Dayananda Sagar University Bengaluru

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# ಸಂಶೋಧನಾ ಸಾಗರ

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# Samshodhana Sagara

2022 - 2023

Book of Research Abstracts
ಸಂಶೋಧನಾ ಸಾರಾಂಶದ ಪುಸ್ತಕ

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# *Dedications*

## *Founders who crafted our Institutions*

**Late Shri. R. Dayananda Sagar**

Dayananda Sagar Institution is named in honour of its founder president Late Shri R Dayananda Sagar. He was a great, confident leader who saw no reason why, as an Indian, he could not provide education for all sections of society. Best known for his pivotal role in setting up the Mahatma Gandhi Vidya Peetha Education Trust (MGVP), Late Shri R Dayananda Sagar also played an important role in the education sector of the emerging India.

**Late Smt. Chandramma Sagar**

Wife of the founder, Late Smt Chandramma Sagar was a Doctor by profession - a Triple FRCS from London, Edinburgh and Glasgow. She was in the panel of Doctors for the President of India.

## *Editorial Committee*

# *Message from the Hon. Chancellor*

Dayananda Sagar University (DSU) continues to pursue the spirit of facilitating human excellence through higher education and its consistent efforts have been recognized many times earlier and which also continued in 2022-2023 with the Times Business Awards as the Best Emerging University.

This year, at the 7th Convocation of the University, the Third batch of doctoral scholars who have successfully cleared the requirements for the award of doctorate degrees were conferred their degrees. The research and consultancy endeavor of DSU continues with its focus on funded research projects with grants from Central & State Government organizations, consultancies in collaboration with various companies, patent applications and research publications done in National/International Journals & Conferences.

**Samshodhana Sagara 2022-23**, the Book of Research Abstracts compiles the research conducted and published by the faculty members, research scholars and students at DSU during the last Academic year. The research culture of DSU encourages all to continue their passoniate and intellectual efforts to contribute to the enhancement of knowledge in their respective domains.

All the Best!

Dr. D. Hemachandra Sagar
Chancellor – Dayananda Sagar University

## *Message from the Hon. Pro Chancellor*

At Dayananda Sagar University (DSU) we are committed to the focus on research and generating intellectual patents, by upholding the highest standards of research ethics. Research focus enables the creation of knowledge and influence the expansion of the body of knowledge for the sustainable welfare of humanity, environment and the planet. Importance of knowledge creation necessitates the creation & utilization of suitable resources that facilitates conduct of research in the most appropriate manner. DSU is proud to award doctorate degrees to its Third batch of research scholars in the year 2022 and the awardees received their degrees at the 6$^{th}$ Convocation of the University.

Along with the conduct of research, the dissemination of research outcomes, undertaken with utmost care and focus on upholding the highest standards of ethics, is necessary to ensure that knowledge creation initiated in a domain can motivate further developments by researchers whose intellectual curiosity encourages them to develop, extend and pursue novel ideas, discover and explore new research aspects while simultaneously working on collaborative & funding opportunities for the conduct of suitable interdisciplinary and multidisciplinary research that benefit all nationally and internationally. Our annual publication of '**Samshodhana Sagara 2022-2023'** is an

Effort in the direction towards highlighting and disseminating the research endeavors of our University Faculty members, researchers and students.

Accreditation & Global rankings for Universities and Higher Educational Institutions mandate monitoring various research output parameters along with teaching and learning outcomes. The present edition of ‘**Samshodhana Sagara 2022-2023’,** DSU’s annual publication of the Book of Abstracts, is a compilation of the research work done during the period August 01, 2022 to July 31, 2023. This edition also showcases the IPs generated by our faculty members and research scholars during the period.

Dr. D. Premachandra Sagar

Pro Chancellor –Dayananda Sagar University

## *Message from the Hon. Vice Chancellor*

At the outset I would like to take this opportunity to thank the BOG, BOM, AC, RIC and FC of Dayananda Sagar University (DSU) for their support and guidance in our continuous endeavor to create excellence at the University. We would like to gratefully acknowledge theencouragement and support received from Dr. D. Hemachandra Sagar (Hon'ble Chancellor of DSU and Chairman of MGVPT) and Dr. D. Premachandra Sagar (Hon'ble Pro Chancellor ofDSU and Vice Chairman of MGVPT), Ms. Tintisha Sagar (BOG member and Joint Secretary of MGVPT), Mr. Rohan Sagar (BOG member and Joint Secretary of MGVPT), Mr. Galiswamy (Secretary of MGVPT), Prof. H.P.Khincha (DSU Evangelist) and Mr. K. Jairaj (DSU Advisor andFormer Additional Chief Secretary of GOK) in achieving this success.

Dayananda Sagar University (DSU), established by Mahatma Gandhi Vidya Peetha (MGVP) Trust under Karnataka Act No 20 of 2013, is a State Private University that started its programs of study from the academic year 2015-16. DSU is being mentored and nurtured by its visionary Hon'ble Chancellor Dr. Hemachandra Sagar and proactive Hon'ble Pro Chancellor Dr. Premachandra Sagar who both are highly qualified. DSU offers UG and PG in addition to PhD programs at present in the areas of Engineering, Commerce, Management, Applied Science, Health Science and Arts as well as Humanities. Offering high quality education to the students by providing world-class infrastructure, industry partnered innovation labs, qualified faculty, employability-oriented curriculum and ample opportunities for learning to become competent professionals in their fields of specialization has been the tradition of DSU.

DSU encourages research among its faculty and students by providing the requisite support in creating high-end research facilities, providing research seed grant, supporting conference travel, organizing conferences, and the filing of patents

DSU has been bringing out a book of research activities (named as **"Samshodhana Sagara"**) to record the research achievements. This book contains the research accomplishments of Academic Year i.e., August 01, 2022 to July 31, 2023. The year has been a moderately good year for DSU as it could accomplish 198 International Journal publications, 70 International and 02 national Conference papers, 20 books & book chapters, securing 67 patents,working on 07 sponsored projects and 07 consulting & Corporate training assignments. We have recorded all theseaccomplishments in '**Samshodhana Sagara 2022-2023'** and determined to achieve higherquality research accomplishments in the years to come to ensure a unique position for DSU in higher education sector of the country.

I am delighted, as Vice-Chancellor of DSU, to place before you all the edition of '**Samshodhana Sagara 2022-2023'.** We remain highly obliged, as ever, to receive your valuable feedback and inputs for scaling up the high-quality research activities at DSU.

Dr. Amit R Bhatt,
Vice Chancellor - Dayananda Sagar University

## *Foreword by the Registrar*

All our efforts are especially dedicated to our respected and beloved Founders, Late Shri R Dayananda Sagar and Late Smt. Dr. Chandramma Sagar. We are also thankful to the Management of DSU for their continuous support and guidance. As a University we remain strongly committed to the spirit of facilitating human excellence through higher education and conduct of research upholding the highest standards of research ethics for the benefit of all stakeholders. This year during DSU's 6$^{th}$ Convocation, the Third batch of doctoral scholars who have successfully defended their Ph. D Thesis and Viva-Voce received their degrees.

Dayananda Sagar University (DSU) remains strongly committed to the focus on research and our annual publication, '**Samshodhana Sagara 2022-2023',** is a compilation of the abstracts of research publications, patents, on-going funded projects and consultancy assignments that have been done by the Faculty Members and Research Scholars at DSU during the period of 1$^{st}$ August'2022 to 31$^{st}$ July'2023.

The present edition of '**Samshodhana Sagara 2022-2023'** highlights **290** abstracts of publications and sixty-Seven that resulted from the research work conducted by our Faculty Members and Research Scholars belonging to different Schools of DSU i.e. the School of Engineering , School of Basic & Applied Sciences, School of Allied Health Sciences, School of Medicine, School of Commerce and Management, School of Arts, Design & Humanities which were successfully published in various reputed International & National Journals, presented at various International & National Conferences, selected as Book Chapters & accepted for Patents. The book also lists Seven on-going funded projects & Seven consultancies& training assignments of DSU.

‘**Samshodhana Sagara 2022-2023’** thus celebrates the annual research related accomplishments of the University’s Faculty and Research Scholars.

Dr. Puttamadappa C,

Registrar-Dayananda Sagar University

## *From the Editorial Board*

This Edition of '**Samshodhana Sagara 2022-23'** is dedicated to Late Barrister Shri R. Dayananda Sagar and his better half, Late Smt. Dr. Chandramma Sagar, triple FRCS from London, Edinburg and Glasgow, the founders of Mahatma Gandhi Vidya Peetha Trust, on the eve of Centenary Celebrations of Late Barrister Shri R. Dayananda Sagar. We take this opportunity to thank, Dr. D Hemachandra Sagar, the Chancellor and Dr. D Premachandra Sagar, Pro-Chancellor who have been very supportive in bringing out this Edition and approving the same. Our sincere thanks are due to Prof. K N Balasubramanya Murthy, our Hon. Vice Chancellor who insists on only quality publication without exception and his encouragement in every stage of bringing out this Edition. We also thank Prof. R. Janardhan, the Pro Vice Chancellor for his constent help in this initiative. We thankprofusely Prof. Puttamadappa C, the Registrar, for his constant support in various initiativestaken up by the Research Cell.

It gives me immense gratification to release the 8th Edition of '**Samshodhana Sagara 2022-23'**, the collection of research publications, patents and the research abstracts at various conference proceedings in International and National conferences during the Academic Year 2022-2023. We have attempted to include only such publications which are published in peer reviewed and refreed journals. Books and Book chapters published by the faculty members in International Publications are also made part of 'Samshodhana Sagara'. This collection also provides the list of Research projects which are funded by DST, SERB/DST, DBT, GST, VGST, Dassault Systems - La foundation and other funding agencies. There are 198 International Journal publications, 70 International and 02 national Conference papers, 20 books & book chapters, securing 67 patents, working on 07 sponsored projects and 07 consulting Consultancy & Training assignments for the year.

I thank all my colleagues in the Editorial Board from various Departments, Colleges and Schools who have helped us in editing this collection and bringing out this Edition. We sincerely hope that more quality publications are accomplished by our faculty members and research scholars in the years ahead.

We will be thankful for any feedbacks and suggestions for improving the quality and look and feel of 'Samshodhana Sagara' in the future.

Dr. M K Banga,
Dean Research - Dayananda Sagar University.

For Editorial Board.

# CONTENTS

# I n d e x

## Department
## of
## Chemistry
## School of Engineering

## INTERNATIONAL JOURNAL PUBLICATIONS

| ID | Author(s) | Title of the Paper | Publication Details | Page No. |
|---|---|---|---|---|
| CHIJ-01 | Uma, B., Anantharaju, K.S., Surendra, B.S., Gurushantha, K., More, S.S., Meena, S., Hemavathi, B., Murthy, H.C.A. | Influence of Ag on the Structural, Electrochemical, Antibacterial, and Photocatalytic Performance of the (CuO-Cu2O) Cu Nanocomposite | ACS Omega - American Chemical Society, 24701343 (ISSN), DOI - 10.1021/acsomega.2c07124, Volume-8, Page No -9947-9961, Year-(2023) | 64 |
| CHIJ-02 | Mamatha, K.M., Srinivasa Murthy, V., Ravikumar, C.R., Murthy, H.C.A., Alam, M.W., Vinutha, K., Jahagirdar, A.A. | Lanthanum oxide nanoparticles as chemical sensor for direct detection of carboxymethyl cellulose in eye drops | Inorganic and Nano-Metal Chemistry- Taylor and Francis Ltd, 24701556 (ISSN), DOI-10.1080/24701556.2022.2055575, Volume 53, Pages 295-301 Year-(2023) | 65 |
| CHIJ-03 | Rikhari, B., Saranya, K., Kalaiyarasan, M., Rahaman, M., Periyasami, G., Pandiaraj, S., Thiruvengadam, M., Pugalmani, S., Rajakumar, G. | Bioactive conductive polymer-coated titanium to support osseointegration | Biomass Conversion and Biorefinery- Springer Science and Business Media Deutschland GmbH, 21906815 (ISSN), DOI-10.1007/s13399-023-04712-w, (2023) | 66 |
| CHIJ-04 | Prasad Nayak, S., Swarnkar, N., Kiran Kumar, J.K. | Eco-friendly synthesis of reduced graphene oxide as sustainable catalyst for photodegradation of methylene blue | Inorganic Chemistry Communications- Elsevier B.V., 13877003 (ISSN), DOI-10.1016/j.inoche.2023.111792, Volume 159, (2024) | 67 |
| CHIJ-05 | Chalapathi, U., Reddy, A.S., Prasad, P.R., Manjula, G., Sangaraju, S., Cheruku, R., Al-Asbahi, B.A., Alhammadi, S., Reddy, C.P., Mohanarangam, K., Reddy, B.P., Park, S.-H. | Two-stage-processed AgSbS2 films for thin-film solar cells | Materials Science in Semiconductor Processing- Elsevier Ltd, 13698001 (ISSN), DOI-10.1016/j.mssp.2023.107821, Volume-168, (2023``) | 68 |

| | | | | |
|---|---|---|---|---|
| CHIJ-06 | Shwetha, J.C., Sharma, A., Solomon, K.A. | Molecular salts of pipemedic acid and crystal structure, spectral properties, and Hirshfeld surface analysis | Journal of the Iranian Chemical Society- Springer Science and Business Media Deutschland GmbH, 1735207X (ISSN), DOI- 10.1007/s13738-023-02905-8, Volume 20, Pages 3161-3176, (2023) | 69 |
| CHIJ-07 | Mamatha, K.M., Srinivasa Murthy, V., Thammanna, B.M., Naveen Kumar, T., Jahagirdar, A.A., Naveen Kumar, A., Muniyappa, M., Ravikumar, C.R., Ananda Murthy, H.C. | Electrochemical sensor of carboxymethyl cellulose and photocatalytic degradation of NavyBlue dye by sonochemically synthesized Titanium oxide nanoparticles | Sensors International- KeAi Communications Co, ISBN: 26663511 (ISSN), DOI: 10.1016/j.sintl.2023.100239, Volume-4, (2023) | 70 |
| CHIJ-08 | Shruthi, M., Ashoka, S., Yogesh, K., Jeong, H.-H., Uthappa, U.T., Selvaraj, M., Kiran, G.K. | Influence of FeVO4 crystallinity on oxygen evolution reaction activity | Ceramics International- Elsevier Ltd, ISBN: 02728842 (ISSN), DOI: 10.1016/j.ceramint.2023.11.082, Pages-3366-3372, Volume-50, (2024) | 71 |
| CHIJ-09 | Shruthi, M., Kiran, G.K., Nishchith, B.S., Ashoka, S., Yogesh, K., Yoo, K., Kim, J. | Fabrication of surface etched NiFe2O4-NiSe2 nanocomposite as an efficient electrocatalyst for oxygen evolution reaction | Inorganic Chemistry Communications- Elsevier B.V., ISBN: 13877003 (ISSN), DOI: 10.1016/j.inoche. 2023.110508, Volume-150, (2023) | 72 |
| CHIJ-10 | sharma, A., Ashoka, S., Nishchith, B.S., Kalegowda, Y. | Electrochemical quantification of glycine using amorphous iron vanadate nanoparticles modified pencil electrode | Inorganic Chemistry Communications- Elsevier B.V., ISBN: 13877003 (ISSN), DOI: 10.1016/j.inoche.2023.110766, Volume-153, (2023) | 73 |
| CHIJ-11 | Praveen, S.K., Jayaprakash, G.K., Abbas, M., Rikhari, B., Kalikeri, S. | Some progress in developing electrochemical sensors for detection of 2,4-dichlorophenoxyacetic acid based on modified carbon interfaces: a brief review | International Association of Physical Chemists- Journal of Electrochemical Science and Engineering, ISBN: 18479286 (ISSN), DOI: 10.5599/jese.2028, Volume 13, Pages- 923-936, (2023) | 74 |
| CHIJ-12 | G.N. Karthammaiah<br>Rao Amaraneni<br>A.K. Solomon | Co-crystal of nadifloxacin with oxalic acid | Acta Crystallographica Section E: Crystallographic Communications- International Union of Crystallography, ISBN: 20569890 (ISSN), DOI: 10.1107/S2056989023002244, Volume-79, Pages-319-322, (2023) | 75 |

| | | | | |
|---|---|---|---|---|
| CHIJ-13 | Natarajan Sathiyamoorthy<br>A. Suvitha<br>Abdul Rahim<br>R. Sahara | Intermolecular hydrogen bond interactions in water clusters of zwitterionic glycine: DFT, MESP, AIM, RDG, and molecular dynamics analysis | Journal of Molecular Liquids- Elsevier B.V., ISBN- 01677322 (ISSN), DOI- 10.1016/j.molliq.2023.123932, Volume-396, (2024) | 76 |
| CHIJ-14 | B. Dhanalakshmi<br>B.M. Kumar<br>Muddenahalli Srinivasa<br>H.K. Vivek<br>M. Sennappan<br>S. Rangappa<br>Srinivasa Murthy | Design and synthesis of 4-aminophenol-1,3,4-oxadiazole derivative potentiates apoptosis by targeting MAP kinase in triple negative breast cancer cells | Journal of Biomolecular Structure and Dynamics- Taylor and Francis Ltd., ISBN: 07391102 (ISSN), DOI: 10.1080/07391102.2023.2274973, (2023) | 77 |
| CHIJ-15 | B. Dhanalakshmi<br>B.M. Kumar<br>Srinivasa Murthy<br>S.M. Srinivasa<br>H.K. Vivek<br>M. Sennappan<br>S. Rangappa | Design, synthesis and docking studies of novel 4-aminophenol-1,2,4-oxadiazole hybrids as apoptosis inducers against triple negative breast cancer cells targeting MAP kinase | Journal of Biomolecular Structure and Dynamics- Taylor and Francis Ltd., ISBN: 07391102 (ISSN), DOI- 10.1080/07391102.2023.2239912, (2023) | 78 |
| CHIJ-16 | P. Sagar<br>N.S. Kumar<br>L. Shreenivasa<br>N. Srinivasa<br>D. De<br>R.T. Yogeeshwari<br>A. Siddaramanna | Citric acid assisted one-pot approach to synthesize CuO, CuO/Cu2O, Cu/Cu2O, and metallic Cu: potential electrocatalyst for enhanced OER | Ionics- Springer Science and Business Media Deutschland GmbH, ISBN: 09477047 (ISSN), DOI: 10.1007/s11581-022-04851-6, Pages: 711-719, Volume-29, (2023) | 79 |

