchmark Twitter corpus (SemEval 2016 and SemEval 2017) and is initially using the conventional term frequency-inverse document frequency statistical weighting filter for feature extraction and subsequently using the swarm-based algorithms. The features are trained over five baseline classifiers namely, the Naïve Bayesian, support vector machines, k-nearest neighbour, multilayer perceptron and decision tree. The results validate that the population-based meta-heuristic algorithms for feature subset selection outperform the baseline supervised learning algorithms. For the binary grey wolf algorithm, an average improvement of 9.4% in accuracy is observed with an approximate 20.5% average reduction in features. Also, for the binary moth flame algorithm, an average accuracy improvement of 10.6% is observed with an approximate 40% average reduction in features. The highest accuracy of 76.5% is observed for support vector machine with binary grey wolf optimizer on SemEval 2016 benchmark dataset.

For details refer to <https://doi.org/10.1007/s11042-019-7278-0>

Sentiment analysis of multimodal twitter data

Akshi Kumar and Geetanjali Garg

Abstract: Text-driven sentiment analysis has been widely studied in the past decade, on both random and benchmark textual Twitter datasets. Few pertinent studies have also reported visual analysis of images to predict sentiment, but much of the work has analyzed a single modality data, that is either text or image or GIF video. More recently, as the images, memes and GIFs dominate the social feeds; typographic/infographic visual content has become a non-trivial element of social media. This multimodal text combines both text and image defining a novel visual language which needs to be analyzed as it has the potential to modify, confirm or grade the polarity of the sentiment. We propose a multimodal sentiment analysis model to determine the sentiment polarity and score for any incoming tweet, i.e., textual, image or info-graphic and typographic. Image sentiment scoring is done using SentiBank and SentiStrength scoring for Regions with convolution neural network (R-CNN). Text sentiment scoring is done using a novel context-aware hybrid (lexicon and machine learning) technique. Multimodal sentiment scoring is done by separating text from image using an optical character recognizer and then aggregating the independently processed image and text sentiment scores. High performance accuracy of 91.32% is observed for the random multimodal tweet dataset used to evaluate the proposed model. The research further demonstrates that combining both textual and image features outperforms separate models that rely exclusively on either images or text analysis.

For details refer to <https://doi.org/10.1007/s11042-019-7390-1>

Cyberbullying detection on social multimedia using soft computing techniques: a meta-analysis

Akshi Kumar and Nitin Sachdeva

Abstract: Cyberbullying is to bully someone in the digital realm. It has become extremely detrimental as the social media and the internet have become more popular and omnipresent. People use the internet services to viciously attack others from behind a screen. The substantial growth in the dimensionality, heterogeneity, subjectivity and multimodality of social media and the pressing need to timely curtail the damage instigated through cyberbullying, has fostered the need to devise automated mechanisms which detect such unfavorable activities. The use of soft computing techniques to handle such pernicious issue has been studied invariably and widely in literature. This study is to understand the viability, scope and significance of this alliance of using soft computing techniques for cyberbullying detection on social multimedia. This work is a systematic literature review to gather, explore, comprehend and analyze the research trends, gaps and prospects of this pairing in a well-organized way. The contribution of this study is noteworthy as it focuses on the use and application of soft computing techniques for cyberbullying detection on social multimedia utilizing a meta-analytic approach in order to integrate, interpret and critically analyze the findings in the original studies for expounding novel approaches to achieve comparable and effectual results pertaining to the defined research domain. Published studies starting April 2003, accessed from six digital portals (ACM, IEEE, Elsevier, Wiley, Springer and Taylor and Francis) have been reviewed to expound the state-of-art within the domain to give insights and finally identify the directions of future research.

For details refer to <https://doi.org/10.1007/s11042-019-7234-z>

Rumour veracity detection on twitter using particle swarm optimized shallow classifiers⁺

Akshi Kumar, Saurabh Raj Sangwan and Anand Nayyar

Abstract: Information overload on Web has been a well-identified challenge which has amplified with the advent of social web. Good, bad, true, false, useful, useless all kinds of information disseminates through the social web platforms. It becomes exceedingly imperative to pro-actively resolve rumours and inhibit them from spreading among the Internet users as it can jeopardize the well-being of the citizens. The task for rumour analysis intends to identify & classify a rumour either as true (factual), false (nonfactual) or unresolved. Determining the accuracy of a rumourous story, a.k.a. rumour veracity is hard owing to the noisy, ambiguous and heterogeneous use of natural language. This necessitates automation of the predictive task which classifies the questionable veracity of rumour accurately. The research presented in this paper, is an empirical study to put forward an optimized learning model which classifies real-time tweets on the basis of truth value, facilitating rumour analysis. The study is conducted on a collection of nearly 14k tweets pertaining to the recent mob lynching fuelled by rumours on suspected child-lifters in the Indian sub-continent (#moblynching) and run on five classical shallow classifiers to categorize tweets into true, false and unspecified using 13 attributes (features). Subsequently, the use of an optimal feature selection method, particle swarm algorithm is proposed to improve the classifier's performance. The empirical analysis validates that the proposed implementation of particle swarm optimization (PSO) for feature subset selection in rumour veracity classification outperforms the baseline supervised learning algorithms. An average 11.28% improvement in accuracy and approximately 31% average reduction in features are demonstrated using PSO. The highest accuracy with optimization of 96.15% is achieved by decision tree.

For details refer to <https://doi.org/10.1007/s11042-019-7398-6>

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Dr. Nirmal Pandey has done B.E. (Computer Science & Engineering) from BIET Jhansi and M.E. (Computer Science & Engineering) from NIT Allahabad. He has done Ph.D. from Delhi Technological University. He has worked on cutting edge technologies in power management, embedded systems, Artificial Intelligence and Machine Learning. He holds 8 patents and he has published a large number of papers in both national and international journals.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **N. Pandey**, O.P. Verma and A. Kumar, “Nature Inspired Power Optimization in Smartphones”, *Swarm and Evolutionary Computing*, vol. 44, pp. 470-479, 2019. Impact Factor: 6.330.

Rumour veracity detection on twitter using particle swarm optimized shallow classifiers⁺

Akshi Kumar, Saurabh Raj Sangwan and Anand Nayyar

Abstract: Information overload on Web has been a well-identified challenge which has amplified with the advent of social web. Good, bad, true, false, useful, useless all kinds of information disseminates through the social web platforms. It becomes exceedingly imperative to pro-actively resolve rumours and inhibit them from spreading among the Internet users as it can jeopardize the well-being of the citizens. The task for rumour analysis intends to identify & classify a rumour either as true (factual), false (nonfactual) or unresolved. Determining the accuracy of a rumourous story, a.k.a. rumour veracity is hard owing to the noisy, ambiguous and heterogeneous use of natural language. This necessitates automation of the predictive task which classifies the questionable veracity of rumour accurately. The research presented in this paper, is an empirical study to put forward an optimized learning model which classifies real-time tweets on the basis of truth value, facilitating rumour analysis. The study is conducted on a collection of nearly 14k tweets pertaining to the recent mob lynching fuelled by rumours on suspected child-lifters in the Indian sub-continent (#moblynching) and run on five classical shallow classifiers to categorize tweets into true, false and unspecified using 13 attributes (features). Subsequently, the use of an optimal feature selection method, particle swarm algorithm is proposed to improve the classifier's performance. The empirical analysis validates that the proposed implementation of particle swarm optimization (PSO) for feature subset selection in rumour veracity classification outperforms the baseline supervised learning algorithms. An average 11.28% improvement in accuracy and approximately 31% average reduction in features are demonstrated using PSO. The highest accuracy with optimization of 96.15% is achieved by decision tree.

For details refer to <https://doi.org/10.1007/s11042-019-7398-6>



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Dr. Rahul Katarya is working as an Associate Professor in the Department of Computer Science & Engineering, Delhi Technological University (formerly Delhi College of Engineering), New Delhi, India. Earlier he worked as an Assistant Professor in the Department of Information Technology, Delhi Technological University (Formerly Delhi College of Engineering), New Delhi India. He is the Officer-in-charge of “Big Data Analytics and Web Intelligence” (BDAWI) research Laboratory. His research interests are Big Data Analytics, Data Science, Web Mining, Social Networks, Recommender Systems, Artificial Intelligence, Machine Learning, Web Personalization, Deep Learning, Knowledge Discovery & Management, Computational Intelligence, Climate change, healthcare and Online Human Behaviour Analysis etc. He is a valued senior member of the Institute of Electrical and Electronics Engineers (IEEE) and Life Member of Computer Society of India (CSI). He is a reviewer of various IEEE Transactions, Elsevier and Springer journals. He has published various research articles in Science Citation Index (SCI) indexed international journals and IEEE international conferences. Dr. Katarya has been awarded the Commendable Research Award for excellence in research, Delhi Technological University for 2017 and 2018.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. Lokesh Jain and **Rahul Katarya**, “Discover opinion leader in online social network using firefly algorithm,” *Expert System & Applications*, vol.122, pp. 1–15, 2019. Impact Factor: 4.292.

Discover opinion leader in online social network using firefly algorithm

Lokesh Jain and **Rahul Katarya***

Abstract: Nowadays, with the widespread access to web 2.0, the social network plays an unbelievable role in knowledge sharing and diffusion of new products. People can share their views and can visit other's opinion about the particular material, news, products, artifacts and, trends, etc. anywhere, anytime, and anywhere. An Opinion leader is a critical person who can change, modify and transform other's view by their knowledge and proficiency. In this article, an innovative approach is proposed to discover the top-N local and global opinion leader within the community and social network respectively. Initially, we identified the community structure within the social network using the modified Louvain method and next identified the opinion leader using a modified firefly algorithm in each community. We also determined the global opinion leader within the same social network using the same firefly algorithm. The proposed approach is exceptionally supportive to expert and intelligent system because it competently discovered the local optimum concurrently in each subgroup of the social network. All the users can update its attractiveness value without any supposition, and as soon as the distance among the user's increases, the other users can automatically create another subgroup in the network and form the local community. In addition, as the population size in the network increases, the entire users measure their prominence simultaneously. Therefore, there is no consequence on computational time and accuracy of the algorithm. Thus, the proposed algorithm is superlative suitable for discovering the opinion leader in the local community and globally in the social network. For legalized the proposed approach, we implemented our proposed method on synthesized as well as on real dataset. Finally, we concluded that both the recommended procedures are much better concerning the accuracy, precision, recall, and F1-score with the widely used standard Social Network Analysis (SNA) measures.

For details refer to <https://doi.org/10.1016/j.eswa.2018.12.043>

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Dr. Ruchika Malhotra is Associate Head and Associate Professor in the Discipline of Software Engineering, Department of Computer Science & Engineering, Delhi Technological University, Delhi, India. She is Associate Dean in Industrial Research and Development, Delhi Technological University. She was awarded with prestigious Raman Fellowship for pursuing Post-doctoral research in Indiana University Purdue University Indianapolis USA. She received her master's and doctorate degree in software engineering from the University School of Information Technology, Guru Gobind Singh Indraprastha University, Delhi, India. She has received IBM Faculty Award 2013. She is recipient of Commendable Research Award (in 2018 and 2019) by Delhi Technological University. Her h-index is 28 as reported by Google Scholar. She is author of book titled “Empirical Research in Software Engineering” published by CRC press and co-author of a book on Object Oriented Software Engineering published by PHI Learning. She has published more than 170 research papers in international journals and conferences. Her research interests are in software testing, improving software quality, statistical and adaptive prediction models, software metrics and the definition and validation of software metrics.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **R. Malhotra** and S. Kamal, “An empirical study to investigate oversampling methods for improving software defect prediction using imbalanced data”, *Neurocomputing*, vol. 343, pp. 120-140, 2019. Impact Factor: 4.072.
2. **R. Malhotra** and M. Khanna, “Dynamic selection of fitness function for software change prediction using Particle Swarm Optimization”, *Information and Software Technology*, vol. 112, pp. 51-67, 2019. Impact Factor: 2.921.

An empirical study to investigate oversampling methods for improving software defect prediction using imbalanced data

Ruchika Malhotra and Shine Kamal

Abstract: Software defect prediction is important to identify defects in the early phases of software development life cycle. This early identification and thereby removal of software defects is crucial to yield a cost-effective and good quality software product. Though, previous studies have successfully used machine learning techniques for software defect prediction, these techniques yield biased results when applied on imbalanced data sets. An imbalanced data set has non-uniform class distribution with very few instances of a specific class as compared to that of the other class. Use of imbalanced datasets leads to off-target predictions of the minority class, which is generally considered to be more important than the majority class. Thus, handling imbalanced data effectively is crucial for successful development of a competent defect prediction model. This study evaluates the effectiveness of machine learning classifiers for software defect prediction on twelve imbalanced NASA datasets by application of sampling methods and cost sensitive classifiers. We investigate five existing oversampling methods, which replicate the instances of minority class and also propose a new method SPIDER3 by suggesting modifications in SPIDER2 oversampling method. Furthermore, the work evaluates the performance of MetaCost learners for cost sensitive learning on imbalanced datasets. The results show improvement in the prediction capability of machine learning classifiers with the use of oversampling methods. Furthermore, the proposed SPIDER3 method shows promising results.

For details refer to <https://doi.org/10.1016/j.neucom.2018.04.090>

Dynamic selection of fitness function for software change prediction using Particle Swarm Optimization

Ruchika Malhotra and Megha Khanna

Abstract: *Context:* Over the past few years, researchers have been actively searching for an effective classifier which correctly predicts change prone classes. Though, few researchers have ascertained the predictive capability of search-based algorithms in this domain, their effectiveness is highly dependent on the selection of an optimum fitness function. The criteria for selecting one fitness function over the other is the improved predictive capability of the developed model on the entire dataset. However, it may be the case that various subsets of instances of a dataset may give best results with a different fitness function.

Objective: The aim of this study is to choose the best fitness function for each instance rather than the entire dataset so as to create models which correctly ascertain the change prone nature of majority of instances. Therefore, we propose a novel framework for the adaptive selection of a dynamic optimum fitness function for each instance of the dataset, which would correctly determine its change prone nature.

Method: The predictive models in this study are developed using seven different fitness variants of Particle Swarm Optimization (PSO) algorithm. The proposed framework predicts the best suited fitness variant amongst the seven investigated fitness variants on the basis of structural characteristics of a corresponding instance.

Results: The results of the study are empirically validated on fifteen datasets collected from popular open-source software. The proposed adaptive framework was found efficient in determination of change prone classes as it yielded improved results when compared with models developed using individual fitness variants and fitness-based voting ensemble classifiers.