## INTERNATIONAL BOOK CHAPTERS

| ID | Author(s) | Title of the Paper | Publication Details | Page No. |
|---|---|---|---|---|
| CHIIN B-01 | Waghmare, K., Malhotra, M. | Mental Health Disorder through Electroencephalogram Analysis using Computational Model | CRC Press, ISBN: 978-100383627-8;978-103241915-2, DOI: 10.1201/9781003363361-12, Pages 207-225 (2024) | 80 |
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| | | | | |
|---|---|---|---|---|
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| CHIIN B-04 | S. Baranidharan<br>Vasani Sankarkumar<br>G. Chandrakala<br>R. Narayanan<br>K. Sathyanarayana | The role of social media in empowering digital financial literacy | Global Perspectives on Social Media Usage Within Governments- IGI Global, ISBN: 9781668474518 (ISBN); 9781668474501 (ISBN), DOI-10.4018/978-1-6684-7450-1.ch006, pages- 80-96, (2023) | 83 |
| CHIIN B-05 | Krishna Sowjanya, K., Mouleeswaran, S.K. | Load Balancing Algorithms in Cloud Computing | Cognitive Science and Technology-Springer, ISBN: 21953988 (ISSN), DOI-10.1007/978-981-19-2358-6_45, page- 483-493, (2023) | 84 |
| CHIIN B-06 | Kumar, A., Rajesh, T.M., Ramachandran, M., Gupta, D | Role of Explainable Edge AI to Resolve Real Time Problem | Studies in Computational Intelligence- Springer Science and Business Media Deutschland GmbH, ISBN: 1860949X (ISSN), DOI-10.1007/978-3-031-18292-1_7, Volume-1072, Page- 101-116, (2023) | 85 |
| CHIIC-01 | Vibha, T.G., Sivaramakrishnan, S. | A Survey of Deep Learning Region Proposal and Background Recognition Techniques for Moving Object Detection | Lecture Notes on Data Engineering and Communications Technologies- Springer Science and Business Media Deutschland GmbH, ISBN- 23674512 (ISSN), DOI-10.1007/978-981-19-3035-5_12, Volume 141, Pages-147-164, (2023) | 86 |

# Index

## Department of Mathematics School of Engineering

### INTERNATIONAL JOURNAL PUBLICATIONS

| ID | Author(s) | Title of the Paper | Publication Details | PageNo. |
|---|---|---|---|---|
| MATIJ-01 | Dutta, R., Das, S., Bhengra, N., Vishwakarma, S.K., Das, S.K. | Nonlocal effect on shear wave propagation in a fiber-reinforced poroelastic layered structure subjected to interfacial impulsive disturbance | Soil Dynamics and Earthquake Engineering- Elsevier Ltd, ISSN: 02677261 (ISSN), DOI: 10.1016/j.soildyn.2023.108307, Volume-176, (2024) | 88 |
| MATIJ-02 | Kumar, U.V., Saha, S., Koley, S | A comparative study of wave scattering by non-porous and porous flexible plates in the presence of a submerged porous structure | Meccanica- Springer Science and Business Media B.V., ISBN: 00256455 (ISSN), DOI-10.1007/s11012-023-01679-w, Volume 58, page-1329-1346, (2023) | 89 |
| MATIJ-03 | Narendra, V.H., Usha, A., Shanmukha, M.C., Mahalakshmi, P., Deepika, T | Computing molecular descriptors of chitosan derivatives and its M-polynomial expressions | Journal of Medicinal and Pharmaceutical Chemistry Research- Sami Publishing Company, ISBN: 29810221 (ISSN), DOI-10.48309/jmpcr.2023.178536, Volume 5, Pages- 953-968, (2023) | 90 |
| MATIJ-04 | Shankar Narayan, S., Saha, S., Bhattacharjee, A., Khan, M.I., Zouidi, F., Eldin, S.M. | Assessing the impact of hyperviscosity on stenosis shape in COVID patients | Ain Shams Engineering Journal- Ain Shams University, ISBN; 20904479 (ISSN), DOI-10.1016/j.asej.2023.102227, Volume-14, (2023) | 91 |

| | | | | |
|---|---|---|---|---|
| MATIJ-05 | Radha, R., Singh, R.K., Singh, M.K. | Pollutant dispersion with an intermediate source in a semi-infinite aquifer | Modeling Earth Systems and Environment- Springer Science and Business Media Deutschland GmbH, ISBN; 23636203 (ISSN), DOI10.1007/s40808-023-01827-x, Volume-10. Pages-1077-1093, (2024) | 92 |
| MATIJ-06 | Shankar Narayan, S., Bhattacharjee, A., Saha, S. | CFD analysis of the hyper-viscous effects on blood flow across abdominal aortic aneurysm in COVID patients: multiphysics approach | Computer Methods in Biomechanics and Biomedical Engineering- Taylor and Francis Ltd, ISBN10255842 (ISSN), DOI-<br><br>10.1080/10255842.2023.2194474, (2023) | 93 |
| MATIJ-07 | Pandey, R.M., Chandola, A., Agarwal, R. | On Bessel-Maitland Function and m-Parameter Mittag-Leffler Function Associated with Fractional Calculus Operators and its Applications | Applied Mathematics and Information Sciences-Natural Sciences Publishing, ISBN: 19350090 (ISSN), DOI: 10.18576/amis/170110, Volume-17, Pages: 79-93, (2023) | 94 |
| MATIJ-08 | Chandola, A., Pandey, R.M. | On some new inequalities and fractional kinetic equations associated with extended gauss hypergeometric and confluent hypergeometric function | International Journal of Mathematics for Industry-World Scientific, ISBN: 26613352 (ISSN), DOI: 10.1142/S2661335223500090, (2023) | 95 |

# INTERNATIONAL CONFERENCE PUBLICATIONS

| | | | | |
|---|---|---|---|---|
| MATIC-01 | Jain, K., Bhattacharjee, A | Modeling and Stability Analysis of SEIRS Model for Understanding the Tuberculosis Disease Dynamics | 2nd International Conference on Recent Trends in Applied and Computational Mathematics- American Institute of Physics Inc, 0094243X (ISSN); 9780735445536 (ISBN), DOI-10.1063/5.0114135 Pages 100-275, Volume-2649, (2023) | 96 |
| MATIC-02 | Ravindran, B.A., Togarichetu, D., Gangadharaiah, V.M., Veerabhadraiah, L. | QSPR Analysis of VL Index with Octane Isomers | 2nd International Conference on Recent Trends in Applied and Computational Mathematics, ICRTACM 2021- American Institute of Physics Inc, ISBN; 0094243X (ISSN); 9780735445536 (ISBN), DOI-10.1063/5.0117457, Volum-2649, (2023) | 97 |
| MATIC-03 | Muddulapuram, M., Togarichetu, D., Halappa, N.V., Veerabhadraiah, L. | Bounds Analysis on Topological Indices of Semi Total Point Graph of Vertex Corona Graph | 2nd International Conference on Recent Trends in Applied and Computational Mathematics, ICRTACM 2021- American Institute of Physics Inc, ISBN; 0094243X (ISSN); 9780735445536 (ISBN), Volume-2649, (2023) | 98 |

# I n d e x

## Department of Physics School of Engineering

## INTERNATIONAL JOURNAL PUBLICATIONS

| ID | Author(s) | Title of the Paper | Publication Details | Page No. |
|---|---|---|---|---|
| PHYIJ-01 | Ashoka, S., Navya, H.S., Meghana, S.T., Yogesh, K., Kumar, S.G. | Insights from Ethylene Glycol Oxidation toward Reduction in the Overpotential Using Sonochemically Derived Orthorhombic $CoV_2O_6{\cdot}2H_2O$ Sheetlike Structures | American Physical Society, ISSN: 24699926, DOI: 10.1103/PhysRevA.108 .063107, Volume:108, | 100 |
| PHYIJ-02 | Prabhakar, G., Mandal, S., Bhuvana, G.R., Nandi, A. | Wideband study of the brightest black hole X-ray binary 4U 1543−47 in the 2021 outburst: signature of disc-wind regulated accretion | Monthly Notices of the Royal Astronomical Society- Oxford University Press, ISSN: 00358711, DOI: 10.1093/mnras/stad0 80, Volume 520, Pages 4889-4901, (2023) | 101 |
| PHYIJ-03 | Chalapathi, U., Bhaskar, P.U., Cheruku, R., Sambasivam, S., Park, S.-H. | Evolution of large-grained $CuSbS_2$ thin films by rapid sulfurization of evaporated Cu–Sb precursor stacks for photovoltaics application | Ceramics International-Elsevier Ltd, ISBN: 02728842 (ISSN), DOI: 10.1016/j.ceramint.20 22.09.365, Volume-49, Pages- 4758-4763 | 102 |
| PHYIJ-04 | Khademhosseini, R., Deshmukh, P.C., Manson, S.T. | Attosecond time delay in atomic photoionization: Angular-dependent transition from dipole to quadrupole and spin-flip dynamics | Physical Review A-American Physical Society, ISBN: 24699926 (ISSN), DOI<br><br>10.1103/PhysRevA.10 8.063107, Volume-108, (2023) | 103 |
| PHYIJ-05 | Pullarao, T., Leelashree, S., Nagaraju, G., Kumar, B.R., Srinath, S., Bitla, Y., Suresh, P. | Influence of (Sr, Zr) Ion Co-doping on the Enhanced Magnetic and Dielectric Response of $BiFeO_3$ | Journal of Electronic Materials- Springer, ISBN:03615235 (ISSN), DOI: 10.1007/s11664-023-10867-z, Volume-53, Pages-786-800, (2024) | 104 |
| PHYIJ-06 | Nivetha, K., Vijaya Kumar, K., Krishna Jyothi, N., Kamma, K.V. | Magnesium ion conducting PVB-based polymer electrolyte for solid-state magnesium batteries | Materials in Electronics-Springer, ISBN: 09574522, | 105 |

| | | | | |
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# Department

## Of
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| | | | | |
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| ID | Author(s) | Title of the Paper | Publication Details | Page No. |
|---|---|---|---|---|
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| INTERNATIONAL BOOK CHAPTERS | | | | |
|---|---|---|---|---|
| **ID** | **Author(s)** | **Title of the Paper** | **Publication Details** | **Page No.** |
| BIOIB-01 | Nair, A., Rao, A.S., Ghat, S.K., Lidia, A., Veena, S.M., Vidya, A.S., More, S.S. | Microbial Pigments: Applications in Beverage Industry | Book Chapter- CRC Press, ISBN: 978-100383794-7;978-103239263-9, DOI: 10.1201/9781003353980-5, (2024), Pages 84-91 | 314 |
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# Index
# Of
## College of Pharmaceutical Sciences
## SCHOOL OF HEALTH SCIENCES
## INTERNATIONAL JOURNAL PUBLICATIONS

| ID | Author(s) | Title of the Paper | Publication Details | Page No. |
|---|---|---|---|---|
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| | | | | |
|---|---|---|---|---|
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| PHSIJ -07 | Gnana Ruba Priya, M., Raja Solomon, V., Hemavathy, N., Jeyakanthan, J., Kumar, D., Mahesh, J. | Design, synthesis, in silico, and pharmacological evaluation of novel quinoline derivatives containing substituted piperazine moieties as potential anti-breast cancer agents | Elsevier B.V., ISBN: ISSN: 22117156, DOI: 10.1016/j.rechem.2024.101359, Volume 7, January (2024) | 323 |
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| | | | | |
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| PHSIJ -19 | Geetha, K.M., Shankar, J., Wilson, B. | Neuroprotective effect of chia seed oil nanoemulsion against rotenone induced motor impairment and oxidative stress in mice model of Parkinson's disease | Advances in Traditional Medicine- Springer, ISBN: 26624052 (ISSN), DOI: 10.1007/s13596-022-00648-0, Pages-1091-1108, volume-23, (2023) | 335 |
| PHSIJ -20 | Teli, G., Pal, R., Maji, L., Sengupta, S., Raghavendra, N.M., Matada, G.S.P. | Medicinal Chemistry Perspectives on Recent Advances in Src Kinase Inhibitors as a Potential Target for the Development of Anticancer Agents: Biological Profile, Selectivity, Structure-Activity Relationship | Chemistry and Biodiversity- John Wiley and Sons Inc, ISBN: 16121872 (ISSN), DOI: 10.1002/cbdv.202300515, Volume-20, (2023) | 336 |

| | | | | |
|---|---|---|---|---|
| PHSIJ -21 | P. Prabhakaran<br>A. Nadig<br>M. Sahyadri<br>S. Tuladhar<br>R.M. Raju<br>S.B. Chidambaram<br>B.B. Kempaiah<br>N.M. Raghavendra<br>Kumar BR | Design and Development of Novel Glitazones for Activation of PGC-1α Signaling Via PPAR-γ Agonism: A Promising Therapeutic Approach against Parkinson's Disease | ACS Omega- American Chemical Society, ISBN: 24701343 (ISSN), DOI: 10.1021/acsomega.2c07521, Volume-8, Pages: 6825-6837, (2023) | 337 |
| PHSIJ -22 | Nelson, V.K., Nuli, M.V., Mastanaiah, J., Saleem T. S, M., Birudala, G., Jamous, Y.F., Alshargi, O., Kotha, K.K., Sudhan, H.H., Mani, R.R., Muthumanickam, A., Niranjan, D., Jain, N.K., Agrawal, A., Jadon, A.S., Mayasa, V., Jha, N.K., Kolesarova, A., Slama, P., Roychoudhury, S. | Reactive oxygen species mediated apoptotic death of colon cancer cells: therapeutic potential of plant derived alkaloids | Frontiers in Endocrinology- Frontiers Media SA, 16642392 (ISSN), DOI: 10.3389/fendo.2023.1201198, Volume-14, (2023) | 338 |
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| BOOK CHAPTERS | | | | |
|---|---|---|---|---|
| **ID** | **Author(s)** | **Title of the Paper** | **Publication Details** | **Page No.** |
| PHSIB-01 | Kumar, P.P., Netala, S. | A systematic review of astragalus membranaceus (fisch.) bge. | Apple Academic Press, ISBN: 978-100061326-1;978-177491126-6, 17 July 2023, Pages 113-128 | 340 |
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# I n d e x
# of
## College of Physiotherapy
## SCHOOL OF HEALTH SCIENCES
## INTERNATIONAL JOURNAL PUBLICATION

| | | | | |
|---|---|---|---|---|
| PHTI J-06 | Mangishetti, S.R., Jang, D., Choi, J., Rajeshkhanna, G., Pittala, S., Kang, S.K., Ji, J., Kim, M., Jung, S.G., Ha, J., Kim, J., Maeng, J., Park, G.H., Bae, J., Kim, W.B. | N-doped graphene leaves on carbon nanotubes and NiMn2O4-graphene hybrid nanocomposites with ionogel film for flexible symmetric and asymmetric supercapacitors | Chemical Engineering Journal- Elsevier B.V., ISBN: 13858947 (ISSN), DOI: 10.1016/j.cej.2023.144863, Volume-472, (2023) | 348 |

# I n d e x
# Of

## Dr. Chandramma Dayananda Sagar Institute of Medical Education & Research (CDSIMER)
## School of Medical Education & Research

### INTERNATIONAL JOURNAL PUBLICATIONS

| ID | Author(s) | Title of the Paper | Publication Details | Page No. |
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| CDIJ-02 | Krishnamurthy, S.L., Shah, R., Krishnan, R., Wasdev, A., Kaushik, Y.S., Nedumparampil, M.M., Amaravathi, R.S. | Bailout Options for Intra-operative Implant and Instrumentation Related Incidents and Complications During Arthroscopic Knee Surgery—A Retrospective Study | Springer, ISBN: ISSN: 00195413, DOI: DOI: 10.1007/s43465-023-01086-z, olume 58, Issue 3, March 2024, Pages 289-297 | 351 |
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| CDIJ-05 | B. Hugar<br>J. Hosahally<br>K. Kumari<br>S. Chisti | Sudden death in goldenhar syndrome | Journal of Forensic Science and Medicine-Wolters Kluwer Medknow Publications, ISBN: 23495014 (ISSN), DOI: 10.4103/jfsm.jfsm_92_21, Volume-9, Pages-84-87, (2023) | 354 |

| | | | | |
|---|---|---|---|---|
| CDIJ-06 | N. Gaffoor<br>A. Shetty<br>V.N. Shivayogi<br>N. Murali | Clinical Masquerades in Physiognomy of Sebaceous Cysts Unveiled on Histopathological Examination: A Spectrum of Cases | Indian Journal of Surgery- Springer, ISBN: 09722068 (ISSN), DOI: 10.1007/s12262-022-03629-4, Volume-85, Page-1044-1049, (2023) | 355 |
| CDIJ-07 | A. Koul<br>A. Shetty<br>N. Gaffoor<br>N. Murali<br>N. Prasad | A Tale of 5Ms: Massive Uterine Leiomyoma Mimicking Ovarian Malignancy along with Multiple Fibroids displaying Multiple Degenerations | Sudan Journal of Medical Sciences- Knowledge E, ISBN: 18585051 (ISSN), DOI: 10.18502/sjms.v18i1.12870, Volume-18, Page-104-110, (2023) | 356 |
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| CDIJ-10 | B.S. Hugar<br>J.S. Hosahally<br>Y.P. Chandra<br>P. Shivarama | Study of Victims of Alleged Sexual Assault | Russian Journal of Forensic Medicine- Eco-Vector LLC, ISBN: 24118729 (ISSN), DOI: 10.17816/fm6708, Volume-9, Pages- 117-124, (2023) | 359 |

# I n d e x

## Of

## Department of Commerce and Management
## SCHOOL OF COMMERCE AND MANAGEMENT
## INTERNATIONAL JOURNAL PUBLICATIONS

| ID | Author(s) | Title of the Paper | Publication Details | Page No. |
|---|---|---|---|---|
| MGSIJ - 01 | Vinaya, R., Goyal, N. | Growth of green investments through fintech innovations | The Sustainable Fintech Revolution: Building a Greener Future for Finance- IGI Global, ISBN: 9798369300107 (ISBN); 9798369300084 (ISBN), DOI: 10.4018/979-8-3693-0008-4.ch003, Pages-37-55, (2023) | 361 |
| MGSIJ - 02 | Ayer, B., Lakshmi, D.V., Mathew, A., Saradha, M., Devarayasamudram, S., Karthik, R. | An efficient management education in developing women entrepreneurial aspirations | International Journal of System Assurance Engineering and Management- Springer, ISBN: 09756809 (ISSN), DOI: 10.1007/s13198-022-01847-3, (2022) | 362 |
| MGSIJ - 03 | Gaur, S., Kalani, P., Mohan, M. | Harmonic-to-noise ratio as speech biomarker for fatigue: K-nearest neighbour machine learning algorithm | Medical Journal Armed Forces India- Elsevier B.V., ISBN: 03771237 (ISSN), DOI- 10.1016/j.mjafi.2022.12.001, (2023) | 363 |
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| BOOK CHAPTERS | | | | |
|---|---|---|---|---|
| ID | Author(s) | Title of the Paper | Publication Details | Page No. |
| MGSIB-01 | S. Sanyal, M. Kalimuthu<br>T. Arumugam<br>R. Aruna<br>J. Balaji<br>A. Savarimuthu<br>C. Chavadi<br>D. Thangam<br>S. Manoharan<br>S. Patil | Internet of Things and Its Relevance to Digital Marketing | Opportunities and Challenges of Industrial IoT in 5G and 6G Networks- IGI Global, 9781799892687 (ISBN); 9781799892663 (ISBN), DOI: 10.4018/978-1-7998-9266-3.ch007, Pages-138-154, (2023) | 365 |

# I n d e x

# Of

## Department of Management Studies (UG)
## SCHOOL OF COMMERCE AND MANAGEMENT
## INTERNATIONAL JOURNAL PUBLICATIONS



## INTERNATIONAL CONFERENCE PUBLICATION

| | |
|---|---|
| **Funded Research Projects, Consultancies & Trainings** | 410-412 |

# I N D E X
# of

## List of Scholar who completed their Ph. D Program Along with Abstract

| | | | | | | |
|---|---|---|---|---|---|---|
| DSUT-05 | Hari Priyaa G (BAS18PFAS02) | Assessment of anti-atherosclerotic activity from plant juices of ayurvedic reputes in cell lines and mice model | BASIC AND APPLIED SCIENCES | SBAS | Dr. Sunil S More | 388 |
| DSUT-06 | Prakruti P Acharya (BAS18PFAS03) | Invitro & Invivo assessment of fabricated Protein Polysaccharide scaffold for enhanced Bone regeneration | BASIC AND APPLIED SCIENCES | SBAS | Dr. Sunil S More & Dr. Krishnamurthy | 390 |
| DSUT-07 | Vinay B.K. (ENG18PPEC11) | Power Aware Asynchronous Strategies for GALS Systems | ECE | SOE | Dr. Pushpa Mala S | 392 |
| DSUT-08 | Shaik Sadik (HSC16PPPH02) | Preliminary phytochemical studies and Screening of syzygium cerasoideum for Antidiabetic, antihyperlipidemic and antioxidant activities | SHS | PHARMACY | Dr. Geetha KM | 394 |
| DSUT-09 | Mulla Suleman Basha (ENG18PPCS10) | Studies on sampling based multi-Viewpoints visual techniques for Efficient big data clustering | CSE | SOE | Dr. Mouleeswaran SK & Dr. K Rajendra Prasad, | 395 |
| DSUT-10 | Laxma Reddy Dontham (ENG17PPEC01) | An energy efficient clustering and Routing using gso and aco in Wireless sensor networks | ECE | SOE | Dr. Puttamadappa C & Dr. H N Suresh | 396 |
| DSUT-11 | Hemanth Kumar B.M. (ENG17PPEC06) | Detection of pathogens using 2-dimensional Photonic crystal biosensor | ECE | SOE | Dr Vaibhav A Meshram & Dr P C Srikanth | 397 |
| DSUT-12 | Sharath M.N. (ENG18PPCS06) | A robust model for securing the data in video Communication | CSE | SOE | Dr. Rajesh T M & Dr. Mallanagouda Patil | 398 |

| | | | | | | |
|---|---|---|---|---|---|---|
| DSUT-13 | Uma Vinod Kumar (ENG17PPBS13) | Surface Gravity Wave Interaction With Composite Porous Structures | Mathematics | SOE | Dr. Deepika. T | 400 |
| DSUT-14 | Trupti Shripad Tagare (ENG19PPEC13) | Energy efficient duty cycle based futuristic Clustering technique for longer network Lifetime of wireless sensor network | ECE | SOE | Dr. Rajashree Narendra | 401 |
| DSUT-15 | Sunil Kumar C (ENG18PPEC03) | Design, Simulation and Analysis of Advanced micro-grid controller with Inverter for Power Quality Improvement in Solar PV Systems | CSE | SOE | Dr. Puttamadappa C & Dr. Chandrashekar Y L | 403 |
| DSUT-16 | RANJITH B (ENG19PPEC10) | Design and development of mems based Optical sensor for biomedical Applications | ECE | SOE | Dr. Saara K & Dr. Preeta Sharan | 404 |
| DSUT-17 | S. Shankar Narayan (ENG17PPBS14) | Mathematical Modelling of Cardiovascular System | Mathematics | SOE | Dr. Anuradha Bhattacharjee | 407 |
| DSUT-18 | Mukti Chaturvedi (ENG18PPEC08) | Experimental & simulation studies Of magnetically impelled arc butt Welding of mild steel tubes | ECE | SOE | Dr. Arungalai Vendan S | 408 |

# DEPARTMENT OF CHEMISTRY
# SCHOOL OF ENGINEERING
## PUBLICATION SUMMARY

| | | |
|---|---|---|
| International Journals | 16 | (CHIJ-01 – CHIJ-16) |
| International Conference | 01 | (CHIC01) |
| Book Chapters | 07 | (CHIINB-01 - CHIIN B-07) |

**DEPARTMENT OF CHEMISTRY**
**SCHOOL OF ENGINEERING**
**INTERNATIONAL JOURNAL PUBLICATIONS**

## CHIJ-01

# Influence of Ag on the Structural, Electrochemical, Antibacterial, and Photocatalytic Performance of the (CuO-Cu2O) Cu Nanocomposite (Article) (Open Access)

**Uma, B., Anantharaju, K.S., Surendra, B.S., Gurushantha, K., More, S.S., Meena, S., Hemavathi, B., Murthy, H.C.A.**

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**Volume-8, Page No -9947- 9961, Year-(2023)**

## Abstract

The cost-effective novel Ag-doped (1-7%) (CuO-Cu2O) Cu (C3) heterostructured nanocomposites are successfully synthesized by the facile solution combustion process using the Leucas aspera extract as a green fuel. The structural properties of fabricated nanocomposites were well-characterized by specific spectral techniques for enhanced electrochemical sensor detection, antibacterial activities, and sunlight-driven photocatalytic dye decoloration studies. The existence of Ag+ ions has been confirmed by the appearance of two peaks of Ag 3d5/2 (367.9 eV) and Ag 3d3/2 (373.9 eV), with the chemical binding nature and exchange of the Ag+ state in the nanocomposite lattice as revealed by X-ray photoelectron spectroscopy analysis. The energy band gap value of the doped nanocomposite decreases from 2.2 to 1.8 eV, as measured by the UV-visible absorption spectral technique, hindering the recombination of electron-holes pairs by trapping e- and h+. This result supports that the C3Ag5 nanocomposite has a great potential as a sunlight photocatalyst toward the Alizarin Red (AR) dye, for which an excellent degradation activity of 98% at 180 min was achieved compared to that of the host nanocomposite (78% at 180 min). The variation of redox peak potentials of the prepared graphite nanocomposite working electrode is an effective tool for paracetamol sensing activity in 0.1 M KCl using electrochemical spectral studies. In addition, the antibacterial activities of the C3Ag5 nanocomposite against Escherichia coli and Staphylococcus aureus were successfully studied. The C3Ag5 nanocomposite exhibited a better performance than C3. The increase in activity is attributed to the presence of Ag as a dopant. 

# CHIJ-02

**Lanthanum oxide nanoparticles as chemical sensor for direct detection of carboxymethyl cellulose in eye drops** (Article)

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**24701556 (ISSN), DOI-10.1080/24701556.2022.2055575, Volume 53, Pages 295-301 Year-(2023)**

## Abstract

Lanthanum oxide nanoparticles (LONPs) were prepared by the probe sonication method. Various analytical and electrochemical techniques were employed to understand the morphology, crystallinity, and band gap of LONPs. The electrochemical sensing ability of the as synthesized LONPs with the carboxymethyl cellulose material present in the eye drops was investigated. X-ray diffraction (XRD) studies revealed that the NPs exists in a hexagonal lattice with a space group, P321 with a crystallite size ranging between 14 and 17 nm. UV-DRS (diffuse reflectance) spectra was used to arrive at the band gap of 3.54 eV for LONPs. Cyclic voltametric (CV) results presented superior electrochemical properties for LONPs with lower value of Ea, c. Carboxymethyl cellulose (CMC) material in eye drops was effectively sensed by LONPs in 0.1 N HCl electrolyte. Electrochemical impedance study corroborated the least charge-transfer resistance value for LONPs, obtained after fitting to the equivalent circuit. The electrochemical behavior confirmed the potential role of LONPs as a promising electrode material for sensing molecule such as CMC. 

# CHIJ-03

## Bioactive conductive polymer-coated titanium to support osseointegration

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**21906815 (ISSN), DOI-10.1007/s13399-023-04712-w, (2023)**

## Abstract

The anti-corrosion performance and biocompatibility of developed bioactive polypyrrole (PPy)-coated titanium (Ti) have been studied in the present work. Coating of PPy on Ti was performed by the electropolymerization technique using various concentrations of pyrrole in an aqueous solution. 13C solid NMR, ATR-FTIR and Raman spectroscopy analysis confirmed the presence of PPy over Ti metal. The morphology of PPy-coated substrates revealed a cauliflower-like structure with a high roughness value. Wettability studies showed the hydrophilic property of the PPy-coated Ti metal compared to uncoated Ti. The increased polarization resistance (Rp) and reduced corrosion current density (i corr) results exhibit improved protection ability for the PPy-coated Ti. Bode impedance and phase angle values were high for the PPy-coated substrate compared to uncoated Ti. Apatite formation on the coated substrate was higher after 7 days of immersion in simulated body fluid (SBF) solution. Cell culture studies result revealed that PPy-coated surface enhances the adhesion of MG-63 cells on titanium surface and also improve the bone-forming ability. 

# CHIJ-04

## Eco-friendly synthesis of reduced graphene oxide as sustainable catalyst for photodegradation of methylene blue (Article) (Open Access)

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## Abstract
Synthetic dyes are employed as colouring agents in various industries such as textile, food, paper, leather, and printing. Sustainable removal of these environmentally toxic colouring agents is a daunting task. In this regard, we report an environment friendly synthesis of reduced graphene oxide prepared by the aqueous extract of the resin of Araucaria cunninghammii (ACrGO). Successful reduction of graphene oxide (GO) was achieved with the help of the extract. The synthesized ACrGO nanocomposite was characterized using UV–visible spectroscopy, scanning electron microscopy, Fourier transform infrared spectroscopy, x-ray diffraction and energy dispersive x-ray analysis. Successful conversion of GO to ACrGO was indicated by an increase in the C/O atomic ratio from 0.8 to 1.4. Superior catalytic activity of ACrGO was observed by effective degradation of the methylene blue dye with a net degradation of 84% in 50 minutes following a pseudo-first order decay kinetics. This study specifies the exploration of various green reducing agents for the reduction of GO as catalysts for improved catalytic applications in future. 

# CHIJ-05

## Two-stage-processed $AgSbS_2$ films for thin-film solar cells (Article)

**Chalapathi, U., Reddy, A.S., Prasad, P.R., Manjula, G., Sangaraju, S., Cheruku, R., Al-Asbahi, B.A., Alhammadi, S., Reddy, C.P., Mohanarangam, K., Reddy, B.P., Park, S.-H.**

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## Abstract

$AgSbS_2$ has shown promise as an earth-abundant, sustainable light-harvesting material for thin-film solar cells owing to its suitable optoelectronic properties and high stability. Here, we report the fabrication of $AgSbS_2$ thin films using a two-stage process (sequential evaporation of Sb/Ag layers and sulfurization at 300–400 °C for 30 min) and their characterization. X-ray diffractometry revealed the formation of $Ag_3SbS_3$ and $Sb_2S_3$ phases, single-phase $AgSbS_2$, and slight decomposition of $AgSbS_2$ and the emergence of monoclinic $AgSbS_2$ at sulfurization temperatures of 300, 350, and 400 °C, respectively. The $AgSbS_2$ films have a cubic crystal structure with a lattice parameter (a) of 0.565 nm. X-ray photoelectron spectroscopy confirmed that the valence states of Ag, Sb, and S were +1, +3, and -2, respectively. Microstructural analysis of the film prepared at 350 °C revealed highly crystalline, large-grains with an average grain size of 5μm. Optical absorption studied suggested that the $AgSbS_2$ film prepared at 350 °C exhibited a direct bandgap of 1.61 eV. Hall measurements revealed an electrical resistivity of $1.52 \times 10^4$ Ωcm, hole mobility of 84.5 $cm^2V^{-1}s^{-1}$, and a carrier concentration of $7.95 \times 10^{12}$ $cm^{-3}$ for the $AgSbS_2$ film prepared at 350 °C. Finally, $AgSbS_2$ solar cells with glass/Mo/$AgSbS_2$/CdS/indium-tin-oxide/Ag configuration were fabricated (optimal device parameters: efficiency, 1.1%; open-circuit voltage, 519.6 mV; short-circuit current density, 6.63 $mA/cm^2$; and fill factor, 31.0%). The device processing conditions must be optimized to further improve the efficiency. © 2023 Elsevier Ltd

## CHIJ-06

### Molecular salts of pipemedic acid and crystal structure, spectral properties, and Hirshfeld surface analysis (Article)

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**1735207X (ISSN), DOI- 10.1007/s13738-023-02905-8,**
**Volume 20, Pages 3161-3176, (2023)**

## Abstract

The research involves synthesizing 1:1 salt of Pipemedic acid (PMA) with oxalic acid (OA), salicylic acid (SA), and p-Toluene sulfonic monohydrate (BS) using a slow evaporation method. Many characterization techniques, including FT-IR, DSC, Single XRD, and DFT calculations, were employed to analyze the salts' structural and physicochemical properties. The proton is transferred from oxalic, salicylic acid, and p-toluene sulfonic monohydrate to pyridine nitrogen of PMA. The salt 1OA, crystallizes in the monoclinic space group P 21/c, with a = 9.923(3) Å a = 90°, b = 9.443(3) Å b = 92.470(10) °and c = 18.248(5) Å g = 90° and volume = 1708.3(9) Å3and Z = 4. The salt 2SA crystallizes in the monoclinic space group P 21/c, with a = 6.8877(3) Å a = 90°.b = 13.9149(6) Å b = 98.092(2)° and c = 21.5313(10) Å g = 90° with volume = 2043.05(16) Å3 and Z = 4.The salt 3BS crystallizes in the monoclinic space group P 21/c, with, a = 9.3352(4) Å a = 90°, b = 12.7754(5) Å b = 97.722(2)°, c = 19.5462(8) Å g = 90°,with volume = 2309.96(16) Å3 and Z = 4. Supramolecular centrosymmetric ring motifs are formed by N–H⋯O hydrogen bonds between protonated nitrogen of the pyridone ring and the carboxylic O atom of the oxalate ion, in both 1OA and 2SA. The dihedral angles of 1OA, 2SA, and 3BS are found to be 43.63°, 88.19°, and 53.89° respectively. The Hirshfeld surfaces and the related 2D fingerprint plots were explored which uncovered that more than two-thirds of close contacts were related to H⋯H, C–H, N–H, and C–C bonding interactions whereas in 3BS, the structure is stabilized by N–H⋯O and N–H⋯S hydrogen bonding interactions. These weak associations assume a significant role in crystal packing as revealed by the Hirshfeld surfaces and the related 2D fingerprint plots. 

# CHIJ-07

## Electrochemical sensor of carboxymethyl cellulose and photocatalytic degradation of NavyBlue dye by sonochemically synthesized Titanium oxide nanoparticles (Article) (Open Access)

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**ISBN: 26663511 (ISSN), DOI: 10.1016/j.sintl.2023.100239, Volume-4, (2023)**

## Abstract

Nanocrystalline titanium oxide nanoparticles ($TiO_2$ NPs) were synthesized by using a low-cost sonochemical method. $TiO_2$ NPs exhibited anatase phase and an average crystallite size of 40.64 nm, according to a powder X-ray diffraction (PXRD) investigation. SEM and TEM images revealed spherical shape, with asymmetric geometries for $TiO_2$ NPs. The micrographs thoroughly corroborated the plate-like structure for the NPs. In order to confirm the average energy gap of $TiO_2$ NPs, diffused reflectance spectroscopy (DRS) via Kubelka-Monk function was applied (3.66 eV). Navy blue dye was used to study the photocatalytic properties of NPs and discovered to be triggered at 590.9 nm. The photodegradation rate of NB dye decolorized up to 74.04% after 120 min of UV light exposure. The first order kinetics was indicated by a linear relationship between log C/Co and k. The demonstrated rates of photodecoloration for NB under UV light in the presence of scavengers $AgNO_3$, ethanol, and ethylenediamine tetraacetic acid (EDTA), were found to be 65.50%, 61.46%, and 57.33%, respectively. Using the carbon paste electrodes and cyclic voltammetry (CV) in 0.1 N HCl solution, the electrochemical characteristics of the obtained sample were studied. The carboxymethyl cellulose sensor made from $TiO_2$ NPs demonstrated a remarkable sensitivity of 0.08 A. The results showed a high recovery for lead with low% of RSD values. The $TiO_2$ electrode is a promising electrode material for sensing applications due to its outstanding electrochemical performance. 

## CHIJ-08

### Influence of FeVO4 crystallinity on oxygen evolution reaction activity (Article)

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4. ISBN: 02728842 (ISSN), DOI:

**10.1016/j.ceramint.2023.11.082, Pages-3366-3372, Volume-50, (2024)**

## Abstract

Enhanced oxygen evolution reaction (OER) kinetics plays an important role in the large-scale production of hydrogen via water electrolysis. In this regard, the crystallinity of FeVO4 is tuned from amorphous to semicrystalline and fully crystalline via precipitation followed by controlled thermal treatment. The prepared FeVO4 samples show a uniform distribution of spherical nanoparticles (40–60 nm). The tailored amorphous, semicrystalline, and fully crystalline FeVO4 samples are immobilized on nickel foam and their OER performance was studied. The OER performance of amorphous, semicrystalline, and fully crystalline FeVO4 shows in the order of amorphous FeVO4 > semicrystalline FeVO4 > fully crystalline FeVO4. The amorphous FeVO4 demonstrates magnificent enhanced OER kinetics with a small overpotential and high current density compared to the semicrystalline and fully crystalline FeVO4. The amorphous FeVO4 exhibits an overpotential of 310 mV at a high current density of 1000 mA cm−2 and also exhibits exemplary stability over 95 h, while semicrystalline FeVO4 and fully crystalline FeVO4 respectively require 360 mV and 390 mV to drive a relatively lower current density of 500 mA cm−2. 

## CHIJ-09

### Fabrication of surface etched $NiFe_2O_4$-$NiSe_2$ nanocomposite as an efficient electrocatalyst for oxygen evolution reaction (Article)

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**ISBN: 13877003 (ISSN), DOI: 10.1016/j.inoche.2023.110508, Volume-150, (2023)**

## Abstract

Investigating earth-abundant and potential electrocatalysts is pivotal for bringing electrochemical hydrogen production from laboratory production to an industrial scale. In this regard, nickel-based electrocatalysts are potential contenders for oxygen evolution reaction (OER) owing to their superior electrochemical activity and low cost. Herein, a nanocomposite made of $NiFe_2O_4$ and $NiSe_2$ nanoparticles (20 nm) is reported for OER wherein a simple, new, and rapid wet chemical synthetic protocol is proposed. The experimental results reveal that the OER performance in the alkaline electrolyte is dependent on the etching rate of selenium. This is because the etching of surface selenium results in a mesoporous structure and a higher concentration of highly electroactive $Ni^{3+}$ on the electrode surface. The 30 min etched $NiFe_2O_4$-$NiSe_2$ nanocomposite exhibits 340 mV overpotential to realize a high current density of 100 mA $cm^{-2}$ with a low Tafel slope of 52.1 mV $dec^{-1}$. Additionally, as-synthesized $NiFe_2O_4$-$NiSe_2$ nanocomposite shows stable performance over 75 h. © 2023 Elsevier B.V.