For details refer to <https://doi.org/10.1016/j.infsof.2019.04.007>



DR. AJAY KUMAR

Department of Electrical Engineering

Dr. Ajay Kumar has received Ph.D. degree from Department of Electrical Engineering, Delhi Technological University, Delhi, India in 2019. He has worked in Microelectronics Research Lab, Applied Physics Department, Delhi Technological University. He has authored or co-authored over 65 papers in various international and national journals and conferences. His research area is modeling and simulation of semiconductor devices at sub-20 nm scale. He received commendable research excellent award in 2018 and 2019 by DTU. Dr. Kumar is the Senior Member of IEEE, member Optical Society of America (OSA) and member other professional societies. He is reviewer of various IEEE Transactions, Elsevier, and IOP journals.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **A. Kumar**, M. M. Tripathi and R. Chaujar “Sub-30nm In₂O₅Sn Gate Electrode Recessed Channel MOSFET: A Biosensor for Early Stage Diagnostics”, *Vacuum*, vol. 164, pp. 46-52, 2019. Impact Factor: 2.515.
2. **A. Kumar**, N. Gupta, M. M. Tripathi and R. Chaujar, “RF Noise Modeling of Black Phosphorus Junctionless Trench MOSFET in Strong Inversion Region”, *Superlattices and Microstructures*. vol. 125, pp. 72-79, 2019. Impact Factor: 2.385.

Sub-30nm In₂O₅Sn Gate Electrode Recessed Channel MOSFET: A Biosensor for Early Stage Diagnostics

Ajay Kumar, M. M. Tripathi and R. Chaujar

Abstract: This paper presents a technology computer-aided design (TCAD) analysis of an ultrasensitive In₂O₅Sn gate (transparent gate) recessed channel (TGRC) metal-oxide-semiconductor field effect transistor (MOSFET) as a biosensor for early-stage disease diagnostics. The key parameters such as sensitivity, switching ratio, and threshold voltage shift have been compared with the conventional MOSFET. For immobilizing the protein molecules, a cavity has been embedded in the gate insulator region due to which gate capacitance changes owing to the accumulation of protein molecules which reflects the deviation in threshold voltage. Higher sensitivity (1.542) is achieved for protein at a very low drain bias (0.2 V) in comparison to streptavidin and APTES ((3-Aminopropyl) triethoxysilane). Moreover, the cavity gap variation (from 8 to 15 nm) and oxide thickness limitation has also been observed for the device as a biosensor. All the results pave 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 (CMOS) technology.

For details refer to <https://doi.org/10.1016/j.vacuum.2019.02.054>.

RF Noise Modeling of Black Phosphorus Junctionless Trench MOSFET in Strong Inversion Region

Ajay Kumar, Neha Gupta, M. M. Tripathi and R. Chaujar

Abstract: In this paper, RF noise modeling of Black Phosphorus Junctionless Trench (BP-JL-T) MOSFET has been investigated in strong inversion region. The simulated and modeled results are simultaneously compared with Conventional Trench (CT) MOSFET at THz frequency range. By using analytical expressions from RF equivalent schematic, few RF figure-of-merits (FOMs) have been evaluated. It is found that RF noise parameters such as noise resistance (R_n), minimum noise figure (NF_{min}), optimum source susceptance (B_{opt}) and conductance (G_{opt}) are reduced to more than 200%. Modeled results reveal that BP-JL-T-MOSFET minimizes RF noise thus, providing the detailed insight to RF engineers for microwave applications/RFIC design.

For details refer to <https://doi.org/10.1016/j.spmi.2018.10.025>.



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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 presently 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.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. P. Chittora, **A. Singh** and M. Singh, “Adaptive EPLL for improving power quality in three-phase three-wire grid-connected photovoltaic system”, in *IET Renewable Power Generation*, vol. 13, Issue. 9, pp.1595-1602, 2019, Impact Factor: 3.605.
2. A. Arora and **A. Singh**, “Design and analysis of functional link artificial neural network controller for shunt compensation”, in *IET Generation, Transmission & Distribution*, vol. 13, Issue 11, pp. 2280-2289, 2019. Impact Factor: 3.229
3. A. Arora and **A. Singh**, “Design and implementation of Legendre-based neural network controller in grid-connected PV systems “, in *IET Renewable Power Generation*, vol. 13, Issue 15, pp. 2783-2792, 2019. Impact Factor: 3.605.

Adaptive EPLL for improving power quality in three-phase three-wire grid-connected photovoltaic system

Prakash Chittora, **Alka Singh*** and Madhusudan Singh

Abstract: A phase-locked loop (PLL) plays an integral part in synchronisation circuits and is immensely used in grid-connected systems, active filters, and uninterrupted power supplies. A number of these circuits based on synchronous reference frame and its modifications, second-order generalised integrator, enhanced PLL (EPLL) have recently been reported in literature. This article proposes an adaptive version of EPLL whose gain adjusts automatically with the variation of error. Adaptive EPLL (A-EPLL) is developed for positive sequence extraction of load current and its performance is tested for active filter operation. A PV system is also connected at the DC link of the shunt active power filter (SAPF) and the developed controller is tested under dynamic load changes. The complete control technique is tested for harmonics reduction, load balancing, and power balance between grid, load, and photovoltaic (PV) source. Detailed experimental results showing a new adaptive PLL for load compensation are illustrated here.

For details refer to <https://doi.org/10.1049/iet-rpg.2018.5261>

Design and implementation of Legendre-based neural network controller in grid-connected PV systems+

Ankita Arora and **Alka Singh***

Abstract: This study presents the development of Legendre-based functional neural network algorithm for shunt compensation in photovoltaic (PV)-based grid-connected system. The controller is developed for improving power quality (PQ) and the compensator is controlled to work in current control mode. It injects the requisite compensating current depending on the nature of the load current. The compensator is also interfaced with PV source and the controller design incorporates its contribution too. Some of the PQ problems studied include curtailment of harmonics, providing necessary reactive power, power factor improvement and so on. Results under distorted grid, varying solar irradiation and variety of loads have been presented. The proposed algorithm is designed using non-linear functional Legendre expansion of load current and has not been used for compensation or PQ problem alleviation till date. Both simulation and experimental results verify that the proposed algorithm performs far better than the adaptive popular backpropagation multilayer perceptron neural network, recurrent neural network and non-adaptive conventional synchronous reference frame theory based techniques.

For details refer to <https://doi.org/10.1049/iet-rpg.2019.0269>

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Design and analysis of functional link artificial neural network controller for shunt compensation

Ankita Arora and **Alka Singh***

Abstract: Here, a new control algorithm based on functional link artificial neural network (FLANN) has been designed and studied for shunt compensation. FLANN controller is synonymous to extended trigonometric functional non-linear expansion and is trained online to achieve mitigation of different power quality (PQ) problems. Increased use of power electronics-based loads has contributed to harmonic pollution in power distribution systems and the PQ issues raised need to be effectively addressed. Several other PQ problems exist at the load end such as poor power factor, unregulated voltage, load unbalancing etc. and these can be effectively controlled using a shunt compensator. The designed FLANN controller is based on individual non-linear functional expansion of the input signal and it is updated online by the adaptive least mean square (LMS) corrective learning algorithm. The controller is designed to predict the weighted active component of load current to generate reference supply current for the grid. The algorithm converges fast and has good transient as well as steady-state response. Simulation as well as experimental results are shown for shunt compensator installed for the single-phase grid-connected system and the performance results are compared with some conventional algorithms usually utilised for compensation.

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Ms. Ankita Arora is working as an Assistant Professor in Department of Electrical Engineering, Delhi Technological University (DTU), Delhi. She received the B.Tech degree in Electrical Engineering from Jamia Millia Islamia, New Delhi, India, in 2012, M.Tech in Process Control from Netaji Subhash Institute of Technology, Delhi University, New Delhi, India, in 2015. She is currently working towards her Doctoral Degree in the Department of Electrical Engineering, DTU. Her research interests include Power electronics, Power quality, Machine Learning, Renewable Energy sources and Microgrid. She is a member of IEEE, International Association of Engineers (IAENG) and many other reputed societies.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **A. Arora** and A. Singh, “Design and analysis of functional link artificial neural network controller for shunt compensation”, in *IET Generation, Transmission & Distribution*, vol. 13, Issue 11, pp. 2280-2289, 2019. Impact Factor: 3.229
2. **A. Arora** and A. Singh, “Design and implementation of Legendre-based neural network controller in grid-connected PV systems”, in *IET Renewable Power Generation*, vol. 13, Issue 15, pp. 2783-2792, 2019. Impact Factor: 3.605.

Design and implementation of Legendre-based neural network controller in grid-connected PV systems⁺

Ankita Arora and Alka Singh

Abstract: This study presents the development of Legendre-based functional neural network algorithm for shunt compensation in photovoltaic (PV)-based grid-connected system. The controller is developed for improving power quality (PQ) and the compensator is controlled to work in current control mode. It injects the requisite compensating current depending on the nature of the load current. The compensator is also interfaced with PV source and the controller design incorporates its contribution too. Some of the PQ problems studied include curtailment of harmonics, providing necessary reactive power, power factor improvement and so on. Results under distorted grid, varying solar irradiation and variety of loads have been presented. The proposed algorithm is designed using non-linear functional Legendre expansion of load current and has not been used for compensation or PQ problem alleviation till date. Both simulation and experimental results verify that the proposed algorithm performs far better than the adaptive popular backpropagation multilayer perceptron neural network, recurrent neural network and non-adaptive conventional synchronous reference frame theory based techniques.

For details refer to <https://doi.org/10.1049/iet-rpg.2019.0269>

Design and analysis of functional link artificial neural network controller for shunt compensation

Ankita Arora and Alka Singh

Abstract: Here, a new control algorithm based on functional link artificial neural network (FLANN) has been designed and studied for shunt compensation. FLANN controller is synonymous to extended trigonometric functional non-linear expansion and is trained online to achieve mitigation of different power quality (PQ) problems. Increased use of power electronics-based loads has contributed to harmonic pollution in power distribution systems and the PQ issues raised need to be effectively addressed. Several other PQ problems exist at the load end such as poor power factor, unregulated voltage, load unbalancing etc. and these can be effectively controlled using a shunt compensator. The designed FLANN controller is based on individual non-linear functional expansion of the input signal and it is updated online by the adaptive least mean square (LMS) corrective learning algorithm. The controller is designed to predict the weighted active component of load current to generate reference supply current for the grid. The algorithm converges fast and has good transient as well as steady-state response. Simulation as well as experimental results are shown for shunt compensator installed for the single-phase grid-connected system and the performance results are compared with some conventional algorithms usually utilised for compensation.



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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. Mandpura**, S. Prakriya and R. K. Mallik, "Outage probability of fixed-gain amplify-and-forward two-way relays with multiple co-channel interferers," *IET Communications*, vol. 13, no. 6, pp. 649-656, 2019. Impact Factor: 1.779.

Outage probability of fixed-gain amplify-and-forward two-way relays with multiple co-channel interferers

Anup Mandpura, Shankar Prakriya and Ranjan K. Mallik

Abstract: In this study, the authors consider a two-way relaying (TWR) system with source terminals T_a and T_b and a relay terminal T_r . They analyse the performance of a fixed-gain amplify-and-forward-based TWR system over Rayleigh fading channels with co-channel interference at all the terminals. Expressions are derived for the outage probability of the system at a medium-to-high signal-to-interference-plus-noise ratio (SINR) range. They also obtain the expression for the value of outage floor and use this to optimise relay location and power allocation. Simulation results demonstrate accuracy of the derived expressions in different SINR ranges.

For details refer to <https://doi.org/10.1049/iet-com.2018.5045>



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Dr. Imran Ahmad Quadri received B.Tech. from Aligarh Muslim University, Aligarh in 2007, M.Tech. from Jamia Millia Islamia, Delhi in 2012 and Ph. D. in Electrical Engineering from Delhi Technological University, India in 2019. He has more than six year of teaching and industrial experience. He has research publications in international 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**, S. Bhowmick and D. Joshi, "A Hybrid Teaching-learning Based Optimization Technique for Optimal DG Sizing and Placement in Radial Distribution Systems," *Soft Computing*, vol. 23, no. 20, pp. 9899-9917, 2019. Impact Factor: 2.784.

A hybrid teaching–learning-based optimization technique for optimal DG sizing and placement in radial distribution systems

Imran Ahmad Quadri, Suman Bhowmick and Dheeraj Joshi

Abstract: Distributed generation (DG) technology has proved to be an efficient and economical way of generation of power. DGs are intended to generate power near the load centers. Optimal allocation of DG resources enhances the overall performance of distribution systems. This paper presents a hybrid teaching–learning-based optimization (HTLBO) technique for the optimal allocation of DGs in distribution systems. The proposed technique is proficient in handling continuous as well as discrete variables and has the capability to escape strong local minima/maxima trappings. The validity and effectiveness of HTLBO are tested on well-defined standard mathematical benchmark functions. The proposed method is further implemented for optimal allocation of DGs in the IEEE 33-bus, 69-bus and 118-bus radial distribution test systems for minimization of power losses, voltage deviation and maximization of voltage stability index. The multi-objective function for DG allocation uses the ϵ -constraints approach. The obtained results reveal improved convergence characteristics over both teaching–learning-based optimization and quasi-oppositional teaching–learning-based optimization.

For details refer to <https://doi.org/10.1007/s00500-018-3544-8>



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Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01

1. G. Pandove and **M. Singh**, "Robust Repetitive Control Design for 3P4W Shunt Active Power Filter," in *IEEE Transactions on Industrial Informatics*, vol. 15, no. 5, pp. 2810-2818, May 2019. Impact Factor: 7.377

Robust Repetitive Control Design for a Three-Phase Four Wire Shunt Active Power Filter

Gitanjali Pandove and **Mukhtiar Singh***

Abstract: This paper presents a discrete repetitive control technique for three-phase four wire (3P4W) shunt active power filter (SAPF). Generally, the control design for power electronics devices involves two control loops: slow acting outer voltage loop and fast acting inner current control loop. The reference for inner current loop is periodic in nature and cannot be easily tracked by a proportional-integral regulator. The repetitive controllers (RCs) are well known for their tracking ability of periodic signals and offer high gain at all the frequencies. The high gain in higher frequency range may lead to instability. Therefore, in the proposed work, the regular RC is modified by squaring its sensitivity function. This approach results in low amplitude of sensitivity function while offering deep notches at low to mid frequencies range and smaller notches at higher frequencies. This control approach has been simulated and implemented on 3P4W SAPF.

For details refer to <https://doi.org/10.1109/TII.2018.2875035>

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Dr. Vinod Kumar Yadav is working as an Associate Professor with the Department of Electrical Engineering, Delhi Technological University, Delhi. He received B.Tech. and M. Tech. degrees in Electrical Engineering from IET Bareilly and NIT Jamshedpur, Jharkhand respectively. He earned his Ph.D. degree from Indian Institute of Technology, Roorkee, Uttarakhand in 2011. Dr. Yadav received best teacher award from National Education Association, Uttar Pradesh in October, 2016. He received prestigious MHRD Scholarship during M. Tech and Ph. D. period. He published many research papers in reputed International Journals like IET, Elsevier, Taylor & Francis, Wiley etc. Dr. Yadav is Invited Reviewer of various reputed International Journals like Energy, Elsevier Science, Renewable & Sustainable Energy Reviews, Elsevier Science, international journal of emerging electric power systems and IEEE General Meeting.

Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	02

1. **V. K. Yadav**, K. Singh and S. Gupta, “Market-oriented transmission expansion planning using non-linear programming and multi-criteria data envelopment analysis”, *Sustainable Energy, Grids and Networks*, vol. 19, pp. 100234, 2019. Impact Factor: 3.182.
2. S. Ghosh, **V. K. Yadav** and V. Mukherjee, “Improvement of partial shading resilience of PV array through modified bypass arrangement”, *Renewable Energy*, vol. 143, pp. 1079-1093, 2019. Impact Factor: 5.439.

Market-oriented transmission expansion planning using non-linear programming and multi-criteria data envelopment analysis

Vinod Kumar Yadav, Kanwardeep Singh and Shubham Gupta

Abstract: This paper presents a novel and effective methodology for transmission expansion planning (TEP) in a double-auction based electricity market. The TEP problem has been formulated as a nonlinear programming problem to maximize the social welfare function of market participants (Generation and Distribution Companies), subject to power system operational and security constraints. The proposed methodology has been solved in two parts: in the first part, nonlinear TEP problem has been solved for a number of market scenarios to identify a set of prospective transmission lines; and in second part, multi-criteria data envelopment analysis has been applied on the identified set of prospective lines to select the most effective ones for transmission reinforcement. The stopping criterion of the TEP methodology has been applied based on the fact that increment in social welfare obtained by transmission reinforcement should be more than the investment cost of Transmission Company. The proposed methodology is well suited for nonlinear modeling of power systems as it reduces the complexity and computational burden of TEP problem substantially. To illustrate the efficacy of the proposed methodology, simulation result of Garver's six-bus, IEEE 24-bus reliability test, and IEEE 662-bus systems have been presented.

For details refer to <https://doi.org/10.1016/j.segan.2019.100234>

Wide Operating Range, Continuous Input Current T-Impedance Boost Converter for PV Application

Santosh Ghosh, **Vinod Kumar Yadav*** and Vivekananda Mukherjee

Abstract: Generation of hot spot, due to partial shading and other mismatch conditions, is associated with photovoltaic (PV) systems since its very early applications in satellites, but a simple, economic and effective solution is still unavailable. Conventional hot spot mitigation technique, using a bypass diode (BPD) across each sub-panel, reduces the reverse bias voltage only up to -12 V to -19 V across the shaded cell, which matches exactly with the voltage range at which avalanche breakdown of PV cells occur. Reverse breakdown of an acidic texturized PV cell occurs merely at -13 V and between -15 V and -20 V for alkaline texturized ones. Hence, the standard BPD based circuit is not effective enough in preventing reverse breakdown of PV cells and hot spot generation. In this paper, a modified bypass circuit is proposed which successfully strikes a balance between the increase in reliability through reduction of hot spot temperature and increase in complexity of bypass circuit. The experimental study and simulation reveal that the proposed bypass circuit effectively reduced hotspot temperature of the obscure cell below average temperature of the module, without increasing the power loss, system complexity and cost thereof, substantially.

For details refer to <https://doi.org/10.1016/j.renene.2019.05.062>

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Dr. Vishal Verma is currently serving as a Full Professor with the Department of Electrical Engineering and is the Dean of International Affairs, Delhi Technological University. 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. Verma is a member of the Indian Society for Technical Education and a Life Member of CES(I).

Award Summary & Publications Details

Category Title	No. of Publications
Premier Research Award	01

1. **V. Verma** and A. Narula, “Wide Operating Range, Continuous Input Current T-Impedance Boost Converter for PV Application,” *IEEE Transactions on Industry Applications*, vol. 55, no. 6, pp. 7442-7451, 2019. Impact Factor: 3.347.

Wide Operating Range, Continuous Input Current T-Impedance Boost Converter for PV Application

Vishal Verma and Aditya Narula

Abstract: High penetration of renewable energy sources, such as photovoltaic (PV), promotes the clean and sustainable energy spread. Subject to the environmental conditions, intermittency in irradiation change poses the challenge in terms of variable power input to the electrical system. Conventional interfacing power converters such as a boost converter integrating photovoltaic source to the dc utility microgrid in order to push the requisite power to the microgrid suffer from increased stress, resulting in a drop of the system efficiency and possible shutdown of the system. This paper proposes a continuous input current, modular T-impedance boost converter for photovoltaic applications. The boosting capabilities of the converter during both normal boost and shoot-through conditions ensure efficient operation over wide input voltages with reduced stress on the switches. The proposed half-bridge floating ground structure restricts the flow of the common-mode current through the converter. The converter response under intermittent irradiation changes and partial shading conditions are simulated under MATLAB Simulink environment and also are experimentally validated to affirm the capability of the converter.

For details refer to <https://doi.org/10.1109/TIA.2019.2933385>



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Dr. Chhavi Dhiman received B. Tech. from Indira Gandhi Technical University for Women, New Delhi, India in 2011, and M. Tech. from Delhi Technological University, New Delhi, India in year 2014. She received Ph.D. degree from Delhi Technological University, in 2019. Her current research interest includes Computer Vision, Machine Learning, Deep Learning, Pattern Recognition, Human Action Recognition in Videos. She is also a reviewer of various journals of IET and Elsevier.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **C. Dhiman** and D. K. Vishwakarma, "A Robust Framework for Abnormal Human Action Recognition Using R-Transform and Zernike Moments in Depth Videos," in *IEEE Sensors Journal*, vol. 19, no. 13, pp. 5195-5203, 2019. Impact Factor: 3.076
2. **C. Dhiman**, D. K. Vishwakarma, "A review of state-of-the-art techniques for abnormal human activity recognition", *Engineering Applications of Artificial Intelligence*, vol. 77, pp. 21-45, 2019, Impact Factor: 3.526

A Robust Framework for Abnormal Human Action Recognition Using R-Transform and Zernike Moments in Depth Videos

Chhavi Dhiman and Dinesh Kumar Vishwakarma

Abstract: The aim of the algorithm is to detect the abnormal actions that are more prone to elderly people in order to make them more independent and improve their quality of life. The framework is structured to construct a robust feature vector by computing R-transform and Zernike moments on average energy silhouette images (AESIs). The AESIs are generated by the integral sum of the segmented silhouettes obtained from the Microsoft's Kinect sensor v1. The proposed feature descriptor possesses scale-, translation-, and rotation-invariant properties that are also less sensitive to noise and minimizes data redundancy. It enhances the proposed algorithm's robustness and makes the classification process more efficient. The proposed work is validated on a novel abnormal human action (AbHA) dataset and three publically available 3D datasets- UR fall detection dataset, Kinect Activity Recognition dataset, and multi-view NUCLA dataset. The proposed framework exhibits superior results from other state-of-the-art methods in terms of average recognition accuracy (ARA). The experimental results demonstrate 96.5%, 96.64%, 95.9%, and 86.4% ARA on the UR fall detection dataset, the KARD dataset, the AbHA dataset, and the multi-view NUCLA dataset, respectively.

For details refer to <https://doi.org/10.1109/JSEN.2019.2903645>

A review of state-of-the-art techniques for abnormal human activity recognition

Chhavi Dhiman and Dinesh Kumar Vishwakarma

Abstract: The concept of intelligent visual identification of abnormal human activity has raised the standards of surveillance systems, situation cognizance, homeland safety and smart environments. However, abnormal human activity is highly diverse in itself due to the aspects such as (a) the fundamental definition of anomaly (b) feature representation of an anomaly, (c) its application, and henceforth (d) the dataset. This paper aims to summarize various existing abnormal human activity recognition (AbHAR) handcrafted and deep approaches with the variation of the type of information available such as two-dimensional or three-dimensional data. Features play a vital role in an excellent performance of an AbHAR system. The proposed literature provides feature designs of abnormal human activity recognition in a video with respect to the context or application such as fall detection, Ambient Assistive Living (AAL), homeland security, surveillance or crowd analysis using RGB, depth and skeletal evidence. The key contributions and limitations of every feature design technique, under each category: 2D and 3D AbHAR, in respective contexts are tabulated that will provide insight of various abnormal action detection approaches. Finally, the paper outlines newly added datasets for AbHAR by the researchers with added complexities for method validations.

For details refer to <https://doi.org/10.1016/j.engappai.2018.08.014>



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Dr. Gurjit Kaur is an Associate Professor in the Department of Electronics & Communication Engineering at the Delhi Technological University, Delhi, India. She has been a topper throughout her academic education. As a testimonial to the same, she has been awarded by Chief Minister S. Prakash Singh Badal for being the topper in Punjab. After that, she was awarded a ‘Gold Medal’ by former President of India Dr. A. P. J. Abdul Kalam for being the overall topper of the Punjab Technical University (PTU), Jalandhar in B.Tech program. She also received an Honour by Guru Harkrishan Education Society for being topper among all the colleges and all the disciplines of PTU, Jalandhar. She then proceeded to PEC University of Technology, Chandigarh to complete her M. Tech in 2003 and also earned her Ph.D. degree from Punjab University, Chandigarh in 2010 with distinction. She has spent over 16 years of her academic career towards research and teaching in the field of Electronics and Communication in well-reputed institutes like PEC University of Technology, Punjab University, Jaypee Institute of Information and Technology, Gautam Buddha University, and Delhi Technological University, Delhi. Her research interests mainly include Optical CDMA, Wireless Communication system, high-speed interconnect and IOT. She has also authored three books at the international and national level. Her two books, i.e., “Handbook of Research on Big Data and the IoT” and “Examining Cloud Computing Technologies through the Internet of Things,” were published by IGI-Global, International Publisher of Progressive Information Science and Technology Research in 2018 and 2017 respectively. She also authored a national level book entitled “Optical Communication,” which was published by Galgotia Publications in 2005.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. D. Srivastava, **G. Kaur** and P. Singh, “Design of novel hybrid WDM/multiple-beam FSO system to improve the link length in rainy season”, *Journal of Optics*, vol. 48, pp. 184–188 2019. Impact factor: 2.753.

Design of novel hybrid WDM/multiple-beam FSO system to improve the link length in rainy season

Disha Srivastava, **Gurjit Kaur*** and Prabhjot Singh

Abstract: As single laser beam cannot deal with the effect of turbulent atmospheric channels in free space optic (FSO) system, so we have proposed a novel hybrid WDM/multiple-beam system which can reduce the effects of tropical rain weather condition and provide a significant enhancement in the link range, scalability and received optical power. The result indicates that the SNR and FSO link ranges are improved by 20 dB and 3 km, respectively, by using the proposed technique in contrast to previous techniques.

For details refer to <https://doi.org/10.1007/s12596-019-00534-0>

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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. R. Verma, **N. Pandey** and R. Pandey, "CFOA based low pass and high pass fractional step filter realizations", *AEU - International Journal of Electronics and Communications*, vol. 99, pp. 161-176, 2019. Impact factor: 2.853.
2. R. Verma, **N. Pandey** and R. Pandey, "Novel CFOA based capacitance multiplier and its application", *AEU - International Journal of Electronics and Communications*, vol. 107, pp. 192-198, 2019. Impact factor: 2.853

CFOA based low pass and high pass fractional step filter realizations

Rakesh Verma, **Neeta Pandey*** and Rajeshwari Pandey

Abstract: This contribution puts forward a new proposal for Current Feedback Operational Amplifier (CFOA) based Low pass (LP) and High Pass (HP) Fractional Step Filters (FSFs). The proposed filters are designed by approximating the fractional Laplacian operator by an appropriate integer order transfer function. Subsequently, functional block diagram (FBD) approach is used for CFOA based realization of LP and HP FSFs of order $(1 + \alpha)$. Higher order FSFs are realized by cascading FSF of order $(1 + \alpha)$ with higher integer order filters. To illustrate this, CFOA based LP (HP) FSFs of order $(5 + \alpha)$ are obtained by cascading LP (HP) FSFs of order $(1 + \alpha)$ with proposed leapfrog realization of 4th order LP (HP) filter. The proposal is verified through SPICE simulations and experimentation. Stability, sensitivity and non-ideal analyses are also included.

For details refer to <https://doi.org/10.1016/j.aeue.2018.11.032>

Novel CFOA based capacitance multiplier and its application

Rakesh Verma, **Neeta Pandey*** and Rajeshwari Pandey

Abstract: This communication presents a novel CFOA based capacitance multiplier. The proposed circuit employs two CFOAs, two resistors and a single capacitor. To achieve higher multiplication factors, the larger component spread is needed in existing CFOA based capacitance multiplier circuits. The proposal addresses this and attains multiplication at lower component spread. The mathematical analysis for modelling the effects of non-ideality shows the deviations from ideal behavior which may be compensated by placing an additional resistor. The functionality is tested using SPICE simulations and experimentation under different conditions. An application namely parallel RLC resonator is included to show the usefulness.

For details refer to <https://doi.org/10.1016/j.aeue.2019.05.010>

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Dr. Poornima Mittal is working as an Associate Professor in the Department of Electronics and Communication Engineering, Delhi Technological University. She has received Ph.D. degree in 2016 from Uttarakhand Technical University, Dehradun. Her research interest includes design and modeling of novel organic flexible electronic devices, low power VLSI circuits and FPGA/VHDL based Implementation. She has more than eighty international journal & conference publications with 294 citations. She has published one patent on novel OTFT structure and one text book on “Organic Thin-Film Transistor Applications: Materials to Circuits” published by CRC Press, Taylor and Francis, U.K., 2016. She is the reviewer of IEEE transactions and many other 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. She is the life member of many professional societies. She has more than 14 years of teaching experience.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. N. Mishra, **P. Mittal** and B. Kumar, “Analytical Modeling for Static and Dynamic Response of Organic Pseudo All-p Inverter Circuits”, *Journal of Computational Electronics*, vol. 18, no. 4, pp. 1490–1500, 2019. Impact Factor: 1.637.
2. S. Negi, **P. Mittal**, B. Kumar and P. Juneja, “Organic LED Based Light Sensor for Detection of Ovarian Cancer”, *Microelectronic Engineering*, vol. 218, pp. 111154-111164, 2019. Impact Factor: 1.654.
3. S. Negi, **P. Mittal** and B. Kumar, “Analytical Modelling and Parameters Extraction of Multilayered OLED”, *IET Circuits, Devices and Systems*, vol. 13, no. 8, pp. 1255-1261, 2019. Impact Factor: 1.277.

Analytical Modeling for Static and Dynamic Response of Organic Pseudo all- p Inverter Circuits

Neha Mishra, **Poornima Mittal*** and Brijesh Kumar

Abstract: This paper presents the performance analysis of all- p -organic Pseudo inverter circuit using dual gate organic thin film transistor (DG-OTFT). The proposed inverter design has shown quite a high performance in terms of noise margin, gain and propagation delay leading to the designing of more robust digital circuits that too with augmented performance. The parameters of all- p -organic Pseudo inverter are compared with the Zero- V_{gs} load logic (ZVLL) and dynamic load logic (DLL) based conventional inverters and a substantial escalation is found for the novel combination of dual gate flexible TFT with Pseudo design. Performance parameter are deeply analyzed and observed that the noise margin is improved by 42.8% as compared to ZVLL based conventional inverter. Bootstrap technique is implemented to further improve the performance and reduce the threshold voltage drop. The performance parameters are analyzed mathematically and compared with the simulated values. The static as well as dynamic characteristics of organic pseudo all- p inverter with and without bootstrap technique are observed. Static power consumption of the organic pseudo all- p inverter is estimated. Therefore, Improvement of noise margin by the bootstrap circuit of the organic pseudo inverter is dealt with.