## CHIJ-10

### Electrochemical quantification of glycine using amorphous iron vanadate nanoparticles modified pencil electrode (Article)

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**ISBN: 13877003 (ISSN), DOI: 10.1016/j.inoche.2023.110766, Volume-153, (2023)**

## Abstract

The quest of stable, environmentally benign and highly electro-active inorganic electrode modifiers is of great research interest in the field of biomolecules detection. In this regard, a simple precipitation method, operating at room temperature and completes in a few minutes, has been employed to prepare FeVO4. The FeVO4 prepared at room temperature exhibits amorphous structure with spherical particles of size 40–60 nm. Thus, the prepared amorphous FeVO4 nanoparticles were coated on pencil electrode by drop-casting. The electrochemical activity of FeVO4 nanoparticles modified pencil electrode towards glycine detection has been carried out in presence of potassium ferricyanide and potassium chloride electrolyte using cyclic voltammetry and chronoamperometric techniques. The linear decrease in current against increased concentration of glycine reveals that the amorphous FeVO4 nanoparticles could be used to detect glycine. The experimental results successfully demonstrate that amorphous FeVO4 nanoparticles exhibit a low detection limit of 5.9 μM with a linear concentration range of 0 μM–72 μM. 

## CHIJ-11

### Some progress in developing electrochemical sensors for detection of 2,4-dichlorophenoxyacetic acid based on modified carbon interfaces: a brief review (Article) (Open Access)

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**ISBN: 18479286 (ISSN), DOI: 10.5599/jese.2028, Volume 13, Pages- 923-936, (2023)**

## Abstract

The herbicide 2,4-dichlorophenoxyacetic acid (2,4-DPAA) is commonly used in agricultural practices. Unfortunately, it has a high toxicity level and is known to be a carcinogenic substance. Therefore, developing an analytical technique capable of detecting this compound is crucial. Electrochemical methods offer a viable solution for the rapid and on-site analysis of 2,4-DPAA residues in real samples. The detection of 2,4-DPAA can be achieved through electrochemical redox electron transfer reactions, making voltammetry an effective approach. Various studies have explored the use of carbon electrodes, such as glassy carbon electrodes (GCE), carbon paste electrodes (CPE), and screen-printed electrodes (SPE), for voltammetric detection of 2,4-DPAA. However, researchers have encountered challenges in detecting 2,4-DPAA using these carbon electrodes. Consequently, modifi-cations have been made to the carbon materials by incorporating chitosan hierarchical porous silica, $Fe_3O_4$-polyaniline nanocomposites, silver, manganese oxide nanoparticles, alizarin yellow R polymer, hierarchical porous calcium phosphate, and molecularly imprinted polypyrrole with $TiO_2$ nanotubes. In this comprehensive review, we have examined the effectiveness of each modified electrode, considering factors such as the limit of detection, precise linear range, and recovery rate for detecting 2,4-DPAA in real samples. © 2023 by the authors.

## CHIJ-12

### Co-crystal of nadifloxacin with oxalic acid (Article) (Open Access)

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**ISBN: 20569890 (ISSN), DOI: 10.1107/S2056989023002244, Volume-79, Pages-319-322, (2023)**

## Abstract

The 2:1 co-crystal of nadifloxacin [systematic name: 9-fluoro-8-(4-hydroxy-piperidin-1-yl)-5-methyl-1-oxo-6,7-dihydro-1H,5H-pyrido[3,2,1-ij] quinoline-2-carboxylic acid] with oxalic acid, C19H21FN2O4·0.5C2H2O4, was prepared by slow evaporation from a chloroform: acetone solvent system. Nadifloxacin belongs to the group of antibacterial drugs. The co-crystal is stabilized through an intramolecular O—H· · ·O bond and intermolecular hydrogen bonds. It was studied by FT–IR spectroscopy, differential scanning calorimetry and X-ray diffraction. Hirshfeld surface analysis indicated that the major contribution to the packing is from O· · ·H/H· · ·O interactions.

**CHIJ-13**

**Intermolecular hydrogen bond interactions in water clusters of zwitterionic glycine: DFT, MESP, AIM, RDG, and molecular dynamics analysis (Article)**

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**ISBN- 01677322 (ISSN), DOI- 10.1016/j.molliq.2023.123932, Volume-396, (2024)**

## Abstract

The putative global minima geometries of zwitterionic glycine-water complexes [zGly.Wn (1 = 1–10)] are controlled by the cyclic network of water molecules bonded to the zwitterionic glycine. Their stability is governed by the number of water-water interactions along with the existence of the intramolecular glycine-water bonds. The computed intramolecular distances suggest that water molecules tend to coordinate within themselves. The computed association energy attains saturation at 6, implying that up to 6 water molecules are coordinated to the zwitterionic glycine. Further addition of water molecules happens to be an intramolecular addition to the existing water. The computed incremental association energy decreases with the increase in the number of water molecules, except for the six and nine water molecules. This implies that compared to the water clusters, the zwitterionic clusters are less stable. The higher stability of n = 6 and 9 can be marked to the resemblance of the cyclic network of water molecules to the bare global minima water clusters. Benchmarking calculations suggest that M06-2X-D3 functional provides binding energy close to the PW6B97D3(BJ) method. The PGM clusters' thermodynamic parameters show that the reaction's enthalpy remains constant and is negative, indicating that the hydration process is exothermic and independent of the number of water molecules. The electron density difference (EDD) diagram shows the build-up of charge is more pronounced in the intramolecular hydrogen bonds (HBs) between water molecules than between zwitterionic glycine and water. QTAIM analysis shows that the water-water HBs are comparatively weaker than zwitterionic glycine-water interactions. 

**CHIJ-14**

# Design and synthesis of 4-aminophenol-1,3,4-oxadiazole derivative potentiates apoptosis by targeting MAP kinase in triple negative breast cancer cells

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**ISBN: 07391102 (ISSN), DOI: 10.1080/07391102.2023.2274973, (2023)**

## Abstract

Women below 40 years greatly suffer from triple negative breast cancers (TNBCs). Compared to other breast cancer cases, the poor prognosis and lower survival rate of TNBC patients make it an alarming task to save the human era from this dreadful disease. Therefore, identifying potential novel leads is urgently required to combat the TNBC. To discover a novel anticancer agent, we synthesized a series of novel 4-aminophenolbenzamide-1,3,4 oxadiazole hybrid analogues (7a–l). The structure of the compounds was confirmed by spectral methods (1H & 13C NMR, IR and MS). All the compounds were subjected to their in-silico and in-vitro antiproliferative studies against the TNBC cell lines MDA-MB-468 and MDA-MB-231. The investigations revealed that 7i has significantly promoted apoptosis against MDA-MB-468 and MDA-MB-231 cells with IC50 values of 16.89 and 19.43 μM, respectively. Molecular docking of 7i, with MAPK has exhibited the highest binding score of −7.10 kcal/mol by interacting with crucial amino acids present at the active sites. Molecular docking is further validated with molecular dynamic studies with simulation for 100 ns, depicting various stable interactions with MAPK. Compound 7i, forms stable H-bonds and π–π stacking with amino acid residues. Molecular dynamic simulation (MDS) reveals that hydrophobic and water bridges were very prominent for 7i to bind, with the amino acid residues in close proximity to the active site of p38 MAPK. The investigations show that the In-vitro antiproliferative study of 7i agreed with the in-silico studies. Collectively, our investigations depict 7i as a potent novel lead for the inhibition of TNBCs by targeting p38 MAPK. Communicated by Ramaswamy H. Sarma.

**CHIJ-15**

# Design, synthesis and docking studies of novel 4-aminophenol-1,2,4-oxadiazole hybrids as apoptosis inducers against triple negative breast cancer cells targeting MAP kinase

**Dhanalakshmi, B., Anil Kumar, B.M., Srinivasa Murthy, V., Srinivasa, S.M., Vivek, H.K., Sennappan, M., Rangappa, S.**

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**ISBN: 07391102 (ISSN), DOI-10.1080/07391102.2023.2239912, (2023)**

## Abstract

In our study, a series of novel 4-aminophenol benzamide-1,2,4-oxadiazole hybrid analogues have been designed and synthesized by condensing 4-hydroxyphenyl arylamides (3a–c) and 5-chloromethyl-3-aryl-1,2,4-oxadiazoles (6a–d). The structure of the synthesised compounds was verified by various spectroscopic techniques (1H NMR, 13C NMR, IR and LC-MS). All the prepared compounds were subjected to in silico and in vitro antiproliferative study against TNBC cell lines MDA-MB-468 and MDA-MB-231. The investigations revealed that compound 7k significantly promoted apoptosis against MDA-MB-468 and MDA-MB-231 cells with IC50 values of 22.31 μM and 26.27 μM, respectively. Compound 7k interacted with crucial active sites of MAPK and exhibited the highest docking score of −7.06 kcal/mol. Docking was validated with molecular dynamic studies with simulation for 100 ns, depicting various stable interactions with MAPK. Consequently, 7k forms stable H-Bonds and π-π stacking with amino acid residues along with π-cation. Our investigations reveal that the in vitro antiproliferative study of 7k was in good correlation with the in-silico studies. Hence, 7k serves as a potential novel lead for the inhibition of TNBCs by downregulating MAPK P38. Communicated by Ramaswamy H. Sarma. 

**CHIJ-16**

# Citric acid assisted one-pot approach to synthesize CuO, CuO/Cu2O, Cu/Cu2O, and metallic Cu: potential electrocatalyst for enhanced OER(Article)

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**ISBN: 09477047 (ISSN), DOI: 10.1007/s11581-022-04851-6, Pages: 711-719, Volume-29, (2023)**

## Abstract

Herein, one-pot synthesis protocol has been proposed to synthesize CuO, binary Cu2O/CuO and Cu/Cu2O nanocomposite, and metallic Cu with the assistance of varied amounts of citric acid. The observed results demonstrate that the oxidizer-to-fuel (O: F) ratio of 1:0.5 and 1:1 yields pure CuO while the O:F ratio of 1:5 and 1:10 produces Cu2O/CuO and Cu/Cu2O binary nanocomposite, respectively. Further increase in the O:F ratio to 1:20 yields pure metallic copper. The prepared copper-based electrocatalysts were immobilized on nickel foam and tested for alkaline water electrolysis where pure CuO anode exhibits superior oxygen evolution reaction (OER) activity. The CuO prepared using O:F ratio of 1:0.5 and 1:1 exhibits magnificent OER performance as compared to Cu2O/CuO, Cu/Cu2O, and pure metallic copper. Particularly, the CuO derived from O:F ratio of 1:1 requires an overpotential of 360 mV and 560 mV to achieve the current density of 100 mA cm−2 and 1100 mA cm−2, respectively with excellent stability over 25 h. The superior performance of CuO is ascribed due to the existence of high catalytic sites and low charge transfer resistance.

# NATIONAL/INTERNATIONAL BOOK CHAPTERS

## CHIINB-01

### Mental Health Disorder through Electroencephalogram Analysis using Computational Model (Book Chapter)

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**CRC Press, ISBN: 978-100383627-8;978-103241915-2,**
**DOI: 10.1201/9781003363361-12, Pages 207-225 (2024)**

## Abstract

Mental health disorders (MHDs) are characterized by various symptoms like anxiety, stress, overeating, mental fatigue, phobia, insomnia, etc. These disorders may lead to substantial morbidity in humans. About 10% of the population of the world currently suffers from some form of mental illness. This entails a huge burden on medical services and the economy due to assistance needed by patients, disabled human beings, and aged geriatric people. The chaste approach to detecting mental illnesses relies on clinical assessment through dispassionate inquiry. This depends on the patient's reactions to a validated questionnaire by observing patient behaviour and discussion with family and relatives. However, there are no settled means to discover mental health disorders from EEG brainwaves. Therefore, research into using EEG brainwaves for clinical assessment of MHDs is alive and presents an excellent possibility to improve our understanding and clinical mediations. In this study, an orderly review of more than 80 research articles utilizing the PRISMA-P orderly review protocol is done to resolve their research methods and outcomes. The study analyzes EEG brainwaves with their domain analysis, preprocessing, classification accuracy, and the cause-and-effect of various mental health disorders. Additionally, this review paper examines the machine learning model for EEG analysis and classification techniques for better accuracy. The comparative study of multiple psychological disorders is carried out, which classifies them into different categories to provide valuable insights into mental health for future study and predictions. © 2024 selection and editorial matter, Bhanu Chander, Koppala Guravaiah, B. Anoop, and G. Kumaravelan; individual chapters, the contributors.

## CHIINB-02

### Influence of Machine Learning Technique in Unmanned Aerial Vehicle

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**ISBN: 9781000872453 (ISBN); 9781032171685 (ISBN), DOI 10.1201/9781003252085-3, Pages 43-57, (2023)**

## Abstract

Drones grant extra freedom in their ability to operate even when they are away from the ground. The exploration premium on the utilization of UAV alongside Artificial Intelligence (AI) and its calculations in various regions and areas is of great significance. The goal was to blend the extension and significance of AI models in upgrading Unmanned Aerial Vehicles abilities, answers for issues, and various application regions. The AI execution has decreased quantities of difficulties to Unmanned Aerial Vehicles other than improving the capacities and making the way for the various areas. The blend of Unmanned Aerial Vehicles and AI has brought about quick, worthwhile yields, flying at low elevation, little in size, high goal pictures and lightweight. The UAV and AI have massive extensions in logical examination. This examination has blended exploration on UAV and AI execution. The current investigation found that explorers in this space are inconsistent and greater part of them identifies with the PC/remote organization, keen urban areas, military, horticulture, mining, and untamed life measurable examination. © 2023 selection and editorial matter, Saravanan Krishnan and M. Murugappan; individual chapters, the contributors.

# CHIINB-03

## Predicting cryptocurrency prices model using a stacked sparse autoencoder and Bayesian optimization

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2. Dayananda Sagar University, India
3. Seshadripuram Evening College, India

## Abstract
In recent years, digital currencies, also known as cybercash, digital money, and electronic money, have gained significant attention from researchers and investors alike. Cryptocurrency has emerged as a result of advancements in financial technology and has presented a unique opening for research in the field. However, predicting the prices of cryptocurrencies is a challenging task due to their dynamic and volatile nature. This study aims to address this challenge by introducing a new prediction model called Bayesian optimization with stacked sparse autoencoder-based cryptocurrency price prediction (BOSSAE-CPP). The main objective of this model is to effectively predict the prices of cryptocurrencies. To achieve this goal, the BOSSAE-CPP model employs a stacked sparse autoencoder (SSAE) for the prediction process and resulting in improved predictive outcomes. The results were compared to other models, and it was found that the BOSSAE-CPP model performed significantly better. © 2023, IGI Global.

# CHIINB-04

## The role of social media in empowering digital financial literacy

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**ISBN:**
**9781668474518 (ISBN); 9781668474501 (ISBN),**
**DOI-10.4018/978-1-6684-7450-1.ch006, pages- 80-96, (2023)**

## Abstract

This systematic review examined the role of social media in enhancing financial literacy among individuals by collecting and reviewing 60 articles published from 2021 to 2023. The findings revealed that social media has a positive impact on financial literacy through the dissemination of financial education, promotion of financial awareness, and sharing of financial experiences. The review also identified digital financial literacy, entrepreneurial learning, and financial knowledge as significant determinants of financial literacy, while demographic characteristics, social media usage behavior, risk attitude, and overconfidence played a role in determining financial literacy. The study recommends that financial institutions, policymakers, and educators leverage social media for promoting financial literacy, and social media usage skills to improve financial literacy among individuals. Overall, the study suggests that the use of social media can democratize financial literacy and enable individuals from diverse backgrounds to access financial education and information. 

## CHINB-05

### Load Balancing Algorithms in Cloud Computing

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**ISBN: 21953988 (ISSN), DOI-10.1007/978-981-19-2358-6_45, page- 483-493, (2023)**

## Abstract

The evolving nature of cloud computing in recent years has increased the demand for accessing resources online. This has resulted in a need to manage more traffic and a greater number of requests for cloud servers. This continuing growth of requests necessitates a more effective load balancer which distributes the workload across various instances. It reduces the risk of experiencing performance issues, the response time of a task can be minimized, and the resource utilization can also be improved. Many cloud-based companies are using both static and dynamic load balancing algorithms. This paper critically reviews various types of load balancing algorithms based on performance metrics. 

# CHINB-06

## Role of Explainable Edge AI to Resolve Real Time Problem


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**ISBN: 1860949X (ISSN), DOI-10.1007/978-3-031-18292-1_7, Volume-1072, Page- 101-116, (2023)**


## Abstract


The growth of information technology (IT) has resulted in physical de-vices being connected to the internet and having the ability to recognize other devices. Artificial Intelligence algorithms are processed on edge or the devices of users. Edge Computing based on the same premise, stores, processes, and manages data directly at Internet of Things (IoT) endpoints. Edge artificial intelligence uses the device's hardware to process data and performs machine learning and deep learning procedures. In the model, you can troubleshoot and improve model performance while also assisting others in understanding the behavior of your models. To make the area more real, explainable edge devices come in a wide range of costs and capabilities. A decade ago, we couldn't imagine that explainable edge artificial intelligence would be at today's level. Now it is a part of industries and even devices for customer service. The best example of explainable edge AI is virtual assistants such as Alexa, google assistant. They learn from the user's world and phrases and can store them directly on the device. These are just a few examples later, and we have possible applications in future works on the explainable edge artificial intelligence. Edge Computing Platform facilitates the development and elastic operation of apps and services. Its benefits the AI assisting in overcoming the technical obstacles that AI-enabled apps experience. Combination of edge and AI is buzzwords within the industry to deliver the performance and reduce the cost compared to state of arts XAI applications. Moreover, edge artificial intelligence is reducing the latency, improving user experience, and reducing the necessary bandwidth, consequently reducing the costs of internet services. It surfs this movement since the need for data processing on the device themselves also represents the increasing use of artificial intelligence. Artificial intelligence edge processing focused on model which trained them in central data center using historical datasets. Compression techniques of data that enables squeezing large artificial intelligence models into small hardware form factors could push some training to the edge over time.

## CHIIC-01

### A Survey of Deep Learning Region Proposal and Background Recognition Techniques for Moving Object Detection

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**ISBN- 23674512 (ISSN), DOI-10.1007/978-981-19-3035-5_12, Volume 141, Pages-147-164, (2023)**

## Abstract

Object detection is the technique of locating targets in an image scene. Moving object detection is to track the object in successive frames which forms the video. Moving object detection forms the primary step in surveillance applications and traffic monitoring systems. With the advent of deep learning remarkable performance is observed in object detection. But the following challenges of detecting small and low-resolution moving objects in the region of interest (ROI), objects with infrequent motion still remain. Deep learning background detection techniques aim at cancelling global camera motion and background movements. The review focuses on the strengths and weaknesses of various deep learning-based moving target region proposal networks and background separation methods. 

# DEPARTMENT OF MATHEMATICS
# SCHOOL OF ENGINEERING

## Publication Summary

| | | |
|---|---|---|
| **International Journals** | **8** | **(MATIJ-01 – MATIJ-08)** |
| **International Conference** | **3** | **(MATIC-01 – MATIC-03)** |

**DEPARTMENT OF MATHEMATICS**
**SCHOOL OF ENGINEERING**
**INTERNATIONAL JOURNAL PUBLICATIONS**

## MATIJ-01

### Nonlocal effect on shear wave propagation in a fiber-reinforced poroelastic layered structure subjected to interfacial impulsive disturbance

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**ISSN: 02677261 (ISSN), DOI: 10.1016/j.soildyn.2023.108307, Volume-176, (2024)**

## Abstract

The present study illuminates the influence of impulsive line source on Horizontally polarized shear (SH) waves propagating in a stratified structure consisting of two distinct nonlocal fiber-reinforced layers with voids over a foundation with nonlocal functionally graded fiber-reinforced substrate with voids. The governing equations for a nonlocal fiber-reinforced poroelastic medium are established. The proposed mathematical model incorporates the Green's function technique and the Fourier transformation to yield the complex dispersion relation of the propagating wave. The study discloses the existence of two wave fronts of SH-waves propagating with different speeds through the layered structure. The second wave front arises as a result of existence of void pores, while the first wave front defines SH-wave propagation in a nonlocal fiber-reinforced layered structure. Each wave front possesses individual critical frequency beyond which they fail to propagate. Speeds of both wave fronts are influenced by the appearance of nonlocality parameter. Using MATHEMATICA, several graphs have been plotted to demonstrate the impact of key parameters on the dispersion and attenuation of both wave fronts. Some notable cases have been derived which validate the present mathematical model. © 2023 Elsevier Ltd.

# MATIJ-02

**A comparative study of wave scattering by non-porous and porous flexible plates in the presence of a submerged porous structure**

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**ISBN: 00256455 (ISSN), DOI-10.1007/s11012-023-01679-w,**
**Volume 58, page- 1329-1346, (2023)**

## Abstract

Water wave scattering and response of a flexible, floating plate in the presence of a submerged bottom founded rectangular porous structure which is at a finite distance from the plate, is investigated using matched eigenfunctions. The effect of obliqueness of incident wave and the gap between the two structures is examined in detail. The impact of plate porosity is highlighted by comparing the key features of scattering by non-porous and porous plates. The code is validated by comparing with documented outcomes in the literature. The energy balance relations for the problem are derived and verified. The presence of the submerged structure results in increased reflection and reduced transmission by both impermeable and porous plates. Vertical wave forces acting on the plate also reduce by over 44 %. However, energy dissipation in the system increases only when the plate is impermeable and shows a marginal decline when the plate is porous. 

## MATIJ-03

### Computing molecular descriptors of chitosan derivatives and its M-polynomial expressions

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**ISBN: 29810221**
**(ISSN), DOI-10.48309/jmpcr.2023.178536, Volume-5, Pages- 953-968, (2023)**

## Abstract

The fundamental topology of the structure of chemical compounds can be better understood by the method of topological indices/numerical descriptors. Topological index depicts the chemical characteristic of a molecule in numerical form. Topological indices are used for modelling of physicochemical, biological, and pharmacokinetic properties of the compounds. It plays vital role in the QSAR/QSPR studies. Descriptor's ability to extract information typically depends on the type of molecular representation used and the specified algorithm. These numerical values help the researchers in choosing the right compound for the drug design. Chitin and chitosan derivatives act as excellent suppressor of anti-tumour and anticancer activities in living beings. The increasing morbidity and mortality rate worldwide are correlated with two most important diseases viz., obesity and diabetes. To improve health condition and prevention of chronic diseases such as asthma, arthritis, hepatitis, gastritis, atherosclerosis etc, chitin, chitosan and their derivatives play as immune-enhancing anti-inflammatory potential. As chitin and chitosan have remarkable applications discussed above, this work pinpoints on computing a polynomial from which topological indices can be extracted for specific values of the parameters. In this work, the focus is on a type of polynomial known as M-polynomial from which various 11 degree-based TIs are derived for molecular graph of chitosan derivatives such as α, β and γ-chitins. © 2023 by SPC (Sami Publishing Company).

# MATIJ-04

## Assessing the impact of hyperviscosity on stenosis shape in COVID patients

**Shankar Narayan, S., Saha, S., Bhattacharjee, A., Khan, M.I., Zouidi, F., Eldin, S.M.**

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**ISBN; 20904479 (ISSN), DOI-**
**10.1016/j.asej.2023.102227, Volume-14, (2023)**

## Abstract

Recent studies have proven that the shape of the stenosis greatly affects the flow characteristics. The 2D rigid wall model examined in this research is analyzed mathematically using various principles and results of functional analysis for the existence and uniqueness of the solution. The model taken into consideration for the current study has also been used to examine the consequences of hyperviscosity in COVID-19 cases. The results of the investigation surmise that the maximum peak velocity of 3.155m/s and the minimum trough pressure of 7041.538Pa were manifested in the high slope geometry. Also, the number of spots over the upper wall of high slope geometry bearing the least wall shear stress was considerably high when compared to the other geometries. The study deduced that the arterial segment bearing dual high slope stenosis was more susceptible to new plaques, plaque ruptures, and hyper viscous syndrome. 

# MATIJ-05

**Pollutant dispersion with an intermediate source in a semi-infinite aquifer**

**Radha, R., Singh, R.K., Singh, M.K.**

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**ISBN; 23636203 (ISSN), DOI10.1007/s40808-023-01827-x,**
**Volume-10. Pages-1077-1093, (2024)**

## Abstract

Groundwater pollution is a one of the major problems of our environment caused by various sources such as industries, pesticides, fertilizers, and mining activities. Convection–dispersion equation (CDE) is employed to model the transport of groundwater contamination mathematically, but it can be challenging due to complex geometries and hydrogeological characteristics. Moreover, for several realistic scenarios, the input contaminant source might be located at an intermediate location of the domain, leading to dispersion in forward and backward directions from the source point. Few previous works in this context have been approached analytically and limited to the one-dimensional (1D) assumption of the medium. In this study, a pollutant dispersion with an intermediate time-dependent point source is modelled mathematically. The forward–backward pollutant distribution in a two-dimensional (2D) semi-infinite transient groundwater flow field is investigated. The concentration gradients are taken as zero across the final boundaries of the domain. The effect of off-diagonal dispersion is included in the model equation. The impact of various hydrological input parameters, such as dispersion, porosity, distribution coefficient, decay parameter, etc., on the pollutant transport is examined graphically. The proposed transport model problem is solved numerically and analytically using the Crank–Nicolson (CN) method, and Laplace transform technique (LTT), respectively. The accuracy of the proposed numerical method is evaluated by comparing it with the analytical solution using graphical and statistical measures. The obtained numerical solution of the 2D model problem shows a good agreement with the analytical solution. This may interest researchers working in surface water and vadose zone hydrology areas. 

## MATIJ-06

### CFD analysis of the hyper-viscous effects on blood flow across abdominal aortic aneurysm in COVID patients: multiphysics approach

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**ISBN10255842 (ISSN), DOI-10.1080/10255842.2023.2194474, (2023)**

## Abstract

Recent research has shown that individuals suffering from COVID-19 are accommodating an elevated level of blood viscosity due to the morphological changes in blood cells. As viscosity is a major flow parameter influencing the flow across a stenosis or an aneurysm, the examination of the significance of hyperviscosity in COVID patients is imperative in arterial pathologies. In this research, we have considered a patient-specific case in which the aneurysm is located along the abdominal aortal walls. Recent research on the side effects of COVID-19 voiced out the various effects on the circulatory system of humans. Also, as abdominal aneurysms exist very often among individuals, causing the death of 150–200 million every year, the hyper-viscous effects of blood on the flow across the diseased aorta are explored by considering the elevated viscosity levels. In vitro explorations contribute considerably to the clinical methods and treatments to be regarded. The objective of the present inquest is to research the flow field in aneurysmatic-COVID-affected patients considering the elastic nature of vessel walls, using the arbitrary Lagrangian-Eulerian approach. The study supports the various clinical findings that voiced the detrimental effects associated with blood hyperviscosity. The simulation results obtained, by solving the fluid mechanics' equations coupled with the solid mechanics' equations, employing a FEM solver suggest that the elevated stress imparted by the hyper-viscous flows on the walls of the aneurysmal aorta can trigger the fastening of the aneurysmal sac enlargement or rupture. 

## MATIJ-07

### On Bessel-Maitland Function and m-Parameter Mittag-Leffler Function Associated with Fractional Calculus Operators and its Applications

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**ISBN: 19350090 (ISSN), DOI: 10.18576/amis/170110, Volume-17, Pages: 79-93, (2023)**

## Abstract

Fractional calculus is of utmost importance because of its extensive use in various fields of inequality theory, applied mathematics, science and engineering. In this paper, our aim is to discuss some image formulas involving various fractional operators that has kernel as the Appell function and the Saigo operators with Bessel-Maitland function and m-parameter Mittag-Leffler function. The results are then represented in the form of the generalized Wright-hypergeometric function. Further, some special and particular cases involving the Mittag-Leffler function, the Wiman function, the Prabhakar function among other generalizations of the Mittag-Leffler function are induced. © 2023 NSP Natural Sciences Publishing Cor.

# MATIJ-08

**On some new inequalities and fractional kinetic equations associated with extended gauss hypergeometric and confluent hypergeometric function**

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**ISBN: 26613352 (ISSN), DOI: 10.1142/S2661335223500090, (2023)**

## Abstract

Fractional kinetic equations are of immense importance in describing and solving numerous intriguing problems of physics and astrophysics. Inequalities are important topics in special functions. In this paper, we studied the monotonicity of the extended Gauss and confluent hypergeometric function that are derived by using the inequalities on generalized beta function involving Appell series and Lauricella function. We also establish generalized fractional kinetic equation involving extended hypergeometric and confluent hypergeometric functions. The solutions of generalized fractional kinetic equation is derived and studied as an application of extended hypergeometric and confluent hypergeometric function using the General integral transform. The results obtained here are general and can be used to derive many new solutions of fractional kinetic equations involving various types of special functions. 

## MATIC-01

### Modeling and Stability Analysis of SEIRS Model for Understanding the Tuberculosis Disease Dynamics

**Jain, K., Bhattacharjee, A.**

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**(ISSN); 9780735445536 (ISBN), DOI-10.1063/5.0114135**
**Pages 100-275, Volume-2649, (2023)**

## Abstract

We study an SEIRS epidemiological model for the infectious disease Tuberculosis using differential equations. The entry of an infectious individual into a susceptible population leads to the spread of infection. There are chances of getting infected even after recovery, which has been taken into consideration. When the infection will establish itself or diminish is researched and validated by stability of equilibrium. The factor which gives the conclusion of equilibrium is the Basic Reproduction Number R0. If $R0 < 1$ then infection dies out and if $R0 > 1$, the infection would establish itself. 

## MATIC-02

### QSPR Analysis of VL Index with Octane Isomers

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**ISBN; 0094243X (ISSN); 9780735445536 (ISBN),**
**DOI-10.1063/5.0117457, Volum-2649, (2023)**

# Abstract

In this study, newly proposed topological index, VL index and a few selected topological descriptors are used to predict the physico- chemical properties of octane isomers. The values of topological descriptors were calculated directly from the structure of the octane isomers. It is found that certain topological descriptors are good for predicting the physical properties of Octane isomers. In this study, four physical properties are studied, which include: Entropy(S), Acentric factor (Acen Fac), Enthalpy of vaporization (HVAP) and Standard enthalpy of vaporization (DHVAP). QSPR prediction models were developed based on the derived values of the topological descriptors and physical properties using simple linear regression and multiple regression techniques. 

## MATIC-03

### Bounds Analysis on Topological Indices of Semi Total Point Graph of Vertex Corona Graph

**Muddulapuram, M., Togarichetu, D., Halappa, N.V., Veerabhadraiah, L.**

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**ISBN; 0094243X (ISSN); 9780735445536 (ISBN), Volume-2649, (2023)**

## Abstract

Topological indices are mathematical tools that correlate the Chemical structure with various physical properties, Chemical reactivity or biological activity numerically. In this paper, we provide lower and upper bounds for few topological indices such as first Zagreb index, Sombar index, VL index, Y-coindex, Harmonic index. 

# DEPARTMENT OF PHYSICS
# SCHOOL OF ENGINEERING

## Publication Summary

| | | |
|---|---|---|
| International Journal | 19 | (PHYIJ-01) (PHYIJ-19) |
| International Conference | 02 | (PHYIC- 01) (PHYIC- 02) |

# DEPARTMENTS OF PHYSICS
# SCHOOL OF ENGINEERING
# INTERNATIONAL JOURNAL PUBLICATIONS

## PHYIJ- 01

### Insights from Ethylene Glycol Oxidation toward Reduction in the Overpotential Using Sonochemically Derived Orthorhombic CoV2O6·2H2O Sheetlike Structures

**Ashoka, S., Navya, H.S., Meghana, S.T., Yogesh, K., Kumar, S.G.**

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3. Department of Chemistry, RV College of Engineering, Bengaluru, 560059, India

**ISSN: 24699926, DOI: 10.1103/PhysRevA.108.063107, Volume:108,**

## Abstract

The use of sustainable and green hydrogen fuel has received significant attention in recent years, and their production via water splitting technology is sternly hindered by the thermodynamically unfavorable anodic reaction. Herein, orthorhombic CoV2O6·2H2O nanosheets (NSs) were obtained by a facile sonochemical method (328 K, 1 h), and their performance toward the oxygen evolution reaction (OER) is reported for the first time. The hierarchical sheetlike structures render the significant electrochemical active surface area and lowest charge transfer resistance in the alkaline medium (KOH) constituting ethylene glycol (EG). The CoV2O6·2H2O NSs modified nickel foam (CoV2O6·2H2O NSs/NF) unveils an overpotential of 340, 360, and 400 mV at the high current densities of 100, 200, and 500 mA cm-2, respectively, at the optimized content of EG (∼10 mmol). The electrolyzer functioning with CoV2O6·2H2O NSs/NF and KOH solution of EG can reduce electrical energy consumption by ∼11.5% and thereby suppress the hydrogen production cost accompanied by the generation of value-added products. The present investigation spotlights the combined effects of low-temperature synthesis, hierarchical structures, and presence of EG to promote the OER kinetics. © 2024 American Chemical Society.

## PHYIJ- 02

### Wideband study of the brightest black hole X-ray binary 4U 1543−47 in the 2021 outburst: signature of disc-wind regulated accretion

**Prabhakar, G., Mandal, S., Bhuvana, G.R., Nandi, A.**

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**ISSN: 00358711, DOI: 10.1093/mnras/stad080, Volume 520, Pages 4889-4901, (2023)**

## Abstract

A comprehensive wideband spectral analysis of the brightest black hole X-ray binary 4U 1543−47 during its 2021 outburst is carried out for the first time using NICER, NuSTAR, and AstroSat observations by phenomenological and reflection modelling. The source attains a super-Eddington peak luminosity and remains in the soft state, with a small fraction (< 3 per cent) of the inverse-Comptonized photons. The spectral modelling reveals a steep photon index (Γ ∼ 2–2.6) and relatively high inner disc temperature (Tin ∼ 0.9–1.27 keV). The line-of-sight column density varies between (0.45–0.54) × 1022 cm−2. Reflection modelling using the RELXILL model suggests that 4U 1543−47 is a low-inclination system (θ ∼ 32◦–40◦). The accretion disc is highly ionized (log ξ > 3) and has super solar abundance (3.6–10 AFe, ⊙) over the entire period of study. We detected a prominent dynamic absorption feature between ∼8 and 11 keV in the spectra throughout the outburst. This detection is the first of its kind for X-ray binaries. We infer that the absorption of the primary X-ray photons by the highly ionized, fast-moving disc winds can produce the observed absorption feature. The phenomenological spectral modelling also shows the presence of a neutral absorption feature ∼7.1–7.4 keV, and both ionized and neutral absorption components follow each other with a delay of a typical viscous time-scale of 10–15 d. © 2023 The Author(s) Published by Oxford University Press on behalf of Royal Astronomical Society.

## PHYIJ- 03

### Evolution of large-grained $CuSbS_2$ thin films by rapid sulfurization of evaporated Cu–Sb precursor stacks for photovoltaics application

**Chalapathi, U., Bhaskar, P.U., Cheruku, R., Sambasivam, S., Park, S.-H.**

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**ISBN: 02728842 (ISSN), DOI: 10.1016/j.ceramint.2022.09.365, Volume-49, Pages-4758-4763**

## Abstract

Ternary chalcostibite ($CuSbS_2$) is a non-toxic and earth-abundant thin-film solar cell material with an optimal band gap, high optical absorption coefficient, and p-type electrical conductivity. Large-grained $CuSbS_2$ thin films are crystallized by sulfurizing thermally evaporated Cu/Sb/Cu precursor stacks at 450 °C for a short duration of 1–10 min. The precursor stacks sulfurized at 450 °C for 1 min resulted in the formation of a Cu-deficient (to a small extent) and Sb-rich large-grained thin-films of $CuSbS_2$ without any secondary phases. Increasing the sulfurization duration from 5 min to 10 min resulted in the formation of near-stoichiometric $CuSbS_2$ films with columnar growth and more uniformly sized grains. The direct band gap of the films is found to be 1.42 eV. The electrical resistivity decreases from 28.6 to 16.7 Ω cm upon increasing the sulfurization duration from 1 to 10 min, respectively, and the hole mobility is in the range of 0.44–0.56 $cm^2 V^{-1} s^{-1}$. The solar cells fabricated using the $CuSbS_2$ films sulfurized for a duration of 5 min exhibited a maximum power conversion efficiency of 2.5% with an open-circuit voltage of 568.7 mV and a short-circuit current density of 13.8 $mA/cm^2$. This study provides a pathway for the development of high-efficiency $CuSbS_2$ solar cells. 

## PHYIJ- 04

### Attosecond time delay in atomic photoionization: Angular-dependent transition from dipole to quadrupole and spin-flip dynamics

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## Abstract

The angular distribution of attosecond Wigner time delay has been investigated including both quadrupole and relativistic effects using the relativistic-random-phase approximation that is based on the Dirac equation and includes significant aspects of many-body correlations. The results show a dramatic evolution of the time delay from (essentially nonrelativistic) dipole to quadrupole and spin-flip dynamics as a function of angle, thereby providing a venue for studying these interactions at the attosecond level.

## PHYIJ- 05

### Influence of (Sr, Zr) Ion Co-doping on the Enhanced Magnetic and Dielectric Response of $BiFeO_3$

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**ISBN:03615235 (ISSN), DOI:10.1007/s11664-023-10867-z, Volume-53, Pages-786-800, (2024)**

## Abstract

$Bi_{1-x}Sr_xFe_{1-y}Zr_yO_3$ (BSFZO, x = 0–0.2 and y = 0–0.2) polycrystalline materials were prepared using the sol–gel method. A thorough investigation was conducted into the impact of ion co-doping (Sr, Zr) on the structural, magnetic, and dielectric characteristics of $BiFeO_3$. Rietveld analysis of XRD data revealed a rhombohedral structure with space group R3c. Measured M–H loops suggested room-temperature ferromagnetism in the BSFZO compound. With (Sr, Zr) co-doping, antiferromagnetic $BiFeO_3$ transformed into a weak ferromagnetic material. The dielectric response ($\varepsilon'(f)$ and $\varepsilon''(f)$) of the parent $BiFeO_3$ samples showed an exponential decay with high permittivity values, whereas the doped compounds were found to exhibit step-like behaviour. The dielectric constant exhibited frequency-dependent behavior, demonstrating a decrease in the dielectric constant at 2 MHz. This reduction was attributed to the conductivity induced by the mixed valence. Detailed dielectric relaxation mechanisms are presented. 