For details refer to <https://doi.org/10.1007/s10825-019-01400-9>.

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Organic LED Based Light Sensor for Detection of Ovarian Cancer

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

Abstract: Organic devices possess an interdisciplinary facet that can be utilized in the different fields; communication, memory devices, bio-degradable technology and sensor application owing to their robustness, light weight and low power requirements. The proposed work is focused on the development of a sensor application based on the organic LEDs for the diagnosis of ‘Ovarian Cancer’. Two organic LEDs: Multilayered OLED and triple hole block layer OLED are analyzed for utilization as light detector and light source in the sensing device for cancer detection. Multilayered OLED depicts excellent light detection qualities owing to lower electron hole recombination and it is six times better as compared to the triple hole block layer OLED. Therefore, it is used as the detector element in the sensing device. On the other hand, triple hole block layer OLED, is used as light source due to its high luminescence characteristics of 25,285 cd/m². Further, a dual gate OTFT is used to drive the triple hole block layer OLED, which is utilized as the light source. DG OTFT in dual gate mode is 18% better compared to single gate mode. Thus DG-OTFT in dual gate mode is able to generate 18 volts at the terminals of the triple HBL OLED necessary for its operation. Thereafter, light detection is performed utilizing the OLED. Multilayered OLED depicted excellent light detecting capabilities. It is able to generate a cathode current of 29mA and 13mA at an incident wavelength of 420 and 440 nm, respectively, an essential requirement for present sensor application. Therefore, it presents a possibility to fabricate a portable fully flexible device for the screening and diagnosis of the ovarian cancer.

For details refer to <https://doi.org/10.1016/j.mee.2019.111154>

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Analytical Modelling and Parameters Extraction of Multilayered OLED

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

Abstract: This research paper investigates the electrical performance of the multilayered organic LED with a focus on the role of charge injection, transport and emission layers. Device parameters; luminescence and current density are extracted using the Silvaco Atlas numerical device simulator and validated through the fabricated experimental results with a minor deviation of 3%. Further, a mathematical model is applied to extract the other device parameters such as; electric field, charge carrier mobility, carrier concentration and carrier current density. Additionally, the multilayered device architecture is critically analysed through cut-line methodology to better comprehend the internal device physics in terms of hole-electron mobility, concentration and their recombination. Subsequently, the performance parameters extracted using analytical model, are compared to the results of internal analysis and a close match is observed. These results prove the Poole-Frenkel mobility dependent behaviour in the OLEDs that varies in accordance with the electric field. The analyses also highlight the high electron and hole concentration in the vicinity of the emission layer as a reason of high luminescence in the multilayered OLED, directly following the Langevin's theory of recombination in organic semiconductors. These analyses highlight the impact of different layers in the organic LEDs and thus open up new horizons to further performance improvement in these devices.

For details refer to <https://doi.org/10.1049/iet-cds.2019.0164>

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Ms. Pragati Dahiya was research scholar in Department of Electronics and Communication Engineering, Delhi Technological University. She joined Ph.D. in Department of Electronics and Communication Engineering, DTU in 2015 under the guidance of Dr. Priyanka Jain. She published 2 paper in SCI journal of impact factor 1.922. She has five International conference papers in her credit.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **P. Dahiya** and P. Jain, “Realization of Second-Order Structure of Recursive Algorithm for Discrete Cosine Transform”, *Circuits, Systems, and signal processing*, vol. 38, pp. 791-804, 2019. Impact Factor: 1.922.

Realization of Second-Order Structure of Recursive Algorithm for Discrete Cosine Transform

Pragati Dahiya and Priyanka Jain

Abstract: A computational and hardware-efficient second-order infinite impulse response filter structure is proposed in this paper. It can compute discrete cosine transform (DCT) with improved processing speed and is valid for $N=2^r$, where N is the length of the input sequence and $r > 1$. A new algorithm is also proposed in this paper which is an improvement over previously reported algorithms in the literature. The proposed algorithm reduces the total number of real multiplications and additions in comparison with the existing algorithms. Using the suggested algorithm, computational cycles required to compute a DCT coefficient are less which further reduces the truncation error while processing a long length of input data.

For details refer to <https://doi.org/10.1007/s00034-018-0885-6>



MS. PRIYANKA GUPTA

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Priyanka Gupta did B.E. (Hons.) and M.Tech in Electronics and Communication Engineering from Maharshi Dayanand University, Rohtak. She is having teaching and research experience of over six years. Currently, she is pursuing Ph.D. from Delhi Technological University, Delhi. She has presented her Pre-Ph.D. seminar. She has published eight papers in reputed journals and conferences. Her research interests are Analog Integrated Circuits and signal processing.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **P. Gupta** and R. Pandey, "A low-power voltage differencing buffered amplifier," *International Journal of Circuit Theory and Applications*, vol. 47, no. 5, pp. 666-685, 2019. Impact Factor 1.554.

A low-power voltage differencing buffered amplifier

Priyanka Gupta and Rajeshwari Pandey

Abstract: A low-voltage, high-performance voltage differencing buffered amplifier (VDBA) designed using differential flipped voltage followers (DFVF) is presented in this paper. The proposed VDBA is capable of providing high transconductance and wide bandwidth (BW) with low biasing currents and buffer transfer ratio close to unity. Mathematical formulations for transconductance and buffer transfer ratio are deduced through low-frequency small signal analysis. Pre and post layout simulations for characterization of the proposed structure are carried out on Cadence Virtuoso using gpdk 0.18- μm CMOS process parameters. The transconductance of the proposed VDBA is observed to be varying from 411.8 μS to 1.374 mS for a corresponding bias current range of 10 to 75 μA , and the 3-dB bandwidth (BW) is recorded to be 1.2 GHz. The PVT analysis is carried out to show the effect of process corners. To check the robustness of the proposed VDBA, Monte Carlo analysis is performed, and results have been included in the form of histograms.

For details refer to <https://doi.org/10.1002/cta.2668>

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BIOGRAPHY

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Dr. Rajeshwari Pandey is a Professor in Department of Electronics and Communication Engineering, Delhi Technological University and is also serving as Associate Dean, (Acad-UG). She did B.Tech. in Electronics and Telecommunication from J. K. Institute of Applied Physics and Technology, University of Allahabad and M.E. in Electronics and Control from BITS, Pilani, Rajasthan. She did Ph.D. from Delhi University. She has served BITS, Pilani, Associated Electronics Research Foundation, Noida and Priyadarshini College of Computer Science, Noida in various capacities. Her research interests include analog integrated circuits and microelectronics and she has published over 100 research papers in various international journals of repute and national/international conferences. She is life member of ISTE, IETE and member of IEEE and IEEE WIE.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. K. Gurumurthy, **R. Pandey** and N. Pandey “New sinusoidal oscillator configurations using operational transresistance amplifier”, *International Journal of Circuit Theory and Applications*, vol. 47, no. 5, pp. 666-685, 2019. Impact Factor 1.554.
2. P. Gupta and **R. Pandey**, “A low-power voltage differencing buffered amplifier,” *International Journal of Circuit Theory and Applications*, vol. 47, no. 5, pp. 666-685, 2019. Impact Factor 1.554.

New sinusoidal oscillator configurations using operational transresistance amplifier

Gurumurthy Komanapalli, **Rajeshwari Pandey*** and Neeta Pandey

Abstract: The objective of this brief is to introduce four new structures of electronically tunable sinusoidal oscillators (SOs) designed using operational transresistance amplifier (OTRA). Each of the proposed SO consists of forward path derived from a generic structure along with one/two OTRA-based resistive gain stages or differentiator in its feedback path. All the proposed SOs enjoy independent tuning of the frequency of oscillation (FO) through resistors without affecting the condition of oscillation (CO). Further, all topologies are found to exhibit low f_o sensitivities at all frequencies with respect to circuit parameters, and the second topology is capable of achieving very low frequencies (VLFs) using less RC component spread and provides linear tuning too. The fourth circuit provides quadrature output. The proposed SOs have been successfully implemented and verified in 180-nm CMOS technology node using ADE (analog design environment) tool Cadence Virtuoso. Both pre layout and post layout simulation results have been included. To assess the oscillator prefabrication performances, Monte Carlo and process-voltage-temperature (PVT) analyses have been performed. The total harmonic distortion (THD) is observed to be less than 3.5%.

For details refer to <https://doi.org/10.1002/cta.2619>

A low-power voltage differencing buffered amplifier

Priyanka Gupta and **Rajeshwari Pandey***

Abstract: A low-voltage, high-performance voltage differencing buffered amplifier (VDBA) designed using differential flipped voltage followers (DFVF) is presented in this paper. The proposed VDBA is capable of providing high transconductance and wide bandwidth (BW) with low biasing currents and buffer transfer ratio close to unity. Mathematical formulations for transconductance and buffer transfer ratio are deduced through low-frequency small signal analysis. Pre and post layout simulations for characterization of the proposed structure are carried out on Cadence Virtuoso using gpdk 0.18- μm CMOS process parameters. The transconductance of the proposed VDBA is observed to be varying from 411.8 μS to 1.374 mS for a corresponding bias current range of 10 to 75 μA , and the 3-dB bandwidth (BW) is recorded to be 1.2 GHz. The PVT analysis is carried out to show the effect of process corners. To check the robustness of the proposed VDBA, Monte Carlo analysis is performed, and results have been included in the form of histograms.

For details refer to <https://doi.org/10.1002/cta.2668>

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Dr. Rajiv Kapoor is a Professor of Electronics and Communication Engineering Department for more than 10 years. He has got teaching along with the industry experience. He has published more than 60 papers in SCI/SCIE Journals. He has got 12 patents published. He has got research consultancy project in collaboration with Maulana Azad Institute of Dental Sciences and Department of Science & Technology, India. In addition, he has got 3 projects sponsored by Industry. The projects are meant for Railways and Aviation sector through M & M Logicsoft Pvt. Ltd. And for the doctors of MAX hospital helping them in the Plastic Surgery. He has guided 15 Ph. D. candidates and guiding 4 Ph. D. candidates. He has published 8 (SCI/SCIE) journal papers in the year 2019.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **R. Kapoor**, R. Gupta, L. H. Son and R. Kumar, "Iris localization for direction and deformation independence based on polynomial curve fitting and singleton expansion", *Multimedia Tools and Applications*, vol. 78, pp. 19279-19303, 2019. Impact Factor: 2.101.
2. **R. Kapoor**, R. Gupta, L. H. Son, R. Kumar and S. Jha, "Fog removal in images using improved dark channel prior and contrast limited adaptive histogram equalization", *Multimedia Tools and Applications*, vol. 78, pp. 23281-23307, 2019. Impact Factor: 2.101.

Iris localization for direction and deformation independence based on polynomial curve fitting and singleton expansion

Rajiv Kapoor, Rashmi Gupta, Le Hoang Son and Raghvendra Kumar

Abstract: In an authentic biometric system, iris recognition aims to detect the iris pattern of a person. The single unique pattern of the human iris may be extracted from the image and encoded, such that a given code may be compared to several others, and then validating if the patterns belong to a particular eye or not. Iris localization is an important aspect of iris recognition since accuracy in iris localization affects iris recognition. The previous iris localization methods were less efficient owing to slow processing time and inefficiency in handling non-straight faces in imperfect conditions. In this paper, we propose a new iris localization method with direction and deformation independence. It is based on the idea that the iris is localized from the side face and from distance. A novel approach of curve fitting using polynomial along with singleton expansion is adopted to efficiently and accurately localize the iris in any distance and direction from the camera. We validate the method by experimental analysis on the basis of accuracy, segmentation error and execution time. The method is suggested to be significant for diagnosing several eye-related disorders as well as for biometric authentication processes.

For details refer to <https://doi.org/10.1007/s11042-019-7314-0>

Fog removal in images using improved dark channel prior and contrast limited adaptive histogram equalization

Rajiv Kapoor, Rashmi Gupta, Le Hoang Son, Raghvendra Kumar and Sudan Jha

Abstract: It is necessary to perform fog removal from an image based on the estimation of depth to increase the visibility of a scene. In this paper, we propose a new algorithm to eradicate fog from images in which fog is defined as a state or cause of perplexity or confusion with respect to the image. It runs at high speed and simultaneously minimizes the halo-artifact with a new median operator in dark channel prior. The proposed method is based on Guided Filter for transmission-map refinement and Contrast Limited Adaptive Histogram Equalization (CLAHE) for visibility improvement. It preserves small details while remaining robust against density of fog, and recovers scene contrast simultaneously. Guided filter improved the transmission map acquired from Median dark channel prior (MDCP), which is an improvement of the Dark Channel Prior DCP by the use of median operation. All of the parameters used in our method are data driven. The quality of algorithm has been validated on several types of fog-degraded images where considerable variation in contrast and illumination exists. Moreover, its performance is compared with the other state-of-the-art methods. The experimental results indicate that the proposed method effectively restores the color and contrast of scene as well as produces satisfactory information in homogeneous fog. It outperforms the existing fog removal methods for run time computational time and other evaluation metrics for rating of visibility enhancement. The proposed method conserves small details part of the image when outstanding vigorous against concentration of fog, and recuperate scene contrast instantaneously. It controls at a high speed than the existing approaches and can diminish the halo effect.

For details refer to <https://doi.org/10.1007/s11042-019-7574-8>

**DR. SUDIPTA MAJUMDAR***Department of Electronics
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Dr. Sudipta Majumdar is working as an Assistant Professor in Electronics & Communication Engineering Department, Delhi Technological University, Delhi. She received her doctorate degree from Delhi University. She has received her M.Tech. and B. Tech degree from University of Allahabad. She also worked as Project Associate in IIT Delhi and IIIT Allahabad. Her research interest includes system identification, parameter estimation, nonlinear modelling and image processing.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. R. Bansal, **S. Majumdar** and H. Parthasarathy, “Extended Kalman Filter Based Nonlinear System Identification Described in Terms of Kronecker Product”, *AEU- International Journal of Electronics & Communication*, vol. 108, pp. 107-117, 2019. Impact Factor: 2.853

Extended Kalman Filter Based Nonlinear System Identification Described in Terms of Kronecker Product

Rahul Bansal, **Sudipta Majumdar*** and Harish Parthasarathy

Abstract: This paper presents output voltage estimation of metal-oxide- semiconductor field effect transistor (MOSFET) circuit using extended Kalman filter (EKF), in which, the nonlinear system dynamics has been modeled using Kronecker product. Input voltage is modeled as an Ornstein- Uhlenbeck (O.U.) process to account both, the white noise and Brownian process. State space model of the circuit has been obtained using Enz-Krummenacher-Vittoz (EKV) model of the MOSFET circuit and Kirchhoff's current law (KCL). The proposed method has the following advantages (i) It can be used for any mode of transistor operation besides near the quiescent point region. The nonlinearity in saturation can be considered in the proposed method. (ii) The method can be used for large amplitude input signal. For small amplitude input signal, Kalman filter (KF) can be used, which results in inaccurate estimation due to linearization of nonlinear system. (iii) The method presents real time parameter estimation as EKF has been used for nonlinear system. It is able to track the parameters, when they are slowly changing with time. (iv) Use of Kronecker product presents more accurate representation of nonlinear system. The proposed method has been compared with Kronecker based wavelet transform (WT) representation of the system. The wavelet coefficients have been obtained using perturbation technique. Finally, the least mean square (LMS) has been applied to the wavelet transform representation of the system for parameter estimation. Simulation results validate the performance of the proposed method.

For details refer to <https://doi.org/10.1016/j.aeue.2019.05.033>

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Tej Singh is a full-time research scholar in the Department of Electronics and Communication Engineering, Delhi Technological University, New Delhi, India. He has received the B.Tech. degree from Madan Mohan Malaviya University of Technology, Gorakhpur, India, in 2010, and M.E degree from the Thapar University, Patiala, India, in 2014. His current research interests include human action and activity recognition, image processing, pattern analysis and machine learning.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **T. Singh** and D. K. Vishwakarma, “Video Benchmarks of Human Action Datasets: A Review”, *Artificial Intelligence Review*, vol. 52, no. 2, pp. 1107–1154, 2019. Impact Factor: 5.095.

Video Benchmarks of Human Action Datasets: A Review

Tej Singh and Dinesh Kumar Vishwakarma

Abstract: Vision-based Human activity recognition is becoming a trendy area of research due to its wide application such as security and surveillance, human-computer interactions, patients monitoring system, and robotics. In the past two decades, there are several publically available human action, and activity datasets are reported based on modalities, view, actors, actions, and applications. The objective of this survey paper is to outline the different types of video datasets and highlights their merits and demerits under practical considerations. Based on the available information inside the dataset, we can categorise these datasets into RGB (Red, Green, and Blue) and RGB-D (depth). The most prominent challenges involved in these datasets are occlusions, illumination variation, view variation, annotation, and fusion of modalities. The key specification of these datasets is discussed such as resolutions, frame rate, actions/actors, background, and application domain. We have also presented the state-of-the-art algorithms in a tabular form that give the best performance on such datasets. In comparison with earlier surveys, our works give a better presentation of datasets on the well-organised comparison, challenges, and latest evaluation technique on existing datasets.

For details refer to <https://doi.org/10.1007/s10462-018-9651-1>



DR. ANIL KUMAR HARITASH

Department of Environmental Engineering

Dr. A. K. Haritash is an Associate Professor in the Department of Environmental Engineering, Delhi Technological University. He has more than 12 years of teaching experience and has around 17 years of research experience. His area of interest is environmental monitoring of Polycyclic Aromatic Hydrocarbons (PAHs), water quality assessment, wetland monitoring, Advanced Oxidation Processes (AOPs), and bioremediation. He has around 70 publications in the form of research papers, conference abstracts, articles, and an edited book. His research on biodegradation of PAHs has been conferred the status of **FAST BREAKING RESEARCH** in Environmental Engineering by Thomson Reuters and ScienceWatch. Dr. Haritash has been conferred state level Outstanding Faculty Award for his contribution in academics and research. He is the recipient of Research Excellence Award for the year 2017 and 2018. He has been on the panel of subject experts in National Science Centre (Polland); Ministry of Drinking Water and Sanitation, Govt. of India; Shastri Indo-Canadian Institute; TERI School of Advanced Studies etc. He is member of Editorial Board of Indian Journal of Waste Management and Applied Chemical Engineering journal. Dr. Haritash has participated in several national and international seminars, conferences, and workshops.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. S. Nandakumar, H. Pipil, S. Ray and **A. K. Haritash**, "Removal of phosphorous and nitrogen from wastewater in Brachiaria-based constructed wetland", *Chemosphere*, vol. 233, pp. 216-222, 2019. Impact Factor: 5.108.
2. Sakshi, S. K. Singh and **A. K. Haritash**, "Polycyclic aromatic hydrocarbons: soil pollution and remediation", *International Journal of Environmental Science and Technology*, vol. 16, issue 10, pp. 6489-6512, 2019. Impact Factor: 2.031.

Removal of phosphorous and nitrogen from wastewater in *Brachiaria*-based constructed wetland

S. Nandakumar, Harsh Pipil, Sanak Ray and **Anil Kumar Haritash***

Abstract: Considering the prevalence of eutrophication of water bodies, sustainable treatment technologies like constructed wetlands (CWs) have come up as a promising alternate for nutrient removal and wastewater treatment. The present study was undertaken to investigate the potential of *Brachiaria*-based constructed wetland for removal of phosphorus and nitrogen in different seasons of a sub-tropical region. The CW cell could efficiently remove phosphate and nitrogen under varying influent concentrations across different seasons. Average removal of total phosphate increased from 55.2% (winter) to 78.5% (spring), 80.7% (autumn), and 85.6% (summer), and maximum removal rate was 384.4 mg/m²-day during the summer season. The soluble/available phosphate was removed on priority owing to its easy bio-availability. The removal efficiency of *Brachiaria* increased with increasing influent phosphate concentration (5–20 mg/l), if supplemented with nitrogen maintaining the N:P ratio of 5:1. This highlighted the characteristic of *Brachiaria* to absorb chemical shocks *w.r.t.* phosphate. The neutral pH (6.2–8.3) and oxidising conditions in rhizosphere ruled out possibility of binding of phosphate with cations (Ca, Fe, and Al) in sediments. Ambient temperature and sunshine hours regulated evapotranspiration and hence nutrient removal. Simultaneous removal of nitrogen (75.6–84.6%) by *Brachiaria* indicated that it can serve dual purpose of nutrient removal and fodder-production for livestock, thus serving as a sustainable prototype for rural communities in sub-tropical regions.

For details refer to <https://doi.org/10.1016/j.chemosphere.2019.05.240>

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Polycyclic aromatic hydrocarbons: soil pollution and remediation

Sakshi, S. K. Singh and Anil Kumar Haritash*

Abstract: Soil is an important environmental matrix to support the life of all organisms directly or indirectly. Despite being the ultimate sink for all pollutants, it has been neglected for long, which has negatively affected the quality of the soil. Disposal of pollutants has resulted in changes in properties of soils and introduction of toxicity into it. The presence of heavy metals, pesticides, polychlorinated biphenyls and polycyclic aromatic hydrocarbons (PAHs) affects all forms of life since these chemicals have associated toxicity, mutagenicity, and carcinogenicity. PAHs are typical pollutants of soil which result in alteration in grain size, porosity and water-holding capacity of soil and affect diversity/population of microbes adversely. Significant changes in permeability, volume, plasticity, etc., are also brought about resulting in poor quality of contaminated soils. Considering the toxicity and global prevalence of PAHs, remediation of contaminated soils has become a challenge. Therefore, it is important to understand the detailed mechanism of physical, chemical or biological changes in soil. Simultaneously, it becomes pertinent to identify the environmentally sustainable treatment options for remediation of contaminated sites. Whereas physical and chemical treatment methods are either cost, chemical, or energy prohibitive, the biological treatment is emerging as an efficient and effective option which employs microorganisms for mitigation. Microorganisms are known for their enzyme-catalyzed catabolic activity when degradation/mineralization of a pollutant is aimed at and can prove useful in degradation of PAHs. Therefore, the present study reviews the effects of PAHs on soil properties, different remediation techniques and the role of microorganisms in remediating contaminated sites.

For details refer to <https://doi.org/10.1007/s13762-019-02414-3>



DR. RAJEEV KUMAR MISHRA
Department of Environmental Engineering

Dr. Rajeev Mishra is working as an Assistant Professor in Department of Environmental Engineering at Delhi Technological University. He did his Ph.D. from IIT Roorkee in 2011. The thrust areas of his research are Environmental Implications of Urban Transport Systems, Air Quality Analysis and Modeling, Traffic Noise Pollution Analysis and Modeling, Knowledge Based Decision Support System, Impact of Urban Transport on Climate Change and Environmental Impact Assessment. Presently, he is supervising 5 Ph.D. and 05 M.Tech. students. 01 Ph.D. Thesis and 13 M.Tech. Dissertations has already been awarded under his guidance. He has published 30 International and 08 National research papers in various reputed journals. He has also presented 36 International and 07 National Conference papers. Dr. Mishra has also written two book chapters published in Springer. Presently, he is working on a project on Ultrafine Particles funded by CPCB. He has reviewed the different research papers of various journals like Environmental Progress and Sustainable Energy (Wiley Publication), Environmental Impact Assessment Review (Elsevier), International Journal of Sustainable Built Environment (Elsevier), Urban Climate (Elsevier) and Ecological Engineering (Elsevier).

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **R. K. Mishra**, A. Pandey, G. Pandey and A. Kumar, “The Effect of Odd-Even Driving Scheme on PM_{2.5} and PM_{1.0} Emission”, *Transportation Research Part D*, vol. 67, pp. 541-552, 2019. Impact Factor: 4.051

The Effect of Odd-Even Driving Scheme On $PM_{2.5}$ and $PM_{1.0}$ Emission

Rajeev Kumar Mishra, Abhinav Pandey, Govind Pandey and Amrit Kumar

Abstract: According to a global survey of 1600 cities by WHO in 2015, Delhi was found to be the most polluted city in the world, highlighting immediate need to bring in appropriate and effective measures to ensure a healthy air quality throughout the city. In a bid to do so, the odd-even driving scheme was implemented a few years ago in Delhi city on a trial basis requiring the vehicles bearing odd and even registration numbers to run on alternative days with effect from 1st January 2016. Applied for the very first time in India and lasting on a pilot basis for 15 days and also referred to as Phase 1 of implementation, the scheme ended on 15th January 2016 with primary goal of assessing the extent to which such a scheme could serve as an effective measure to bring down and control the excessively high ambient air pollution levels. Other associated benefits, which the study considered, were decongestion of city roads, and promoting use of public transport system and carpooling, besides other alternative modes of transport. The paper presents a comparative analysis of particulate matter concentrations recorded before and during the implementation of odd-even scheme of Phase 1 for three key traffic corridors of the city. The study reports an average reduction of $PM_{2.5}$ of 5.73% and that of $PM_{1.0}$ of 4.70% in the ambient air across all the corridors during the days of implementation of scheme, which depicts a small but positive impact of the measure adopted towards abatement of urban air pollution in the megacity of Delhi.

For details refer to <https://doi.org/10.1016/j.trd.2019.01.005>



DR. DINESH KUMAR VISHWAKARMA
Department of Information Technology

Dr. Dinesh Kumar Vishwakarma received the Ph.D. degree in the field of computer vision 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 learning, sentiment analysis, fake news detection, crowd analysis, and human action and activity recognition. He received the research excellence awards from the Delhi Technological University and these awards include Premium Research Award and Commendable Research Award in the year 2017 and 2018 respectively. He is a reviewer of various journals/transactions of the 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
Commendable Research Award	07

1. **D. K. Vishwakarma** and C. Dhiman, “A unified model for human activity recognition using spatial distribution of gradients and difference of Gaussian kernel” *The Visual Computers*, vol. 35, no. 11, pp. 1595–1613, 2019, Impact Factor: 1.415.
2. **D. K. Vishwakarma** and T. Singh, “A Visual Cognizance Based Multi-Resolution Descriptor for Human Action Recognition using Key Pose”, *International Journal of Electronics and Communications*, vol. 107, pp. 513-521, 2019, Impact Factor: 2.853.
3. **D. K. Vishwakarma** and D. Varshney, A. Yadav, “Detection and Veracity analysis of Fake News via Scrapping and Authenticating the Web Search”, *Cognitive Systems Research*, vol. 58, pp. 217-229, 2019. Impact Factor: 1.384.

4. G. Tripathi, K. Singh and **D. K. Vishwakarma**, “Convolutional neural networks for crowd behaviour analysis: a survey” *The Visual Computers*, vol. 35, no. 5, pp. 753-776, May 2019. Impact Factor: 1.415.
5. C. Dhiman and **D. K. Vishwakarma**, “A Robust Framework for Abnormal Human Action Recognition using R-Transform and Zernike Moments in Depth Videos”, *IEEE Sensors Journal*, vol. 19, no. 13, pp. 5195 - 5203, 2019. Impact Factor: 3.076.
6. C. Dhiman and **D. K. Vishwakarma**, “A review of state-of-the-art techniques of Abnormal Human Activity Recognition”, *Engineering Applications of Artificial Intelligence*, vol. 77, pp. 21-45. 2019. Impact Factor: 3.526.
7. T. Singh and **D. K. Vishwakarma**, “Video Benchmarks of Human Action Datasets: A Review”, *Artificial Intelligence Review*, vol. 52, no. 2, pp. 1107–1154, 2019. Impact Factor: 5.095.

A unified model for human activity recognition using spatial distribution of gradients and difference of Gaussian kernel

Dinesh Kumar Vishwakarma and Chhavi Dhiman

Abstract: Understanding of human action and activity from video data is growing field and received rapid importance due to surveillance, security, entertainment and personal logging. In this work, a new hybrid technique is proposed for the description of human action and activity in video sequences. The unified framework endows a robust feature vector wrapping both global and local information strengthening discriminative depiction of action recognition. Initially, entropy-based texture segmentation is used for human silhouette extraction followed by construction of average energy silhouette images (AEIs). AEIs are the 2D binary projection of human silhouette frames of the video sequences, which reduces the feature vector generation time complexity. Spatial Distribution Gradients are computed at different levels of resolution of sub-images of AEI consisting overall shape variations of human silhouette during the activity. Due to scale, rotation and translation invariant properties of STIPs, the vocabulary of DoG-based STIPs are created using vector quantization which is unique for each class of the activity. Extensive experiments are conducted to validate the performance of the proposed approach on four standard benchmarks, i.e., Weizmann, KTH, Ballet Movements, Multi-view IXMAS. Promising results are obtained when compared with the similar state of the arts, demonstrating the robustness of the proposed hybrid feature vector for different types of challenges—illumination, view variations posed by the datasets.

For details refer to <https://doi.org/10.1007/s00371-018-1560-4>

A visual cognizance based multi-resolution descriptor for human action recognition using key pose

Dinesh Kumar Vishwakarma and Tej Singh

Abstract: Human activity recognition using videos sequences is a well-known phenomenon which has many real-life applications such as daily assistive living, security and surveillance, patient monitoring, robotics, and sports analysis. Recently, single or still images based action recognition is becoming very popular due to spatial cues present in an image and required less computation. Hence, a robust framework is constructed by computation of textural and spatial cues of still images at multi-resolution. A fuzzy inference model is used to select the single key image from action video sequences using maximum histogram distance between stacks of frames. To represent, these key pose images the textural traits at various orientations and scales are extracted using Gabor wavelet while shape traits are computed through a multilevel approach called Spatial Edge Distribution of Gradients (SEDGs). Finally, a hybrid model of action descriptor is developed using shape and textural evidence, which is known as Extended Multi-Resolution Features (EMRFs) model. The highest classification accuracy is achieved through SVM classifier on various human action datasets: Weizmann Action (100%), KTH (95.35%), Ballet (92.75%), and UCF YouTube (96.36%). The highest accuracy achieved on these datasets are compared with similar state-of-the-art approaches and EMRFs shows superior performance.