## PHYIJ- 06

### Magnesium ion conducting PVB-based polymer electrolyte for solid-state magnesium batteries

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**ISBN: 09574522, DOI: 10.1007/s10854-024-12017-5, Volume 35, (2024)**

## Abstract

Polymer electrolytes have attained prominence as a compelling paradigm in the realm of battery applications, heralding a new era of advanced energy storage systems. Considering the advantages and recent advancements, the primary objective of this investigation was directed towards formulating a solid-state polymer electrolyte film for magnesium-ion conducting batteries by employing solution-cast method with Polyvinyl Butyral (PVB) polymer doped with MgCl2 6H2O. The incorporation of MgCl2 6H2O into the PVB matrix induces discernible changes in structural characteristics, significant modification of the electronic band structure, and thermal stability in the resulting polymer electrolyte films. The optimized composition PVB: MgCl2 6H2O (70:30) demonstrates a moderate ionic conductivity of 1.8983 × 10−6 S/cm at ambient temperature, highlighting its potential for efficient ion conduction and charge transport. Electrochemical cell analysis under a constant 100 kΩ load reveals an open circuit voltage of 2.3 V and a short circuit current of 1.3 μA. 

## PHYIJ- 07

### Multimission view of the low-luminosity 'obscured' phase of GRS 1915+105

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**Volume-525, Pages-489-507, (2023)**

## Abstract

GRS 1915+105 has been observed in an 'obscured' phase since 2019 May, exhibiting steady and low X-ray luminosities with sporadic re-brightenings. In this paper, we perform a comprehensive and wide-band analysis of the spectral and timing properties of the source during the period 2019-2021 using observations from AstroSat (SXT: 0.5-8 keV; LAXPC: 3-60 keV), the Neutron star Interior Composition Explorer (NICER) (0.5-12 keV), and the Nuclear Spectroscopic Telescope Array (NuSTAR) (3-60 keV). Spectral analysis reveals the presence of a highly variable obscurer (1022-1024 atoms cm-2) throughout the observation period. The source is detected in the low/hard state for most of the time, with the spectra being described by a Comptonized component (Γ ~1.16-1.79, kTe ~2-31 keV). The source spectra steepen (Γ ~2.5), indicating a softening of the spectrum, during the rise of the re-brightenings. Various emission and absorption lines corresponding to the neutral Fe Kα, Fe xxv Kα, Fe xxvi Kα, and the Ni xxviii Kα were detected, with the equivalent widths varying in the range 70 eV-3.5 keV. The column density of the absorbing plasma varied in the range 1016-1018 atoms cm-2 at a distance ≤2 × 1010 cm. Interestingly, the source is also seen to exhibit various variability classes (ρ, λ, δ, χ) at relatively low luminosities (~0.01 LEdd) during the re-brightening phases. Different variability classes show the signature of quasi-periodic oscillations (νQPO: 20-180 mHz, rmsQPO: 7.5 per cent-16 per cent). The source showed a maximum bolometric luminosity (Lbol) of ~0.01 LEdd (re-brightening phases) and a minimum Lbol of 0.004 LEdd (quiet phase) during the period. We discuss the possible disc dynamics around the black hole during this low-luminosity 'obscured' phase. © 2023 The Author(s) Published by Oxford University Press on behalf of Royal Astronomical Society.

# PHYIJ- 08

**Broad-band X-ray properties of black holes GRS 1758−258 and 1E 1740.7−2942: AstroSat and NuSTAR results**

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**ISBN: 00358711 (ISSN), DOI:10.1093/mnras/stad446, Volume-520, Pages-5828-5844, (2023)**

## Abstract

We present the results on broad-band X-ray properties of persistent black hole binaries GRS 1758−258 and 1E 1740.7−2942 using AstroSat, NuSTAR, and Swift–XRT observations carried out during 2016–2022. We perform spectral modelling of both sources after eliminating the contamination in their LAXPC spectra from nearby X-ray sources. Preliminary spectral modelling using Comptonization and line emission (∼6.4 keV) models suggest that GRS 1758−258 occupies both dim-soft state (kTbb = 0.37 ± 0.01 keV, Γ ∼ 5.9, Lbol = 1 per cent of Eddington luminosity LEdd) and hard state (Γ = 1.64–2.22, kTe = 4–45 keV, Lbol = 1–5 per cent LEdd) that requires a multicolour disc blackbody model (kTin = 0.54 ± 0.01 keV) occasionally. 1E 1740.7−2942 instead is found only in hard state (Γ = 1.67–2.32, kTe = 5–16 keV, Lbol = 1–2 per cent LEdd). Reflection properties of both sources are studied by applying relativistic reflection model RELXILL to the broad-band spectra. Our results from AstroSat and NuSTAR consistently unveiled the presence of a Comptonizing region along with an ionized reflection region (ionization parameter log ξ = 2.7–3.8 and 2.7–4.7 erg cm s−1 in GRS 1758−258 and 1E 1740.7−2942, respectively) in both sources. Reflection modelling revealed GRS 1758−258 to have a high metal abundance (Afe = 3.9+0.4-0.3 times solar metal abundance) and inclination angle (i) of 61 ± 2◦. In case of 1E 1740.7−2942, i is constrained to be 55 ± 1◦. Finally, we discuss the implication of our findings in the context of accretion dynamics by comparing our results with the previous studies. 

# PHYIJ- 09

## Optical properties and electric modulus studies of TSP: $CH_3COONa$ based biopolymer electrolytes

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**ISBN: ISSN: 00304026, DOI: 10.1016/j.ijleo.2024.171661, Volume 301, (2024)**

## Abstract

The research of biopolymers for the creation of solid polymer electrolytes (SPE) for electrochemical devices has resulted from the green revolution. Various strategies have been used to build and characterise biopolymer-based membranes for proton and lithium-ion conduction. However, research on biopolymers based on sodium ions is uncommon in the literature. The solution cast approach is used in this work to create a SPE based on the biopolymer Tamarind Seed Polysaccharide (TSP) incorporated with sodium acetate ($CH_3COONa$). UV–visible optical absorption spectroscopy in the wavelength range of 200–800 nm was used to investigate the optical characteristics. From the studies of optical absorption, optical transmission, optical absorption coefficient, refractive index spectrum, extinction coefficient spectra, direct energy bandgap, indirect energy bandgap, optical absorption edge, Urbach – energy, and optical dielectric loss were calculated. The comparative study of the optical dielectric loss to the optical bandgap showed that the direct allowed transition was the most probable electronic transition for the prepared films. The calculated optical bandgap (Direct allowed) was decreased for 80:20 film from 5.51 eV (for pure TSP) to 4.88 eV. The direct, indirect, and absorption edges for pure TSP were all high, and when the salt concentration of $CH_3COONa$ increased, the above characteristics progressively decreased. For 80 % TSP: 20 % $CH_3COONa$ concentration, a low direct and indirect energy bandgap value was obtained. Tangent loss and electric modulus experiment results were then presented using AC Impedance data. For the 80:20 film, the tangent energy loss revealed a minimum and the electric modulus spectrum exhibited the zeroth tail is at its maximum. 

# PHYIJ- 10

## Structural and electrical properties of TSP: CH3COONa amorphous Biopolymer electrolytes for electrochemical cell applications

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**ISBN: 00223093 (ISSN), DOI: 10.1016/j.jnoncrysol.2023.122465, Volume-616, (2023)**

## Abstract

Solid biopolymer electrolytes have gained enormous attention recently due to their potential as non-toxic, biodegradable properties over their synthetic counterpart. Considering their uses in energy applications, the present investigation aims to synthesize and characterize solid biopolymer electrolytes comprising tamarind seed polysaccharide (TSP) as the host polymer and sodium acetate (CH3COONa) salt as the ionic dopant. The solution cast technique was employed to create free-standing tamarind seed polysaccharide (TSP): Sodium acetate (CH3COONa) solid polymer electrolyte films with varying weight percentages. X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR) studies investigated the structural and chemical correlation between TSP and CH3COONa. AC impedance spectroscopy was used to test the conductivity and dielectric properties of the prepared polymer films. The conductivity rises with increasing temperature. The maximum conductivity was found to be 1.95 × 10−4 S cm−1 for 80:20 (TSP: CH3COONa) wt.% ratio sample at room temperature (303 K), which was three orders of magnitude higher than the pure TSP (10−7 S cm−1). These polymer electrolyte films showed conductivity that altered with temperature, which follows Arrhenius's behaviour. Dielectric studies showed that dielectric constant and dielectric loss were high at low frequencies and decreased at high frequencies. Wagner's polarisation technique confirmed that charge transport in these polymer electrolyte systems was principally ionic, with the highest tion (∼ 0.99) and electrons having a negligible contribution. The discharge studies of the cell showed good stability and performance with OCV at 1.68 V and SCC at 0.69 mA. 

## PHYIJ- 11

### Temporal Response of Atoms Trapped in an Optical Dipole Trap: A Primer on Quantum Computing Speed

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**ISBN: 22182004 (ISSN), DOI: 10.3390/atoms11040072, Volume-11, (2023)**

## Abstract

An atom confined in an optical dipole trap is a promising candidate for a qubit. Analyzing the temporal response of such trapped atoms enables us to estimate the speed at which quantum computers operate. The present work models an atom in an optical dipole trap formed using crossed laser beams and further examines the photoionization time delay from such confined atoms. We study noble gas atoms, such as Ne (Z = 10), Ar (Z = 18), Kr (Z = 36), and Xe (Z = 54). The atoms are considered to be confined in an optical dipole trap using X-ray Free Electron Lasers (XFEL). The present work shows that the photoionization time delay of the trapped atoms is different compared with that of the free atoms. This analysis alerts us that while talking about the speed of quantum computing, the temporal response of the atoms in the trapped environment must also be accounted for. © 2023 by the authors.

## PHYIJ- 12

### Dramatic relativistic effects on the ns dipole angular distribution asymmetry parameter, βns, of heavy and superheavy elements

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**ISBN: 09534075 (ISSN), DOI: 10.1088/1361-6455/acb873, Volume-56, (2023)**

## Abstract

A theoretical study of the dipole photoelectron angular distribution asymmetry parameter, β, of the 6s, 5s and 4s subshells has been conducted for a range of closed-shell heavy, Hg (Z = 80), Rn (Z = 86), Ra (Z = 88) and superheavy, No (Z = 102), Cn (Z = 112), Og (Z = 118), Ubn (Z = 120) elements to understand the deviation of β from the nonrelativistic value of 2 owing to relativistic effects. It was found that the deviation, strongest in Cooper minimum regions, persists over all energy for all ns subshells, and the deviations increase with Z. Three levels of relativistic calculations were performed in order to pinpoint the particular interactions responsible for the details of the behavior of the ns β's as functions of energy, n, and Z and, in addition to the effects of the (relativistic) spin-orbit interaction, interchannel coupling was found to be of crucial importance in the determination of the β parameter in most of the situations studied. 

# PHYIJ- 13

**Photo-electrodes decorated with carbon quantum dots: Efficient dye-sensitized solar cells**

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**ISBN: 25901230 (ISSN), DOI: 10.1016/j.rineng.2023.101611, Volume-20, (2023)**

## Abstract

In this study, the blue and green carbon quantum dots (CQDs) are synthesized and applied to the photo-electrodes of dye-sensitized solar cells (DSSCs). The DSSCs exhibited high power conversion efficiency because of the conversion of ultraviolet to the visible region in photo-anode, and good catalytic activity in the photo-cathode. The blue color CQDs (BCQDs) and green color CQDs (GCQDs) are synthesized from the citric acid in a single pot process. We examine the influence of both CQDs decorated on photo-anode and photo-cathode and both photo-electrodes on the photovoltaic performance of the DSSCs. Furthermore, the DSSCs are studied by electrochemical impedance spectroscopy, cyclic voltammetry, and Tafel polarization data to study the charge transfer kinetics. The better performance observed from the DSSCs due to enhanced charge carrier collection through the CQDs. The photovoltaic results of DSSCs shown that the best efficiency shown by DSSC, which fabricated by both photo-electrodes decorated by CQDs. 

# PHYIJ- 14

## Two-step synthesis of a-NiCu (OH)2CO3/Na3NiCuCO3PO4: a battery-type electrode for pseudocapacitor applications

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**ISBN: 11440546 (ISSN), DOI: 10.1039/d2nj04762d, Volume-47, Pages- 4386-4401, (2023)**

## Abstract

Here, we report the environmentally friendly and cost-effective two-step synthesis of amorphous nickel-copper carbonate hydroxide on nickel-copper carbonophosphate (a-NiCu (OH)2CO3/Na3NiCuCO3PO4) using the alkaline (1 M KOH) etching of hydrothermally prepared Na3NiCuCO3PO4 at room temperature. The KOH etching creates a mesoporous structure, and the high specific surface area (171.14 m2 g−1) assists electrolytes in passing through the porous architecture more efficiently and facilitates high faradaic reactions. The KOH etched sample with a Ni: Cu ratio of 4: 1 in the precursor (Ni: Cu-80:20+KOH) exhibits excellent specific discharge capacitance of 3400.0 F g−1 at a current density of 1 A g−1. The assembled Ni: Cu-80:20+KOH based symmetric battery-type pseudocapacitor (with 1 mg mass loading) exhibits a maximum energy density of 32.4 W h kg−1 at a power density of 1.54 kW kg−1 with excellent cyclic stability (65% retention after 40 000 charge-discharge cycles at the current density of 5 A g−1). The symmetric supercapacitors (with 4 mg mass loading) connected in series can illuminate a red light-emitting diode (LED) for 18.16 min (two cells) and power a 6 V DC motor fan for 14 s (four cells). The features efficaciously illustrate that a-NiCu (OH)2CO3/Na3NiCuCO3PO4 is a promising electrode material for advance electronic applications. 

## PHYIJ- 15

### Electrochemical kinetic study and performance evaluation of surface-modified mesoporous sodium carbonophosphates nanostructures for pseudocapacitor applications

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**ISBN: 09258388 (ISSN), DOI: 10.1016/j.jallcom.2023.168711, Volume-939, (2023)**

## Abstract

Sodium carbonophosphates as a novel low-cost and safe electrode material have been widely researched for sodium and lithium-ion battery application. Here, we report the pseudocapacitive behavior of the surface-modified mesoporous Na3MCO3PO4 (M=Ni, Co, Mn and Cu) nanostructure compounds in 1 M KOH electrolyte at room temperature. The electrochemical kinetic performances are studied using cyclic voltammetry (CV) cycled from 10 mVs−1 to 100 mVs−1. The electrodes are found to follow different kinetic behaviors depending on the scan rate. Overall, the deep reconstructed Na3CoCO3PO4 (Co (OH)2/Co3O4 agglomerated nanoplates) electrode provided a high specific capacitance compared to the deep reconstructed Na3MnCO3PO4 (Mn (OH)2/Mn3O4) and surface-modified Na3NiCO3PO4 (Ni (OH)2/Na3NiCO3PO4) and Na3CuCO3PO4 (Cu(OH)2/Na3CuCO3PO4) based electrodes at the current density of 20 Ag−1. The fabricated symmetric supercapacitor based on the Co (OH)2/Co3O4 delivered an energy density of 14.5 Wh kg−1 at the ultrahigh power density of 20 kW kg−1 demonstrating its excellent rate performance suitable for electric vehicle applications. The surface-modified Ni (OH)2/Na3NiCO3PO4 based SSC device showed high retention of 116% initial capacitance after 70,000 charging–discharging cycles, revealing excellent cycling stability.

## PHYIJ- 16

### A novel polyaniline-based nanocomposite derived from used tea biomass: a promising electrocatalyst for oxygen evolution reaction

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**ISBN- 24701556 (ISSN), DOI- 10.1080/24701556.2023.2264274, (2023)**

## Abstract

A potential electrocatalyst for alkaline water electrolysis was prepared by using an inexpensive used tea dust biomass wherein the used tea dust biomass was subjected for calcination followed by polymerization with varied amounts of monomer, aniline, to prepare nanocomposites. The thoroughly characterized nanocomposites were tested as potential electrocatalysts for oxygen evolution reaction (OER). The nanocomposite prepared using 5 mL of aniline requires an overpotential of only 380 mV (1.61 V vs RHE) to generate the current density of 250 mA cm−2 while the sample prepared without aniline requires 450 mV (1.68 V vs RHE) to generate the same amount of current density. Adding optimum amounts of polyaniline increases the number of active sites and conductivity, which are beneficial to facilitate OER. This study demonstrates successful conversion of tea waste biomass, produced in every home, into potential electrocatalyst, which can be used to generate environmentally benign carbon free hydrogen fuel. © 2023 Taylor & Francis Group, LLC.

## PHYIJ- 17

### Correction to: Influence of $Sm^{3+}$ doped β-$Ga_2O_3$ thin films on structural, optical, and photoluminescence properties (Journal of Materials Science: Materials in Electronics, (2023), 34, 31, (2085), 10.1007/s10854-023-11505-4)

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## Abstract

In the Acknowledgements section of this article the information relating to credit given by co-author M. Dilip Kumar has to be corrected. The expression, "The author M. Dilip Kumar grateful to the Dr. Hidayath Ulla, Department of Physics, Presidency University, Bangalore, India for his support and guidance, also providing the synthesis facilities" should be removed. The correct acknowledgements is given below. The authors gratefully acknowledge the IISc Bangalore, India, and Centre of Excellence in Advanced Materials Research, Department of Physics, School of Applied Sciences, REVA University, Bangalore, India for providing the needful characterization facilities. © 2023, Springer Science+Business Media, LLC, part of Springer Nature.

# PHYIJ- 18

## Influence of Sm3+ doped β-Ga2O3 thin films on structural, optical, and photoluminescence properties

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**ISBN: 09574522 (ISSN), DOI:10.1007/s10854-023-11505-4, Volume-34, (2023)**

## Abstract

The pure and Sm-doped (1, 3, and 5 at%) β-Ga2O3 thin films were deposited on a glass substrate using the sol–gel spin coating method and investigated the structural, morphological, and optical properties. The XRD studies revealed that all deposited thin films exhibited polycrystalline monoclinic β-phase structure. The crystalline quality was greatly improved with the Sm-doping. The SEM–EDS, XPS, and Raman spectroscopy measurements confirmed the Sm element was successfully incorporated into the β-Ga2O3 host lattice. The photoluminescence spectra showed a wide blue band region centered at 439 nm in all the films. The average optical transmittance was above 73% in the visible spectra for all deposited films. The optical band gap energy (Eg) decreased from 4.83 eV for pure β-Ga2O3) film to 4.68 eV for 5 at% Sm-doped β-Ga2O3 films. 