For details refer to <https://doi.org/10.1016/j.aeye.2019.05.023>

Detection and veracity analysis of fake news via scrapping and authenticating the web search

Dinesh Kumar Vishwakarma, Deepika Varshney, and Ashima Yadav

Abstract: Social media has become a part of our day-to-day life and has become one of the significant sources of information. Most of the information available on social media is in the form of images. This has given rise to fake news event distribution, which is misinforming the users. Hence, to tackle this problem, we propose a model which is concerned with the veracity analysis of information on various social media platforms available in the form of images. It involves an algorithm which validates the veracity of image text by exploring it on web and then checking the credibility of the top 15 Google search results by subsequently calculating the reality parameter (Rp), which if exceeds a threshold value, an event is classified as real else fake. In order to test the performance of our proposed approach, we compute the recognition accuracy, and the highest accuracy is compared with similar state-of-the-art models to demonstrate the superior performance of our approach.

For details refer to <https://doi.org/10.1016/j.cogsys.2019.07.004>

Convolutional neural networks for crowd behaviour analysis: a survey⁺

Gaurav Tripathi, Kuldeep Singh and **Dinesh Kumar Vishwakarma***

Abstract: Interest in automatic crowd behaviour analysis has grown considerably in the last few years. Crowd behaviour analysis has become an integral part all over the world for ensuring peaceful event organizations and minimum casualties in the places of public and religious interests. Traditionally, the area of crowd analysis was computed using handcrafted features. However, the real-world images and videos consist of nonlinearity that must be used efficiently for gaining accuracies in the results. As in many other computer vision areas, deep learning-based methods have taken giant strides for obtaining state-of-the-art performance in crowd behaviour analysis. This paper presents a comprehensive survey of current convolution neural network (CNN)-based methods for crowd behaviour analysis. We have also surveyed popular software tools for CNN in the recent years. This survey presents detailed attributes of CNN with special emphasis on optimization methods that have been utilized in CNN-based methods. It also reviews fundamental and innovative methodologies, both conventional and latest methods of CNN, reported in the last few years. We introduce a taxonomy that summarizes important aspects of the CNN for approaching crowd behaviour analysis. Details of the proposed architectures, crowd analysis needs and their respective datasets are reviewed. In addition, we summarize and discuss the main works proposed so far with particular interest on CNNs on how they treat the temporal dimension of data, their highlighting features and opportunities and challenges for future research. To the best of our knowledge, this is a unique survey for crowd behaviour analysis using the CNN. We hope that this survey would become a reference in this ever-evolving field of research.

For details refer to <https://doi.org/10.1007/s00371-018-1499-5>

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+Eligible for Certificate only

A Robust Framework for Abnormal Human Action Recognition Using R-Transform and Zernike Moments in Depth Videos

Chhavi Dhiman and **Dinesh Kumar Vishwakarma**^{**}

Abstract: The aim of the algorithm is to detect the abnormal actions that are more prone to elderly people in order to make them more independent and improve their quality of life. The framework is structured to construct a robust feature vector by computing R-transform and Zernike moments on average energy silhouette images (AESIs). The AESIs are generated by the integral sum of the segmented silhouettes obtained from the Microsoft's Kinect sensor v1. The proposed feature descriptor possesses scale-, translation-, and rotation-invariant properties that are also less sensitive to noise and minimizes data redundancy. It enhances the proposed algorithm's robustness and makes the classification process more efficient. The proposed work is validated on a novel abnormal human action (AbHA) dataset and three publically available 3D datasets- UR fall detection dataset, Kinect Activity Recognition dataset, and multi-view NUCLA dataset. The proposed framework exhibits superior results from other state-of-the-art methods in terms of average recognition accuracy (ARA). The experimental results demonstrate 96.5%, 96.64%, 95.9%, and 86.4% ARA on the UR fall detection dataset, the KARD dataset, the AbHA dataset, and the multi-view NUCLA dataset, respectively.

For details refer to <https://doi.org/10.1109/JSEN.2019.2903645>

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+Eligible for Certificate only

A review of state-of-the-art techniques for abnormal human activity recognition

Chhavi Dhiman and **D. K. Vishwakarma****

Abstract: The concept of intelligent visual identification of abnormal human activity has raised the standards of surveillance systems, situation cognizance, homeland safety and smart environments. However, abnormal human activity is highly diverse in itself due to the aspects such as (a) the fundamental definition of anomaly (b) feature representation of an anomaly, (c) its application, and henceforth (d) the dataset. This paper aims to summarize various existing abnormal human activity recognition (AbHAR) handcrafted and deep approaches with the variation of the type of information available such as two-dimensional or three-dimensional data. Features play a vital role in an excellent performance of an AbHAR system. The proposed literature provides feature designs of abnormal human activity recognition in a video with respect to the context or application such as fall detection, Ambient Assistive Living (AAL), homeland security, surveillance or crowd analysis using RGB, depth and skeletal evidence. The key contributions and limitations of every feature design technique, under each category: 2D and 3D AbHAR, in respective contexts are tabulated that will provide insight of various abnormal action detection approaches. Finally, the paper outlines newly added datasets for AbHAR by the researchers with added complexities for method validations.

For details refer to <https://doi.org/10.1016/j.engappai.2018.08.014>

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+Eligible for Certificate only

Benchmarks of Human Action Datasets: A Review

Tej Singh and **Dinesh Kumar Vishwakarma****

Abstract: Vision-based Human activity recognition is becoming a trendy area of research due to its wide application such as security and surveillance, human-computer interactions, patients monitoring system, and robotics. In the past two decades, there are several publically available human action, and activity datasets are reported based on modalities, view, actors, actions, and applications. The objective of this survey paper is to outline the different types of video datasets and highlights their merits and demerits under practical considerations. Based on the available information inside the dataset, we can categorise these datasets into RGB (Red, Green, and Blue) and RGB-D(depth). The most prominent challenges involved in these datasets are occlusions, illumination variation, view variation, annotation, and fusion of modalities. The key specification of these datasets is discussed such as resolutions, frame rate, actions/actors, background, and application domain. We have also presented the state-of-the-art algorithms in a tabular form that give the best performance on such datasets. In comparison with earlier surveys, our works give a better presentation of datasets on the well-organised comparison, challenges, and latest evaluation technique on existing datasets.

For details refer to <https://doi.org/10.1007/s10462-018-9651-1>

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BIOGRAPHY

MS. RAJNI SETHI

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Rajni Sethi received her B.Tech. degree in Information Technology from Y.M.C.A Institute of Engineering, Faridabad, India in 2009 and M.Tech degree in Information Systems from Delhi Technological University, Delhi, India in 2012. She is pursuing Ph.D. in the field of underwater image processing from Delhi Technological University, Delhi. Her research interests include image processing, color image enhancement, evolutionary computing and soft computing.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **R. Sethi** and I. Sreedevi. "Adaptive enhancement of underwater images using multi-objective PSO." *Multimedia Tools and Applications*, vol. 78, no. 22, pp. 31823-31845. Impact Factor: 2.101

Adaptive enhancement of underwater images using multi-objective PSO

Rajni Sethi and Indu Sreedevi

Abstract: Underwater images have poor clarity and bad contrast due to low illumination in deep water. Moreover, underwater images are bluish-green in appearance due to inherent wavelength absorption property of water. Therefore, the study of underwater images is a difficult task. Being computationally simple, histogram-based enhancement techniques are obvious choice for improvement of contrast and color of underwater images. However, due to lack of any guidance mechanism, these techniques can overstretch the histogram leading to artifacts in the image. Hence, an adaptive method named ‘Contrast and Information Enhancement of Underwater Images’(CIEUI) is proposed, which enhances underwater images by improving their contrast and information content using Multi-Objective Particle Swarm Optimization (MOPSO). Objective functions of MOPSO are chosen to act as guiding mechanism to ensure color & contrast correction and information enhancement respectively without introducing artifacts. Computed results not only have good contrast and color performance but also have better information content. The proposed CIEUI technique performs quantitatively and qualitatively better as compared to state-of-the-art algorithms.

For details refer to <https://doi.org/10.1007/s11042-019-07938-x>



BIOGRAPHY

DR. SEBA SUSAN

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Dr. Seba Susan is an Associate Professor in the Department of Information Technology at Delhi Technological University (DTU). She completed her Bachelors in Technology (B. Tech) in Electronics Engineering from Cochin University of Science & Technology (2002), Masters in Engineering (M.E.) in Electronics & Communication (2008) from the erstwhile Delhi College of Engineering now Delhi Technological University and Ph.D. from Electrical Engineering Department of IIT Delhi (2014). Her research areas are Computer Vision, Data Mining, Speech and Natural Language Processing, Pattern Recognition, Image Processing & Soft Computing with the area of specialization being the use of statistical inferencing tools for Machine Learning and Pattern Recognition. She has published 60 papers in National and International Journals and Conferences. She has a total teaching experience of 17 years and is a Faculty in the Department of Information Technology DTU since July 2010.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	03

1. **S. Susan** and A. Kumar, “SSO_{Maj}-SMOTE-SSO_{Min}: Three-step intelligent pruning of majority and minority samples for learning from imbalanced datasets”, *Applied Soft Computing*, vol. 78, pp. 141-149, 2019. Impact Factor: 4.873.
2. **S. Susan** and J. Keshari, “Finding significant keywords for document databases by two-phase Maximum Entropy Partitioning”, *Pattern Recognition Letters*, vol. 125, pp. 195-205. Impact Factor: 2.810.
3. **S. Susan** and M. Hanmandlu, “Smaller feature subset selection for real-world datasets using a new mutual information with Gaussian gain”, *Multidimensional Systems and Signal Processing* 30, no. 3, pp. 1469-1488, 2019. Impact Factor: 2.338.

SSO_{Maj}-SMOTE-SSO_{Min}: Three-step intelligent pruning of majority and minority samples for learning from imbalanced datasets

Seba Susan and Amitesh Kumar

Abstract: Real world datasets, particularly in the current context of Big Data applications, suffer from the problem of imbalanced representation of samples from different categories. Most classifiers and learning techniques are inept to deal with this problem, with the majority of them tending to overlook the issue. Typical data balancing methods in literature resort to data sampling that constitutes of either undersampling the majority class samples or oversampling the minority class samples. An intelligent combination of undersampling the majority class and oversampling the minority class is expected to improve the learning performance. In this paper, data balancing is achieved prior to classification, through a novel three-step sequence of intelligent undersampling of the majority class followed by the oversampling of the minority class, which is further followed by the intelligent undersampling of the minority class that has now become the majority class due to the oversampling. The recently proposed Sample Subspace Optimization (SSO) that uses Particle Swarm Optimization (PSO) as an intelligent agent to find globally optimum solutions in the search space, is our choice for the intelligent undersampling technique. The oversampling in the second step is achieved through Synthetic Minority Oversampling (SMOTE) as well as intelligent variants such as Borderline SMOTE, ADASYN and MWMOTE. The increase in computational complexity is compensated by the higher performance achieved due to relevant sampling. Experiments on benchmark datasets from the UCI repository establish the efficiency of our three-step approach SSO_{Maj}-SMOTE-SSO_{Min} as observed from the higher AUC scores from the Receiver Operating Characteristics.

For details refer to: <https://doi.org/10.1016/j.asoc.2019.02.028>

Finding significant keywords for document databases by two-phase Maximum Entropy Partitioning

Seba Susan and Juli Keshari

Abstract: This paper investigates the selection of class-specific significant keywords for document databases. We define two types of significant keywords with respect to a document class: Elite and Unique Elite, derived in two phases. Elite Keywords are defined as those that have high term frequencies within the class. To obtain the top partition of distinctively high occurring terms in each class, we employ Maximum Entropy Partitioning (MEP) in the first phase. Our presumption is that the term probabilities within the subset of significant (and non-significant) keywords at the point of maximum entropy are relatively more uniform with respect to each other. Unique Elite keywords are those that are Elite for a particular class, and at the same time have a higher frequency of occurrence only in that class as compared to the other classes. To measure this aspect, in the second phase, we compute the entropy of each Elite keyword across all classes, sort the entropies in the ascending order and again employ MEP to shortlist those Elite keywords that occur uniquely in this class, characterized by distinctively low entropy. Experimental comparisons with the state-of-the-art on benchmark datasets using an ensemble of bagged tree classifiers, establishes the discriminatory powers of the derived keywords.

For details refer to: <https://doi.org/10.1016/j.patrec.2019.04.023>

Smaller feature subset selection for real-world datasets using a new mutual information with Gaussian gain

Seba Susan and Madasu Hanmandlu

Abstract: A new filter method is proposed for feature selection and ranking that incorporates a novel mutual information with Gaussian gain for evaluating the relationships between features and the class, and in-between features. The new mutual information is derived as per the axioms of classical information theory from the recently introduced non-extensive entropy with Gaussian gain. The characteristic of this entropy is its non-linearity when representing correlated information in natural texture images represented by sparse probability distributions. In this work, we trace this property in our new mutual information in the context of correlated random variables associated with real-world datasets. The non-linearity of the Gaussian function embedded in the mutual information formula is utilized for identifying the most important features in the correct order of rank, right at the outset of the incremental feature selection algorithm. This leads to formation of smaller groups of ranked feature subsets that give the highest classification accuracies. Extensive experimentation on twenty benchmark datasets from the UCI repository along with comparison to the state-of-the-art confirms the efficacy of our approach. An automated optimum feature subset selection is also proposed based on a simple statistical test on the new measure.

For details refer to: <https://doi.org/10.1007/s11045-018-0612-2>



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Srishti Vashishtha has received B. Tech degree in Information Technology from Maharaja Surajmal Institute of Technology, GGSIPU, Delhi, M. Tech degree in Computer Science from University school of Information, Communication and Technology, Guru Gobind Singh Indraprastha University(GSIPU) Delhi. She is currently pursuing Ph.D. in Department of Information Technology from Delhi Technological University, Delhi. Her area of interests includes Data Mining, Natural language Processing and Machine Learning.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Vsshishtha** and S. Susan, "Fuzzy rule based unsupervised sentiment analysis from social media posts", *Expert Systems with Applications*, vol. 138, pp. 112834, 2019. Impact Factor: 4.292.