# PHYIJ- 19

## Quadrupole Effects in the Photoionisation of Sodium 3s in the Vicinity of the Dipole Cooper Minimum

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**ISBN: 22182004 (ISSN), DOI: 10.3390/atoms11100125, Volume-11, (2023)**

## Abstract

A procedure to obtain relativistic expressions for photoionisation angular distribution parameters using the helicity formulation is discussed for open-shell atoms. Electric dipole and quadrupole transition matrix elements were considered in the present work, to study the photoionisation dynamics of the 3s electron of the sodium atom in the vicinity of the dipole Cooper minimum. We studied dipole–quadrupole interference effects on the photoelectron angular distribution in the region of the dipole Cooper minimum. Interference with quadrupole transitions was found to alter the photoelectron angular distribution, even at rather low photon energies. The initial ground and final ionised state discrete wavefunctions of the atom were obtained in the present work using GRASP, and we employed RATIP with discrete wavefunctions, to construct continuum wavefunctions and to calculate transition amplitudes, total cross-sections and angular distribution asymmetry parameters. © 2023 by the authors.

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## PHYIC- 01

### Effect of VO2+ ions incorporation on paramagnetic behavior of Calcium Borophosphate (CaBP) nanophosphors: A detailed study of structural and EPR properties

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**DOI: 10.1016/j.matpr.2023.05.183 Volume 92, (2023)**

## Abstract

Novel phosphor luminous materials have attracted much interest due to their prevalent use in light emitting diodes (LEDs), Field-emission display (FED), Plasma display panel (PDP), and fluorescent markers in biomedicine. Vanadium steel is utilised for crankshafts, bicycle frames, gears, and other things. Solid-state technique is used to produce samples of Calcium Borophosphate (CaBP) Nanophosphors that incorporate VO2+ ions. At various VO2+ concentrations, the structural and EPR features have been investigated. The powder XRD patterns and predicted lattice cell properties allow us to determine that the generated phosphors belong to the triclinic crystal system. Crystallite sizes for VO2+ doped CaBP nanophosphors are typically in the range of 29 nm. The octahedral coordination of VO2+ with tetragonal compression is shown in the EPR data. An increase in the bonding parameters is observed with an icnrease in VO2+ concentration. The Tetragonal and Spin Hamiltonian values and the calculated crystal field support the same.

# PHYIC- 02

## Electrical, transport, and optical properties of a novel PVB-NaNO3 complexed solid polymer electrolyte thin-films for solid-state battery

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## Abstract

The thin films of solid polymer electrolyte were made using Polyvinyl Butyral (PVB), and Sodium Nitrate (NaNO3) of different compositions, using Methanol as a solvent, by 'solution casting technique. Then, this Polymer electrolyte thin films were checked using different characterization techniques like UV-visible spectroscopy, FTIR, XRD, and DC conductivity studies. The electrolyte sample with 30 wt% of NaNO3 showed maximum conductivity of 1.52x10-11 S cm−1 at 338 K and 4.01x10-8 Scm−1 at 393 K. The Cole-Cole graphs of AC conductivity were plotted using the impedance spectroscopy data, for PVB70%: NaNO330% concentration which showed the conductivity of 7.07x10-10 Scm−1 at 333 K and 6.54x10-7Scm−1 at 393 K. Using Wagner's polarization technology, the carriers which led to the conduction of charge transport in the electrolyte films were found. It was identified that the ions were predominantly the charge transport carriers. The absorption spectra for the samples were calculated using a UV Spectrometer in the wavelength range of 250-900 nm. In Pure PVB polymer, the optical absorption is very less and this increases gradually when the salt NaNO3 concentration is increased. For the combination of PVB 70%: NaNO3 30% concentration, maximum absorption is seen at the wavelength 530 nm. For the same combination, there was a minimum absorption edge and it shifts towards the maximum energy above this concentration. The photon energy range lies between 2.4 eV and 1.6 eV, which shows that the band gap of the doped samples decreases. 

# DEPARTMENT OF
# AEROSPACE ENGINEERING
# SCHOOL OF ENGINEERING
## Publication Summary

| | | |
|---|---|---|
| **International Journal** | **01** | **(ASEIJ-01)** |
| **International Conference** | **01** | **(ASEIC-01)** |
| **National Conference** | **02** | **(ASENC-01-ASENC-02)** |

## ASEIJ-01

### Design and Optimization of Wing Internal Structure to Study the Flutter Frequency of Aircraft Wing


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**ISBN: 09753060 (ISSN), DOI: 10.4273/ijvss.15.1.14,**
**Volume-15, Pages- 73-79, (2023)**



# Abstract

The field of aviation has reached a lot of milestones in the 19th and early 20th century, but the supersonic commercial flights are still a nightmare in 21st century. The major obstacle to reach this milestone is the effect of flutter, which is an aeroelastic phenomenon. It is very important to understand the effect of flutter to reduce it. In this paper effect of flutter is studied by varying the wing internal structures. A scaled down model of the AGARD 445.6 wing having 65A004 aerofoil is designed using Catia V5, for which the experimental data is available for validation. Grid independence study is carried out to obtain more reliable mesh quality. Since flutter is a transient phenomenon time-step independence study is carried out for the time steps of, 0.005s, 0.0025s and 0.00125s. Since there is no difference between the flutter frequency readings for 0.0025 seconds and 0.00125 seconds, 0.0025 seconds is chosen to reduce the computation time. The baseline case is validated with an experimental data available and an error of 0.2-5.32% is observed. Aircraft wing is mainly made out of aluminium alloys. Hence a suitable aluminium alloy is selected by comparing the flutter frequencies. To choose a suitable material, three materials each from wood, alloys and composite are considered i.e., mahogany, aluminium alloy 7075 T6 and Aluminium Metal Matrix Composite (AMC) which are widely used in the Aviation industry. AMC is considered on the basis of frequency charts whose flutter frequency is 30Hz. In this paper in order to supress the flutter we have introduced optimization of ribs and spars in the wing. Variation in the number of ribs, flange width and rib thickness are considered individually. Wing configuration with 10 ribs, flange width of +10% and 10mm rib thickness respectively are having the best flutter frequencies. The wing with above features is further optimised by keeping weight as a constraint by introducing circular and triangular cut-outs section. Flutter frequency for without cut-out, circular cut-out and triangular cut-out are 77.84 Hz, 78.27Hz and 78.43Hz respectively. Hence it is concluded that ribs with triangular cut-outs can be able to reach maximum flutter frequency.
 

## ASEIC-01

### Passive Control of Transonic Unsteady Pressure Fluctuations Using Aerodisc

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**ISBN: 21954356 (ISSN); 9789811962691 (ISBN), DOI:10.1007/978-981-19-6270-7_82, Pages-493-496, (2023)**

## Abstract

Shock wave and boundary layer interactions (SWBLI) are known to generate very high levels of unsteady pressure fluctuations which can trigger transonic buffet over the payload region of a launch vehicle. Experiments were carried out on a typical launch vehicle model in the NAL 0.6m trisonic wind tunnel to measure the pressure fluctuations over the payload region. It was found that a passive Aerodisc protruding upstream of the nose of the vehicle very significantly alleviates the pressure fluctuations, especially in the low-frequency band, which is crucial for launch vehicles. The effectiveness of the Aerodisc in the alleviation of SWBLI is demonstrated in this paper through analyses of unsteady pressure data. 

## ASENC-01

### Aeroelastic Analysis in a Hybrid Composite by Embedding Shape Memory Alloy

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**ISBN:9781665461634 (ISBN), DOI:10.1109/APSCON56343.2023.10101339, (2023)**

## Abstract
The engineering world is moving toward weight reduction to increase overall performance. Smart structures are becoming a new area of research in the aerospace domain. To improve the wing performance, the focus is on reducing the aeroelastic problems by embedding smart materials into the structure and making an adaptive structure. The linear and Nonlinear analysis in frequency and time domain is performed on hybrid composite beam with and without SMA. The postponement of flutter speed is improved by embedding the SMA in the Hybrid composite. © 2023 IEEE.

## ASENC-02

**Starting of a scramjet air intake**

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**ISBN: 12709638 (ISSN), DOI: 10.1016/j.ast.2023.108560, Volume-141, (2023)**

# Abstract

The starting of a supersonic air-intake at the design Mach number depends on the internal blockage due to flame-holder struts in the combustor. In the present work, the starting of a two-dimensional supersonic air-intake for scramjet operation was verified experimentally on an isolated full-scale truncated model. The first ramp of the supersonic air-intake was truncated and simulated from downstream of the second ramp where the local Mach number was 3.7. The flight mission dictated the opening time of the cowl plate to be fixed as 200 mS. The maximum blockage of struts which allows the intake to start was determined by varying the blockage ratio in the range of 20% to 30%. The results indicate that the intake starts when the blockage ratio was 20%, but unstarts for 25% and 30%. In the unstart condition, discrete frequencies of 45 Hz and 60 Hz occurred and pressure fluctuations in the intake showed limit cycle oscillations. A detailed analysis of unsteady pressure fluctuations confirms that the buzz could be modeled as a Van Der Pol oscillator with nonlinear damping. 

# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
# SCHOOL OF ENGINEERING

## Publication Summary

| | | |
|---|---|---|
| **International Journals** | **28** | **(CSEIJ-01 – CSEIJ-28)** |
| **International Conferences** | **45** | **(CSEIC-01 – CSEIC-45)** |
| **Book Chapters** | **07** | **(CSENB-01 – CSEIB-07)** |

## CSEIJ-01

### An Efficient Computational Risk Prediction Model of Heart Diseases Based on Dual-Stage Stacked Machine Learning Approaches

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**ISBN: 21693536 (ISSN), DOI-10.1109/ACCESS.2024.3350996, Pages-7255-7270, Volume-12, (2024)**

**Abstract**

Cardiovascular diseases (CVDs) continue to be a prominent cause of global mortality, necessitating the development of effective risk prediction models to combat the rise in heart disease (HD) mortality rates. This work presents a novel dual-stage stacked machine learning (ML) based computational risk prediction model for cardiac disorders. Leveraging a dataset that includes eleven significant characteristics from 1190 patients from five distinct sources, five ML classifiers are utilized to create the initial prediction model. To ensure robustness and generalizability, the classifiers are cross-validated ten times. The model performance is optimized by employing two hyperparameter tuning approaches: RandomizedSearchCV and GridSearchCV. These methods aim to find the optimal estimator values. The highest-performing models, specifically Random Forest, Extreme Gradient Boost, and Decision Tree undergo additional refinement using a stacking ensemble technique. The stacking model, which leverages the capabilities of the three models, attains a remarkable accuracy rate of 96%, a recall value of 0.98, and a ROC-AUC score of 0.96. Notably, the rate of false-negative results is below 1%, demonstrating a high level of accuracy and a non-overfitted model. To evaluate the model's stability and repeatability, a comparable dataset consisting of 1000 occurrences is employed. The model consistently achieves an accuracy of 96.88% under identical experimental settings. This highlights the strength and dependability of the suggested computer model for predicting the risk of cardiac illnesses. The outcomes indicate that employing this two-step stacking ML method shows potential for prompt and precise diagnosis, hence aiding the worldwide endeavor to decrease fatalities caused by heart disease. © 2013 IEEE.

## CSEIJ-02

# A novel encryption with bacterial foraging optimization algorithm-based pixel selection scheme for video steganography

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**ISBN: 13807501 (ISSN), DOI:10.1007/s11042-023-14420-2, Pages 25197-25216, Volume-82, (2023)**

## Abstract

In the digital era, security is a challenging problem due to the drastic increase in the utilization of the Internet, personal computers, smartphones, etc. for communication purposes. A major issue in the data hiding process lies in the way of embedding the secure data by maintaining the quality of a cover object that necessitates complex techniques that conceal a massive quantity of payload and the robustness of these approaches over hackers. Video steganography is considered an effective way of securing data transmission, which encompasses two processes namely embedding and extraction. Several existing video steganography techniques hide the secret message with no selection of optimal pixels where the proper choice of pixels to hide data helps to improve quality and robustness. Therefore, this article introduces novel encryption with bacterial foraging optimization algorithm-based pixel selection scheme for video steganography (EBFOA-PSVS) technique. The hidden message will be successfully concealed in the cover video utilizing the proposed EBFOA-PSVS technique, which also uses the best possible BFOA pixel selection. The best pixels are then chosen using BFOA to produce the highest peak signal-to-noise ratio (PSNR). Finally, the cover video contains the hidden image that has been encrypted. The EBFOA-PSVS approach has improved in terms of various parameters, according to a thorough comparison investigation of the findings on benchmark test movies. 

## CSEIJ-03

# Adaptive Boosting Based Supervised Learning Approach for Covid-19 Prediction from Cough Audio Signals

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**ISBN: 21476799 (ISSN), Pages-38-51, Volume-11, (2023)**

## Abstract

An increasing number of people have died as a result of the COVID-19 pandemic's second wave of breakout. As has been shown, several nations' healthcare systems are being destroyed by the second wave. Regional routine testing combined contact tracing can take the place of regional constraints in preventing the virus from propagating, and the "Track, Test, and Treat" programme has straightened the epidemic track in its early phases. Thus, to lower infection rates and minimise the negative effects on medical Machine learning along with feature engineering is a potential domain for developing Covid 19 positive as well as negative samples classification, a critical research objective in contemporary engineering. While there are effective machine learning-based methods to classify COVID-19 positive and negative samples like cough audio signals, detection accuracy with the highest possible sensitivity and specificity is still not scalable using the majority of contemporary methods. Typically, detection accuracy is proportional to the optimal features used to train the classifier. As a result, it is obvious that optimizing features for Covid 19 infection recognition from cough audio signals is a possible research objective. In support of this argument, this article suggested and described a novel technique “Adaptive Boosting based Supervised Learning (ABSL) Approach for Covid-19 Prediction from Cough Audio Signals”. The spectral features and Mel-frequency cepstral coefficients are used in the proposed model. The feature engineering has been done by the diversity assessment model “kruuskal-wallis test”. In addition, a novel binary classification strategy has been derived by using adaptive boosting strategy. The experiments have been done on benchmark dataset to evaluate the proposed approach's performance against a comparable contemporary method Random forest classifier that trained by Mel-frequency cepstral coefficients (MFCCs). The experiments demonstrated that the suggested ABSL has the potential to escalate prediction accuracy with a low rate of false alarms. 

**CSEIJ-04**

# Multiresolution approach on medical image fusion by modified local energy

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**ISSN: 18631703, DOI: 10.1007/s11760-023-02636-6-**
**Volume 17, Pages 4049-4056, (2023)**

## Abstract

Human and machine perception data that are not redundant are very important in medical field for diagnosis and treatment. Existing fusion methods lack in complexity and are time-consuming. The proposed work fuses medical images to extract valuable necessary information from dissimilar images to a single image in the wavelet domain using a novel modified local energy (MLE) fusion rule termed MLE image fusion. Modified local energy helps to provide edge characteristics more clearly in the fusion outcome than a single pixel-based fusion rule. The denoising property of the local energy is the additional advantage of the proposed fusion. The similarity of the fused image with the source images is improved by B-Spline registration in the pre-processing stage. Finally, the fused image is created with all the corresponding coefficients by transforming the inverse wavelet. SVM-based contouring of the lesion part helps observe to identify the lesion part from the fused image. The proposed approach assists medical professionals in the diagnosis of lesions or anomalies in tissues. Experiments on real-time and standard datasets with expert radiologist subjective evaluation and quantitative analysis are carried out by well-known non-reference performance measures. 

## CSEIJ-05

### Analysis and prediction of seed quality using machine learning

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**ISBN: ISSN: 20888708, DOI: 10.11591/ijece. v14i1.pp904-910,**
**Volume 14, Pages 904-910(2024)**

## Abstract

The mainstay of the economy has always been agriculture, and the majority of tasks are still carried out without the use of modern technology. Currently, the ability of human intelligence to forecast seed quality is used. Because it lacks a validation method, the existing seed prediction analysis is ineffective. Here, we have tried to create a prediction model that uses machine learning algorithms to forecast seed quality, leading to high crop yield and high-quality harvests. For precise seed categorization, this model was created using convolutional neural networks and trained using the seed dataset. Using data that can be used to forecast the future, this model is used to learn about whether the seeds are of premium quality, standard quality, or regular quality. While testing data are employed in the algorithm's predictive analytics, training data and validation data are used for categorization reasons. Thus, by examining the training accuracy of the convolution neural network (CNN) model and the prediction accuracy of the algorithm, the project's primary goal is to develop the best method for the more accurate prediction of seed quality. 

## CSEIJ-06

### Cost based Random Forest Classifier for Intrusion Detection System in Internet of Things

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**ISBN: ISSN: 15684946, DOI: 10.1016/j.asoc.2023.111125,**
**Volume 151, Article number 111125, (2024)**

## Abstract

Internet of Things (IoT) is the collection of physical and digital devices that are interconnected using Internet for exchange of information and delivery of services. The Internet of Things (IoT) is an extended application of Internet that is used to offer various services for users in the fields of agriculture, healthcare, education, smart homes and so on in the modern world. The significant issues of the intrusion present in IoT are network disconnection, network hacking and data theft from the source. So the challenging task for worldwide utilization of IoT is to address their security issues, because of the feature imbalance in the different types of attacks. The most essential task for addressing security issues is to predict and classify the intrusion in the network. In this paper, the Cost based Random Forest Classifier (CRFC) is proposed for developing an effective Intrusion Detection System (IDS). The CRFC based classification is improvised by incorporating the cost matrix calculated based on feature importance that helps to improve the process of splitting the features even if there is a feature imbalance. Further, three important libraries of Python namely, Spark, Kafka, and Scikit-learn are used in this IDS to improve the classification performances. In that, Spark is used to implement the distributed environment, Kafka is used for streaming the data and Scikit is used to implement CRFC. There are two datasets known as NSL-KDD and UNSW-NB15 that are used to evaluate the performance of the proposed CRFC-IDS method. The CRFC-IDS method is analyzed on the basis of accuracy, precision, recall, F1-Measure, Area Under the Curve (AUC), False Acceptance Rate (FAR) and Matthews Correlation Coefficient (MCC). The existing approaches OCSVM and DBF are used for comparison with the CRFC-IDS method. The accuracy of CRFC-IDS for NSL-KDD dataset is found to be 99.957%, which is highest when compared to OCSVM and DBF. © 2023 Elsevier B.V.

**CSEIJ-07**

## EMOTION RECOGNITION USING CNN

### Evaluation of filtering and contrast in X-ray and computerized tomography scan lung classification

**Setty, A.N., Mathad, R.T., Shenthar, K., Likhith**

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**ISBN- ISSN: 25024752, DOI: 10.11591/ijeecs. v33.i3. pp1715-1725, Volume 33, Pages 1715-1725**

## Abstract

Deep learning provides many convenient methods to help medical practitioners take informed decisions about diverse ailments. The goal of this project is to measure the effectiveness of filters and contrast enhancement techniques qualitatively and quantitatively in classifying lung scan images. Transfer deep learning was used to obtain the necessary results, with DenseNet 121 being the base model. Salt and pepper filter were used to introduce noise, and 3×3 mean and 5×5 mean with contrast limited adaptive histogram equalization (CLAHE) was used to minimize the effect of noise. All layers excluding the rearmost were frozen, and new dense and dropout layers were added to identify features of computerized tomography (CT) scan images of lungs. The resultant models were of comparable accuracy, where the model with no filter gave the accurate results for the given data, and the one using the 5×5 mean filter gave better adaptability in classification of unseen data. The misclassification between normal and pneumonia affected lungs is relatively higher, because of the lack of distinct features between them.