Fuzzy rule based unsupervised sentiment analysis from social media posts

Srishti Vashishtha and Seba Susan

Abstract: In this paper, we compute the sentiment of social media posts using a novel set of fuzzy rules involving multiple lexicons and datasets. The proposed fuzzy system integrates Natural Language Processing techniques and Word Sense Disambiguation using a novel unsupervised nine fuzzy rule based system to classify the post into: positive, negative or neutral sentiment class. We perform a comparative analysis of our method on nine public twitter datasets, three sentiment lexicons, four state-of-the-art approaches for unsupervised Sentiment Analysis and one state-of-the-art method for supervised machine learning. Traditionally, Sentiment Analysis of twitter data is performed using a single lexicon. Our results can give an insight to researchers to choose which lexicon is best for social media. The fusion of fuzzy logic with lexicons for sentiment classification provides a new paradigm in Sentiment Analysis. Our method can be adapted to any lexicon and any dataset (two-class or three-class sentiment). The experiments on benchmark datasets yield higher performance for our approach as compared to the state-of-the-art.

For details refer to <https://doi.org/10.1016/j.eswa.2019.112834>



DR. ANIL KUMAR

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Dr. Anil Kumar is an Associate Professor in Department of Mechanical Engineering, Delhi Technological University, Delhi (India). He did his Ph.D. from Indian Institute of Technology, Delhi (India) in 2007. He has been Assistant Professor in Energy Centre, Maulana Azad National Institute of Technology, Bhopal, India and Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, India. He has more than 14 years of experience in the teaching, and research and development in Design and Development of Solar thermal application, Distribution of energy generation, Clean energy technologies, Heat Transfer in buildings applications, Analysis of energy system through soft computing tools and Natural rubber sheet drying. Previously, Dr. Kumar has also served as the researcher at Energy Technology Research Technology Center, Prince of Songkla University (PSU), Hat Yai, Thailand from 2015-2017. Notably, Dr. Kumar has authored around 175 research papers (112 in International Journal of repute) and 2 patents. He is also author of 8 books (4 national and 4 International editions). His book title “Energy Management: Conservation and Audit” is under publication from CRC, Taylor and Francis. Dr. Kumar is a visiting faculty at various prestigious Institutes and Universities. He has been awarded from “Research Excellence Award 2016”. The researcher has Top 20 Publications from the Web of Science database, honoured by President, Prince of Songkla University, Hat Yai, Thailand. He is editor and member of editorial board of many journal of repute.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. A. K. Dwivedi, **A. Kumar**, P. Baredar and O. Prakash, “Bamboo as a complementary crop to address climate change and livelihoods - Insights from India”, *Forest Policy and Economics*-vol. 102, pp 66–74, 2019. Impact Factor: 3.099.

Bamboo as a complementary crop to address climate change and livelihoods - Insights from India

Arun Kumar Dwivedi, **Anil Kumar***, Prashant Baredara and Om Prakash

Abstract: The government of India has recently amended forest act 1927, whereby Bamboo grown in non-forest areas has been removed from the purview of restrictions on its felling and interstate transportation. The new regulation is aimed to increase the commercialization of Bamboo and help in fulfilling the government's commitment to double farmers' income by 2022. It will boost the interest of farmers and entrepreneurs in cultivation, treatment, and processing of Bamboo, which will not only generate new income avenues but also result in the increased green cover of the country. Bamboo has the potential to generate carbon credits due to high carbon sequestration rates, which can be traded internationally. Farmers can use Bamboo farming in sub-optimal land to generate additional income and improve the fertility of the land. This study is about the 'twofold potential' of Bamboo in improving financial conditions of farmers by utilization of cultivable wasteland and helping in climate change mitigation by avoided deforestation, afforestation, and carbon sequestration. India has approximately 146 million hectares of degraded land. Farmers can earn upto 800 USD per hectare annually by selling raw bamboo from their degraded land. Bamboo cultivation can generate around 10 CERs per hectare annually, which can be traded as carbon credits. Additionally, under-employed farmers can work as skilled workers in bamboo handicraft industry and can earn upto 2700 USD annually at current exchange rates, which is significantly higher than the present average income (1750 USD/annum) of farmers.

For details refer to <https://doi.org/10.1016/j.forpol.2019.02.007>

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Ankit Sonthalia completed his B.Tech in Mechanical Engineering from the VIT, Vellore in the year 2010. He then completed his M.Tech in Automotive Engineering from the VIT, Vellore in collaboration with ARAI Pune in the year 2014. He joined Delhi Technological University as a part-time Research Scholar in 2016. His area of research is production of renewable diesel and its testing in a diesel engine. He has published seventeen scientific research papers in SCI journals. He is a reviewer for several international journals. He is also a member of Society of Automotive Engineers and Institution of Engineers, India.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. Sonthalia** and N. Kumar, “ Hydroprocessed vegetable oil as a fuel for transportation sector: A review”, *Journal of the Energy Institute*, vol. 92, no. 1, pp 1-17, 2019. Impact Factor: 3.774.

Hydroprocessed vegetable oil as a fuel for transportation sector: A review

Ankit Sonthalia and Naveen Kumar

Abstract: Renewable fuels produced from vegetable oils are an attractive alternative to fossil-based fuel. Different type of fuels can be derived from these triglycerides. One of them is biodiesel which is a mono alkyl ester of the vegetable oil. The biodiesel is produced by transesterification of the oil with an alcohol in the presence of a catalyst. Another kind of fuel (which is similar to petroleum-derived diesel) can be produced from the vegetable oil using hydroprocessing technique. This method uses elevated temperature and pressure along with a catalyst to produce a fuel termed as 'renewable diesel'. The fuel produced has properties that are beneficial for the engine as well as the environment. It has high cetane number, low density, excellent cold flow properties and same materials can be used as are used for engine running on petrodiesel. It can effectively reduce NO_x, PM, HC, CO emissions and unregulated emissions as well as greenhouse gases as compared to diesel. The fuel is also beneficial for the after-treatment systems. Trials in the field have shown that the volumetric fuel consumption of renewable diesel is higher than petrodiesel and nearly proportional to the volumetric heating value. The present review focuses on the hydroprocessing technique used for the renewable diesel production and the effect of different parameters such as catalyst, reaction temperature, hydrogen pressure, liquid hourly space velocity (LHSV) and H₂/oil ratio on oil conversion, diesel selectivity, and isomerization. The review also summarizes the effect; renewable diesel has on combustion, performance, and emission characteristics of a compression ignition engine.

For details refer to <https://doi.org/10.1016/j.joei.2017.10.008>



DR. ANUJ KUMAR JAIN

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Dr. Anuj Kumar Jain graduated in Mechanical Engineering from Harcourt Butler Technological Institute (Now Harcourt Butler Technological University), Kanpur in 2004. He obtained his Master's degree in 2007 from M.A.N.I.T., Bhopal and Ph.D from Delhi Technological University, Delhi. He has also worked as Assistant Professor in various reputed colleges / university like The North Cap University, Gurugram, Indraprastha Engineering College, Ghaziabad and Bharat Institute of Technology, Meerut. He has also served in Mawana Sugar Works, Meerut as Mechanical Engineer and Capgemini (I) Pvt. Ltd., Pune as Software Associate. He has presented and published twelve research papers in national and international conferences and journals.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **A. K. Jain**, V. Rastogi and A. K. Agrawal, "Commentary on, "Discussion on 'A novel approach to study the effects of asymmetric stiffness on parametric instabilities of multi-rotor-system' by Jain et al. *Journal of Sound and Vibration* , vol. 413, pp. 159-172"", *Journal of Sound and Vibration*, vol. 448, pp 259 – 264, Feb 2019, Impact Factor: 3.123.



PROF. NAVEEN KUMAR

Department of Mechanical Engineering

Dr. Naveen Kumar is working as a Professor in Department of Mechanical Engineering, Delhi Technological University. 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; internal combustion engines, alternative fuels with special emphasis on biofuels, decentralized energy systems, renewable energy, waste recycling and Sustainable development. Prof. Kumar possesses more than 29 years of experience in academics, industry, and research. He has guided a large number of Ph.D. and M.Tech. Students and has undertaken Sponsored Research Projects from Government and Industrial Houses such as Ministry of New and Renewable Energy, Petroleum Conservation Research Association and Yanmar Co. Ltd., Japan. He had been a principal consultant in a World Bank Sponsored project “Fences for Fuel” in India. He also worked in an Indo-Spanish Collaborative project to develop new and fast methods of biodiesel production. He has published more than 100 research papers in the International Journals of repute and more than 100 in Indian Journals and Conferences.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **N. Kumar** and M. Tomar, “ Influence of nanoadditives on ignition characteristics of Kusum (*Schleichera oleosa*) biodiesel”, *International Journal of Energy Research*, vol. 43, no. 8, pp. 3223-3226, 2019. Impact Factor: 3.343.

Influence of nanoadditives on ignition characteristics of Kusum (*Schleichera oleosa*) biodiesel

Naveen Kumar and Mukul Toma

Abstract: Biodiesel obtained from inedible sources emerged as a productive approach in Indian energy scenario due to the scarcity of food resources come up with extensive usage of edible crops. Kusum (*Schleichera oleosa*) oil is abundantly available in India and can be used as feedstock to produce biodiesel. However, issues such as higher viscosity, poor stability, and lower calorific value result in poor ignition characteristics, hence limiting its use in combustion applications. An improvement in performance and emission characteristics can be achieved by doping nanoparticles in Kusum biodiesel (KBD). The present work examines the impact of a metal compound and carbon-based primarily based nanoparticles on the evaporation time and ignition probability of the KBD. During the experimental process, different fuel samples of KBD were prepared by amalgamating nanoparticles; then, a sequence of hot plate (stainless steel) ignition test was conducted on these test fuels. The comparative assessment of neat biodiesel and the biodiesel fuel doped with 30 ppm each of alumina (Al_2O_3), and multiwalled carbon nanotubes (MWCNTs) nanoparticles were carried out. The Kusum oil was converted to biodiesel using two-stage transesterification process. In the initial stage, refined oil was gone through the acid catalyst esterification process followed by the transesterification reaction. The prepared methyl ester was confirmed and characterized using GC-MS technique. The thermophysical and spray properties of the test fuels including density, viscosity, calorific value, cloud/pour point, Sauter mean diameter (SMD), and specific surface area (SSA) were also calculated. The experimental result showed a significant increase in ignition probability and heat conduction properties due to improved surface area/volume ratio. Also, lower evaporation time was noted for metal/carbon-based nanoparticles doped biodiesel as compared with neat biodiesel

For details refer to <https://doi.org/10.1002/er.4446>

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Dr. Paras Kumar is working as an Assistance Professor in Mechanical Engineering Department, Delhi Technological University, Delhi since 2010 and has 20 years of teaching and research experience. He received his Ph.D. degree from DTU Delhi. He has published 35 research papers in reputed journals and conferences. His research interest includes tribology, machine design, wear modelling and simulation, noise monitoring and modelling.

Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **P. Kumar**, H. Hirani and A. K. Agrawal. "Effect of gear misalignment on contact area: Theoretical and experimental studies." *Measurement*, 132, pp. 359-368, 2019. Impact Factor: 2.791.

Effect of gear misalignment on contact area: Theoretical and experimental studies

Paras Kumar, Harish Hirani and Atul Kumar Agrawal

Abstract: Parallel and angular gear misalignments reduce effective contact area and increase contact stresses, which in turn accelerate gear surface fatigue failure. In the present study, experiments on gear tooth contact area by varying degree and extent of misalignment have been performed. Theoretical model to estimate contact area as a function of misalignment is proposed. A methodology to measure contact area using coordinate measuring machine (CMM) is also discussed. The results of effective contact area obtained from theoretical and experimental studies show good agreement. It is observed that in the case of axial and radial misalignments, the contact patch area reduces linearly in proportion to amount of misalignment while in case of angular misalignment it follows a non-linear behaviour. As far as the angular misalignment is concerned, the contact patch changes from rectangular to quadrilateral and finally to triangular shape depending upon angle of misalignment. At an angular misalignment of 9° , contact patch shifts from quadrilateral to triangular shape. Combined parallel and angular misalignments result in larger reduction in contact area as compared with individual axial, radial and angular misalignment.

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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Agrawal** and R.K. Singh, "Analyzing disposition decisions for sustainable reverse logistics: Triple Bottom Line approach", *Resources, Conservation and Recycling*, vol. 150, pp. 1044-48, 2019. Impact Factor: 7.044.

Analyzing disposition decisions for sustainable reverse logistics: Triple Bottom Line approach

Saurabh Agrawal and Rajesh Kumar Singh

Abstract: In last few decades, circular economy concepts have gained a lot of consideration because of its focus towards sustainability. Reverse logistics play an important role in the adoption and implementation of circular economy concepts in supply chains. It is defined as “sequence of activities required to collect the used product from the customers for their disposition to either reuse or repair or re-manufacture or recycle or dispose of it”. Disposition is one of the crucial decisions which may greatly affect the reverse logistics performance from sustainability perspective. It also plays an important role in improving the operational efficiency of the reverse logistics. The objective of this study is to explore the reverse logistics in context of Indian electronics industry and examine the effect of disposition decisions on Triple Bottom Line (TBL) i.e. economic, environmental, and social performance of reverse logistics. Hypotheses related to disposition decisions and TBL performance was developed. A survey instrument was prepared and was sent to seven hundred organizations from the Indian electronics sector. Over all 208 responses were found suitable for the research. All the necessary statistical analysis was carried out to ensure the reliability and validity of the questionnaire. Partial least square path modelling technique of structural equation modeling has been used for testing the research hypothesis. Measurement model had shown sufficient data fit for the modelling. Partial least square path modelling results reveal that effectiveness of disposition decisions is positively associated with TBL performance. The article contributes to the few studies available on improving the reverse logistics performance. Findings will be useful for managers in managing reverse logistics in effective manner.

For details refer to <https://doi.org/10.1016/j.resconrec.2019.104448>

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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	01

1. **S. Rani**, A. K. Agrawal and V. Rastogi, “Vibrational analysis for detecting failure mode and crack location in first stage gas turbine blade”, *Journal of Mechanical Science and Technology*, vol. 33, no. 1, pp 1-10, 2019. Impact Factor 1.221.

Vibration analysis for detecting failure mode and crack location in first stage gas turbine blade

Sushila Rani, A. K. Agrawal and V. Rastogi

Abstract Structure frequency response testing “modal analysis” is an integral part of the development and testing of structures such as pistons, turbine blades, compressor blades, crankshafts, and connecting rods. The usefulness of this technique lies in the fact that the energy in an impulse input is distributed continuously in the frequency domain. Thus, an impulse force will excite all resonances within given frequency range. To detect a fault in the structure, one may require frequency response functions (FRFs) of structures in both conditions, before (healthy structure) and after (failed structure) fault occurs. Now by extracting modal properties from collected FRFs and by comparing modal properties, one can detect and locate the structural faults. A case study is presented in order to detect failure mode and locate cracks on a 30 MW first stage gas turbine blade made of nickel based super alloy IN738LC, which has failed after rendering a useful life of 72000 h. The root causes of failure are detected by comparing the failed blade experimental model with the failed blade computational model. It is observed that the frequencies of the real failed blade experimental model are lesser than the computational model of the failed turbine blade. This is due to the metallurgical defects, which result in loosening of stiffness at the leading and trailing edges of the blade. Further, the stress concentration areas noticed on leading and trailing edges in computational model of the failed blade at the sixth mode are well corroborated with the cracked zone seen on leading and trailing edges of a real case failed turbine blade, collected from the site. It is concluded that the blade has failed due to that the resonance at sixth modal frequency. Scanning electron microscope (SEM) images reveal the presence of corrosion pits on the surfaces of the turbine blade that lead to surface degradation, which results in crack initiation and its propagation with high-cycle fatigue. It is concluded that the failure of turbine blade occurs due to high cycle fatigue.

For details refer to <https://doi.org/10.1007/s12206-018-1201-x>

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Award Summary & Publications Details

Category Title	No. of Publications
Commendable Research Award	02

1. **R. Sharma**, “Breast cancer incidence, mortality and mortality-to-incidence ratio (MIR) are associated with human development 1990–2016: evidence from Global Burden of Disease Study 2016”, *Breast Cancer*, vol. 26, no. 4, pp. 428-445. Impact Factor: 2.044.
2. **R. Sharma**, “The burden of prostate cancer is associated with human development index: evidence from 87 countries, 1990–2016”, *EPMA Journal*, vol. 10, pp. 137-152, 2019. Impact Factor: 4.661

Breast cancer incidence, mortality and mortality-to-incidence ratio (MIR) are associated with human development, 1990–2016: evidence from Global Burden of Disease Study 2016

Rajesh Sharma

Abstract: Objective To examine breast cancer burden in females using incidence, mortality and mortality-to-incidence ratio (MIR) and its association with human development.

Methods We employ the data of breast cancer in females from the Global Burden of Disease 2016 study for the period 1990 to 2016 for 102 countries. Human development is measured using the human development index (HDI). 5-year survival rate of breast cancer is proxied using the mortality-to-incidence ratio (MIR).

Findings Globally, breast cancer has claimed 535341 female lives and 1.7 million incident cases had surfaced in 2016. High incidence rates were observed in very high HDI countries led by the Netherlands (117.2/100,000), whereas the mortality rate was high in low/medium HDI countries led by Afghanistan (35.4/100,000). Breast cancer incidence has more than doubled in 60/102 countries, whereas deaths have doubled in 43/102 countries. Globally, breast cancer MIR decreased from 0.41 to 0.32 over 1990–2016 and displayed negative gradient with HDI ($r = -0.87$), indicating a low 5-year survival in less developed countries.

Conclusion Heterogeneity in breast cancer burden, as per human development, and increasing breast cancer incidence and low survival rates, indicated by MIR, call for broader human development, improving breast cancer awareness, and cost-effective screening and treatment in less developed countries.

For details refer to <https://doi.org/10.1007/s12282-018-00941-4>

The burden of prostate cancer is associated with human development index: evidence from 87 countries, 1990–2016

Rajesh Sharma

Abstract: Aim To examine the temporal patterns of the prostate cancer burden and its association with human development.

Subject and Methods: The estimates of the incidence and mortality of prostate cancer for 87 countries were obtained from the Global Burden of Disease 2016 study for the period 1990 to 2016. The human development level of a country was measured using its human development index (HDI): a summary indicator of health, education, and income. The association between the burden of prostate cancer and the human development index (HDI) was measured using pairwise correlation and bivariate regression. Mortality-to-incidence ratio (MIR) was employed as a proxy for the survival rate of prostate cancer.

Results: Globally, 1.4 million new cases of prostate cancer arose in 2016 claiming 380,916 lives which more than doubled from 579,457 incident cases and 191,687 deaths in 1990. In 2016, the age-standardised incidence rate (ASIR) was the highest in very high-HDI countries led by Australia with ASIR of 174.1/100,000 and showed a strong positive association with HDI ($r = 0.66$); the age-standardised mortality rate (ASMR), however, was higher in low-HDI countries led by Zimbabwe with ASMR of 78.2/ 100,000 in 2016. Global MIR decreased from 0.33 in 1990 to 0.26 in 2016. Mortality-to-incidence ratio (MIR) exhibited a negative gradient ($r = -0.91$) with human development index with tenfold variation globally with seven countries recording MIR in excess of 1 with the USA recording the minimum MIR of 0.10.

Conclusion: The high mortality and lower survival rates in less-developed countries demand all-inclusive solutions ranging from cost-effective early screening and detection to cost-effective cancer treatment. In tackling the rising burden of prostate cancer predictive, preventive and personalised medicine (PPPM) can play a useful role through prevention strategies, predicting PCa more precisely and accurately using a multiomic approach and risk-stratifying patients to provide personalised medicine.

For details refer to <https://doi.org/10.1007/s13167-019-00169-y>

PATENT INVERTOR'S PROFILES



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Mr. S. K. Agrawal currently pursuing 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.



DR. KAPIL SHARMA

Dr. Kapil Sharma is IEEE senior member and head of Information Technology Department, Delhi Technological University, Delhi, India. He was born in Haryana, India. In 2011, he has completed Doctors Degree in Computer Science and Engineering under the Faculty of Engineering and Technology at the M. D. University, Rohtak (Haryana), India. He has obtained his Bachelor of Engineering and Master of Technology Degrees in Computer Science & Engineering and Information Technology. He has published various research papers in international conferences and journals in the domain of mobile communications, cyber security and machine learning along with several national and international patents.

Beam forming method for a transmitting antenna and a device thereof US10326508

Sachin Kumar Agrawal and Kapil Sharma

Abstract: A method and a device for beam forming in cellular communication systems are provided. The method includes creating a virtual three-dimensional shape around the transmitting antenna, selecting at least one face from among 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 among the one or more grids as an optimum grid set based on a second set of parameters, and forming at least one beam based on the at least one grid.



US010326508B2

(12) **United States Patent**
Agrawal et al.

(10) **Patent No.:** US 10,326,508 B2

(45) **Date of Patent:** Jun. 18, 2019

(54) **BEAM FORMING METHOD FOR A TRANSMITTING ANTENNA AND A DEVICE THEREOF**

7/0802 (2013.01); H04B 7/0456 (2013.01);
H04L 5/0026 (2013.01); H04L 5/0048
(2013.01)

(71) Applicants: **Samsung Electronics Co., Ltd.**,
Suwon-si, Gyeonggi-do (KR); **DELHI TECHNOLOGICAL UNIVERSITY**,
New Delhi (IN)

(58) **Field of Classification Search**
USPC 375/267
See application file for complete search history.

(72) Inventors: **Sachin Kumar Agrawal**, Ghaziabad (IN); **Kapil Sharma**, Delhi (IN)

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(73) Assignees: **Samsung Electronics Co., Ltd.**,
Suwon-si (KR); **Delhi Technological University**, New Delhi (IN)

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 15/975,162

(22) Filed: May 9, 2018

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(65) **Prior Publication Data**

Primary Examiner — Eva Y Puente

(74) Attorney, Agent, or Firm — Jefferson IP Law, LLP

For details refer to <https://patents.google.com/patent/US10326508B2/en?q=US10326508>

Beam forming method for a transmitting antenna and a device thereof US10454553

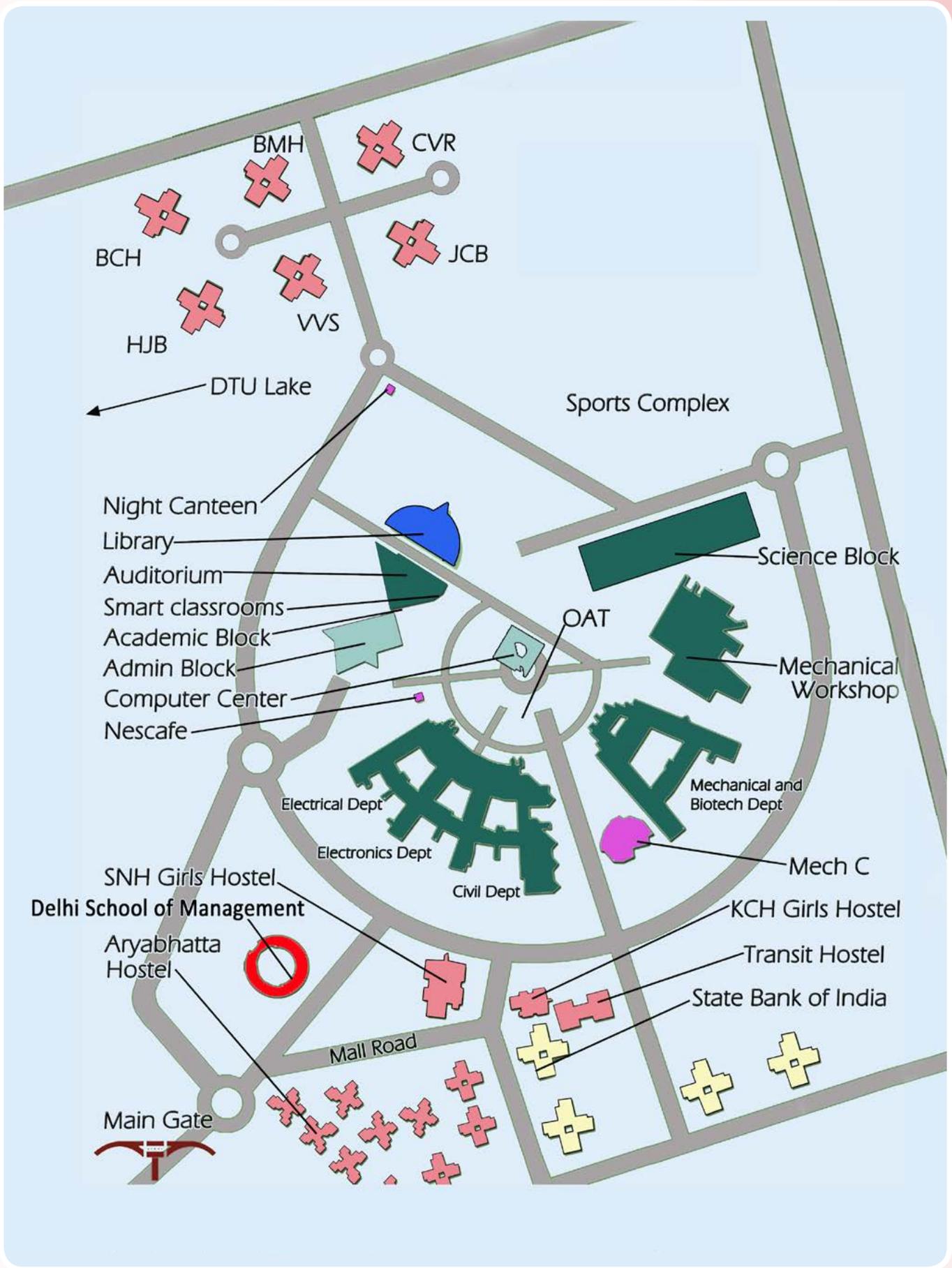
Sachin Kumar Agrawal and Kapil Sharma

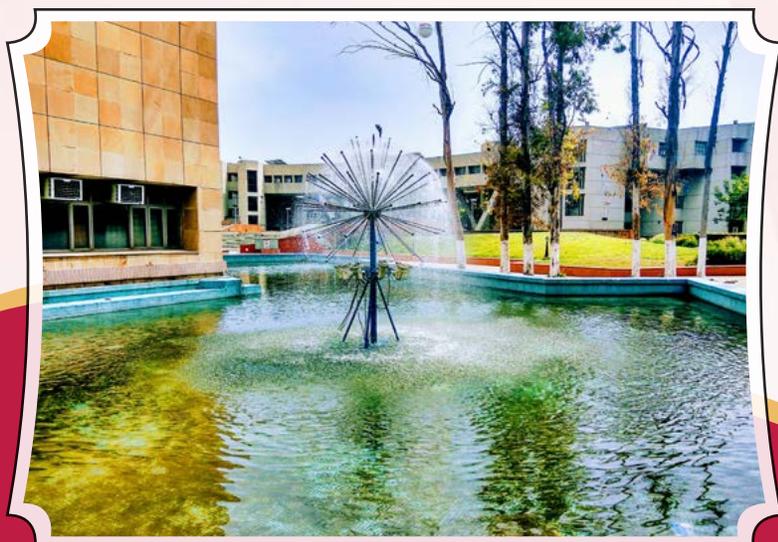
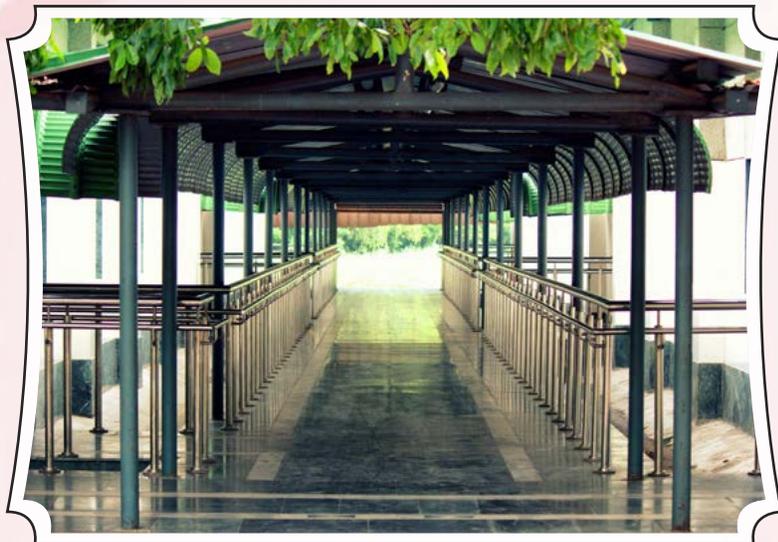
Abstract: The disclosure relates to method and device for beam forming in cellular communication systems. In accordance with one embodiment, the device selects at least one obstruction free zone and at least one obstruction free beam window, the at least one obstruction free beam window being selected within the at least one obstruction free zone. The device forms at least one beam based on said at least one obstruction free beam window thus selected.



(12) United States Patent Agrawal et al.	(10) Patent No.: US 10,454,553 B2
	(45) Date of Patent: Oct. 22, 2019
(54) BEAM FORMING METHOD FOR A TRANSMITTING ANTENNA AND A DEVICE THEREOF	(58) Field of Classification Search CPC H04B 7/0617; G01S 13/06; H04L 43/16; H04W 84/042; H04W 88/08 USPC 375/267 See application file for complete search history.
(71) Applicants: Samsung Electronics Co., Ltd. , Suwon-si (KR); Delhi Technological University , Delhi (IN)	(56) References Cited U.S. PATENT DOCUMENTS 6,369,756 B1 4/2002 Wang et al. 6,453,177 B1 * 9/2002 Wong H01Q 1/246 455/450 7,782,251 B2 8/2010 Bishop et al. 8,040,278 B2 * 10/2011 Maltsev H01Q 3/2605 342/378 9,246,216 B2 * 1/2016 Harel H04B 7/0404 (Continued)
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(73) Assignees: Samsung Electronics Co., Ltd. , Suwon-si (KR); Delhi Technological University , Delhi (IN)	(Continued)
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 10 days.	
(21) Appl. No.: 15/909,546	
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(30) Foreign Application Priority Data	

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