## CSEIJ-08

# Hybrid Optimization Enabled Routing Protocol for Enhancing Source Location Privacy in Wireless Sensor Networks


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**ISBN: ISSN: 23950455, DOI: 10.22247/ijcna/2023/218511,**
**Volume 10, January 2023, Pages 51-67**



## Abstract

Wireless sensor networks (WSN) are utilized in various application domains concerning monitoring and smart application, in which highly sensitive information in healthcare and military applications is also employed using the WSN. The openness and unattended nature of the WSN make security as a challenging task. The information eavesdropping is employed by the network intruder from the source node; hence the location of the source node needs to be protected for the acquisition of information security. Thus, this research introduces a privacy preservation of the source location method using the hybrid optimization based secure routing. For this, Shuffled Shepherd-Coot (SS-Coot) optimization is proposed by hybridizing the foraging behavior of the Coot, a water bird, with the shepherd's behavior in herding the animal community. The incorporation of the herding behavior of the shepherd with Coot's foraging behavior helps to enhance the diversification phase to obtain the best solution by avoiding premature convergence. In the proposed source location privacy preservation, the network boundary radiuses are obtained optimally using the SS-Coot algorithm during the network initialization. Then, the routing through the various boundaries of the network with multi-hop helps to protect the location of the source by confusing the intruder's backtrace process. The analysis is performed based on Packet Delivery Ratio (PDR), throughput, energy consumption, and delivery latency and obtained the values of 1.02867, 1.02909, 0.30171, and 0.00165, respectively. © EverScience Publications.

**CSEIJ-09**

**An optimal model for classification of lung cancer using grey wolf optimizer and deep hybrid learning**

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**ISBN: ISSN: 25024752, DOI: 10.11591/ijeecs. v30.i1. pp406-413,**
**Volume 30, Pages 406-413, (2023)**

## Abstract

In recent years, metaheuristic methods have shown major advantages in the field of feature selection due to its comprehensibility and possible extensive search competence. However, the majority of evolutionary computation-based feature selection algorithms in use today are wrapper approaches, which are expensive to compute, particularly for extensive biomedical data. Developing an effective evaluation strategy is crucial for significant reduction of computational cost. The proposed framework extracts deep feature from ResNet-50 and VGG-16 based convolutional neural models with initial segmentation process based on marker-controlled watershed method. Next the feature reduction is a two-fold approach with principal component analysis applied to reduce the dimensionality of large feature space from convolutional neural network (CNN) models as first step. The second step is optimal feature subset selection using a swarm intelligence method referred as modified grey wolf optimization. Finally, the selected feature subset is fed to various machine learning classifiers. The experimental result reveals that the proposed algorithm outperforms the other state-of-the-art methods with classification accuracy of 96.56%, thus upholding the dependability of the approach. 

## CSEIJ-10

### Energy-efficient virtual machine placement in distributed cloud using NSGA-III algorithm

**Gopu, A., Thirugnanasambandam, K., R, R., AlGhamdi, A.S., Alshamrani, S.S., Maharajan, K., Rashid, M.**

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**ISBN: ISSN: 2192113X, DOI: 10.1186/s13677-023-00501-y,**
**Volume 12, Issue 1, December 2023, Article number 124**

## Abstract

Cloud computing is the most widely adapted computing model to process scientific workloads in remote servers accessed through the internet. In the IaaS cloud, the virtual machine (VM) is the execution unit that processes the user workloads. Virtualization enables the execution of multiple virtual machines (VMs) on a single physical machine (PM). Virtual machine placement (VMP) strategically assigns VMs to suitable physical devices within a data center. From the cloud provider's perspective, the virtual machine must be placed optimally to reduce resource wastage to aid economic revenue and develop green data centres. Cloud providers need an efficient methodology to minimize resource wastage, power consumption, and network transmission delay. This paper uses NSGA-III, a multi-objective evolutionary algorithm, to simultaneously reduce the mentioned objectives to obtain a non-dominated solution. The performance metrics (Overall Nondominated Vector Generation and Spacing) of the proposed NSGA-III algorithm is compared with other multi-objective algorithms, namely VEGA, MOGA, SPEA, and NSGA-II. It is observed that the proposed algorithm performs 7% better that the existing algorithm in terms of ONVG and 12% better results in terms of spacing. ANOVA and DMRT statistical tests are used to cross-validate the results. 

## CSEIJ-11

### Reinforcement learning strategies using Monte-Carlo to solve the blackjack problem

**Srinivasaiah, R., Biju, V.G., Jankatti, S.K., Channegowda, R.H., Jinachandra, N.S.**

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**ISBN: ISSN: 20888708, DOI: 10.11591/ijece. v14i1.pp904-910,**
**Volume 14, Issue 1, February 2024, Pages 904-910**

## Abstract

Blackjack is a classic casino game in which the player attempts to outsmart the dealer by drawing a combination of cards with face values that add up to just under or equal to 21 but are more incredible than the hand of the dealer he manages to come up with. This study considers a simplified variation of blackjack, which has a dealer and plays no active role after the first two draws. A different game regime will be modeled for everyone to ten multiples of the conventional 52-card deck. Irrespective of the number of standard decks utilized, the game is played as a randomized discrete-time process. For determining the optimum course of action in terms of policy, we teach an agent-a decision maker-to optimize across the decision space of the game, considering the procedure as a finite Markov decision chain. To choose the most effective course of action, we mainly research Monte Carlo-based reinforcement learning approaches and compare them with q-learning, dynamic programming, and temporal difference. The performance of the distinct model-free policy iteration techniques is presented in this study, framing the game as a reinforcement learning problem. 

## CSEIJ- 12

### Uncertainty determination and reduction through novel approach for industrial IOT

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**ISBN: ISSN: 26659174, DOI: 10.1016/j.measen.2023.100995, Volume 31, February 2024, Article number 100995**

## Abstract

The most fundamental and crucial processes in Data analysts is effective information processing while cleaning information from noisy sensors. Conventional outlier identification techniques should not be used directly for this type of assessment, as sensor data can contain both noise (piezoelectric microphone type) and severe abnormalities. To manage the problem of sound reduction while maintaining the anomalies in the IIoT information, this paper proposes a method of calculating the noise score which considers both the rate of variation and the variance. To establish the unit of evaluation of the measurement of difference which would be used in conjunction with statistical analyses, a sliding window method. Extensive testing shows that the proposed strategy surpasses existing advanced noise detection methods, producing a clean dataset that maintains anomalies to successfully use abnormal investigation techniques. © 2023 The Authors

## CSEIJ- 13

**Polarity classification on twitter data for classifying sarcasm using clause pattern for sentiment analysis**

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**ISBN: ISSN: 13807501, DOI: 10.1007/s11042-023-14909-w,**
**Volume 82, Issue 21, September 2023, Pages 32789-32825**

# Abstract

Nowadays, an enormous amount of data is available on the WWW and exponentially growing as well. A lot of users use social networking websites such as Twitter, Facebook, Instagram, and Google+ as common platforms for sharing and exchanging views and opinions on any topics/events. The researchers have considered the reviews and views of the users on these platforms for sentiment analysis, opinion mining, question answering, text summarization, etc. The paper proposes a novel approach for identifying reviews or opinion of users having sarcasm in the text patterns at the clause level. The sentences are classified into four categories such as Simple Sentences, Compound Sentences, Complex Sentences, and Compound-Complex Sentences based on the rules derived from a decision tree. The Simple Sentences and Complex Sentences alone are considered for analysing the sentence patterns where a positive sentiment contrasts with a negative polarity and vice-versa. The decision tree and neuro-fuzzy rules are used on sentence structures to classify the sentences into sarcastic and non-sarcastic sentence patterns. Membership functions are used to map the fuzzy rules and linguistic grading is used for grading the sarcastic patterns. The proposed approach is evaluated on Twitter Dataset and found that the results are promising with the recent and relevant work. 

## CSEIJ-14

### Emotion estimation from nose feature using pyramid structure

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**Volume 82, Issue 27, November 2023, Pages 42569-42591**

# Abstract

The facial expression and human emotions are considered as important components for building various real-time applications such as human expression and emotion recognition systems. Various parts of the human face contribute to recognizing expression. The contribution of action units on the nose is considered important. In this paper, input images are converted into HSV color space for better representation. The nose area is localized and the boundary is drawn by segmentation process using Fuzzy C-means Clustering (FCM). The segmented nose on the human face is modelled using a pyramid/tetrahedron structure and it is superimposed on the reference face. The feature points are identified on the pyramid model, where the Action Units (AUs) falling on the tetrahedron are identified. These points are validated with the theoretical properties of the tetrahedron so that the constructed feature vector is robust. The degree of deformation at various points is constructed as the feature vector. The feature vector is extracted for all the database images, say JAFE and CK++ datasets, and the feature database is created and stored separately. The feature data sets are used for training and thus, they are n-fold cross-validated to avoid over and under fitting. Given an input image for estimating the expression and emotion, the feature vector of the input image is compared with the feature vector of deformed images stored in the database. We have used Support Vector Machine (SVM), and Multilayer Perceptron (MLP) and Random Forest classifier to classify the expression and derive emotion. The JAFE and CK++ datasets are used for experimental analysis. It is found that the Nose feature using pyramid/tetrahedron structure is giving good results. Most of the time the classification accuracy is more than 95%. The experimental results are compared with some of the well-known approaches and the proposed tetrahedron model has performed well with classification accuracy more than 95%. 

**CSEIJ-15**

## Privacy Preservation Modelling for Securing Image Data using Novel Ethereum-based Ecosystem

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# Abstract

The broad usage of images in real-time applications demands a cloud infrastructure due to its advantages. Many use cases are built where the image data is shared, sharing becomes the core function, and the medical domain takes its broad advantage. The cloud is a centralized infrastructure for its all-operation usages; it depends mainly on the trusted third party to handle security concerns. Therefore, the privacy preservation of the image data or any data becomes an issue of concern. The distrusted system advantages are achieved using blockchain technology for image data security and privacy concerns. The traditional approaches of the security and privacy models raise many apprehensions as these are designed on the centralized systems of the data sharing mechanisms. It is also observed that large data files are not wisely handled, which demands building a framework model that takes image data and any other data of any size to ensure a dependable optimal security system. This paper presents a framework model to achieve optimal time complexity for securing the privacy aspects of the image data or any other data that uses space optimal file system using distributed security mechanism for both the storage and sharing of the data. The proposed framework model for optimal time complexity and security uses a duplication algorithm using stakeholder agreement to ensure efficient access control to the resources using the cryptographic approach to the Ethereum ecosystem. The performance metric used in the model evaluation includes the degree of availability and efficiency. On benchmarks, it performs well compared to the traditional cloud-built distributed systems. The quantified outcome of the proposed scheme exhibits a 42.5% of reduction in time for data repositioning, a 41.1% of reduction in time for data retrieval, a 34.8% of reduction in operational cost, a 73.9% of reduction in delay, and a 61% faster algorithm execution time in contrast to conventional blockchain method 

CSEIJ-16

## Multi-Deep CNN based Experimentations for Early Diagnosis of Breast Cancer

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## Abstract

Breast cancer is one of the deadly cancer types that causes high mortality among women globally. Meanwhile, Deep Learning (DL) emerges as the most frequently utilized and rapidly developing branch of classical machine learning. The study examines a modern Computer-Aided Diagnosis (CAD) framework that uses DL to extract features and classify them for aiding radiologists in breast cancer diagnosis. This is accomplished through four distinct experimentations aimed at identifying the most optimal method of effective classification. Here, the first uses Deep CNNs that are pre-trained, such as AlexNet, GoogleNet, ResNet50, and Dense-Net121. The second is based on experiments using Deep CNNs to extract features and applying them onto a Support Vector Machine algorithm using three different kernels. The next one involves the fusion of different deep features for demonstrating the classification improvement by fusion of these deep features. The final experiment involves Principal Component Analysis (PCA) for reducing the computational cost and for decreasing the larger feature vectors created during fusion. The abovesaid experimentations are carried out in two different mammogram datasets namely MIAS and INbreast. The classification accuracy attained for both datasets through the fuzing of deep features (97.93% for MIAS and 96.646% for INbreast) is the highest compared with the state-of-the-art frameworks. In contrast, the classification performance did not enhance while applying the PCA on combined deep features; but the decrease in execution time provides a reduced computational cost. Abbreviations: CAD: Computer Aided Diagnosis; CNN: Convolution Neural Network; CSI: Classification Success Index; DCNN: Deep Convolution Neural Network; DICOM: Digital Imaging and Communications in Medicine; DL: Deep Learning; FC layer: Fully Connected layer; FFDM: Full-Field Digital Mammograms; FN: False Negative; FP: False Positive; ICSI: Individual Classification Success Index; MIAS: Mammographic Image Analysis Society; ML: Machine Learning; MLO: Medio-Lateral Oblique; PCA: Principal Component Analysis; PGM: Portable Gray Map; PPV: Positive Predictive Value; RBF: Radial Basis Function; SGDM: Stochastic Gradient Descent with Momentum; SVM: Support Vector Machine; TN: True Negative; TP: True Positive; TPR: True Positive Rate; UK: United Kingdom. 

## CSEIJ-17

### Brain stroke prediction model based on boosting and stacking ensemble approach

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**Volume-16, Pages- 437-446, (2024)**

## Abstract

The concern of brain stroke increases rapidly in young age groups daily. The leading causes of death from stroke globally will rise to 6.7 million yearly if untreated and undetected by early estimates by WHO in a recent report. Machine learning (ML) based prediction models can reduce the fatality rate by detecting this unwanted medical condition early by analyzing the factors influencing cerebral stroke. This research studied the performance and behavior of six ML models which is based on boosting along with ensemble learning techniques for the prediction of brain stroke, like Ada-Boost (AB), histogram based gradient boost (HGB), XGBoost (XGB), gradient boost (GB), light gradient boosting machine (LGBM), Cat boost (CB). We have used two separate datasets with similar attributes for building and validating the deployed model, whereas dataset 1 (DF 1) contains 43,400 tuples for training and testing the models. Dataset 2 (DF 2) has 4981 tuples and 11 attributes used to validate the model performances after applying basic data pre-processing steps. We accomplished an accuracy of 98.51% with the CB on DF 2. Later we stacked on subsets of six models as mentioned above and listed the results. We concluded that the stacked model performed well in finding the best mapping function for predicting stroke with an accuracy of 97.88%. This study produces an insightful view of boosting-based stacking generalized prediction model for brain stroke at an early. 

## CSEIJ-18

### Deep learning based graphical password authentication approach against shoulder-surfing attacks

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**Volume-19, Pages- 99-115, (2023)**

## Abstract

The password used to authenticate users is vulnerable to shoulder-surfing assaults, in which attackers directly observe users and steal their passwords without using any other technical upkeep. The graphical password system is regarded as a likely backup plan to the alphanumeric password system. Additionally, for system privacy and security, a number of programs make considerable use of the graphical password-based authentication method. The user chooses the image for the authentication procedure when using a graphical password. Furthermore, graphical password approaches are more secure than text-based password methods. In this paper, the effective graphical password authentication model, named as Deep Residual Network based Graphical Password is introduced. Generally, the graphical password authentication process includes three phases, namely registration, login, and authentication. The secret pass image selection and challenge set generation process is employed in the two-step registration process. The challenge set generation is mainly carried out based on the generation of decoy and pass images by performing an edge detection process. In addition, edge detection is performed using the Deep Residual Network classifier. The developed Deep Residual Network based Graphical Password algorithm outperformance than other existing graphical password authentication methods in terms of Information Retention Rate and Password Diversity Score of 0.1716 and 0.1643, respectively. 

**CSEIJ-19**

**Mobility Prediction-Based Source Anonymity Routing Protocol (Mpsarp) For Source Location Privacy Using Ns2 Techniques**

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**ISBN: 19928645 (ISSN), Volume-101, Pages-3259-3269, (2023)**

## Abstract

According to information and technology, the three most crucial criteria for success are the three most essential factors in safeguarding privacy in the twenty-first century. As a result, should keep a close check on all of the vast organizations that are watching - companies like Google, Twitter, Facebook, AT&T, and Verizon - making sure they aren't spying on. Every one of these businesses has recently added location-based services to their product or service offerings (or is doing so). Even though I don't reside in a vast geographical area, Twitter can now know what city I'm in and what neighborhood I'm in. Today, consumers face the reality of walking about with a beacon that constantly transmits information about their location to a central server. While capable of broadcasting exact details of our places and movements, cell phones are not the only gadgets that can do so. To address these problems, the study suggested MPSARP ensure location privacy across a wireless network (Mobility prediction-based source anonymity routing protocol). Our proposal is for an Unspecified, efficient routing and location-based system that offers good anonymity protection at a reasonable cost while maintaining excellent performance (MPSARP). By dynamically partitioning a network arena into diverse zones and arbitrarily picking nodes inside zones to serve as intermediary relay nodes, this approach provides a nontraceable unspecified route that is not traceable by the user, resulting in a nontraceable unknown way that is not traceable by the user. The process of simulation is accomplished using NS2 and the performance outperforms the existing techniques. 

## CSEIJ-20

### Secure clustering and routing based on multi Objective - Trust aware average inertia weighted cat swarm optimization for Wireless Sensor Networks

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**Pages-5401-5408, Volume-45, (2023)**

## Abstract

Wireless Sensor Networks (WSNs) are a group of devices/sensors which are connected as a network for transferring and receiving the data observed from the environment through intermediate links. Energy efficiency and security during data broadcasting are considered challenging tasks in the WSN. These challenging tasks are considered as a motivation of this research and the Multi-Objective - Trust Aware Average Inertia Weighted Cat Swarm Optimization (MO-TAIWCSO) is proposed for achieving secure reliable transmission over the WSN. Due to an effective velocity update of searching process, the AIWCSO is selected for discovering an optimal solutions. The developed MO-TAIWCSO is optimized by using the trust, energy ratio, communication cost, and degree of SCH. This MO-TAIWCSO performs optimal Secure Cluster Head (SCH) and secure path discovery for the secure transmission of data under malicious attacks. The main objective of this MO-TAIWCSO is to improve the data delivery while minimizing the energy usage of the nodes. The performance of the MO-TAIWCSO method is analyzed by using the throughput, Packet Delivery Ratio (PDR), energy consumption, network lifetime, Normalized Routing Load (NRL) and End to end delay (EED). The existing researches namely ETOR and TBSEER are used to evaluate the MO-TAIWCSO. The PDR of MO-TAIWCSO for 100 nodes is 99.97%, which is high when compared to the ETOR and TBSEER. 

## CSEIJ-21

### Energy and cost optimization mechanism for workflow scheduling in the cloud

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**Volume-80, Number of Pages-3069-3074, (2023)**

## Abstract

Cloud computing has become one of the most important platforms for various applications like artificial intelligence, big data, the Internet of Things, and others, especially demand for cloud computing has exploded in recent years. Because of the increased demand for cloud computing, it has become more complex, which can lead to software or hardware failure. Due to the advanced infrastructure, failure may not be detected and repaired at a given timeline and will end up costing higher. In addition, the advent of cloud computing has another advantage over the massive spread of scientific work. Scientific workflow refers to a series of computations that enable data analysis in a distributed and systematic way; because this work flow has a large number of works, energy consumption is a major problem. Besides these issues, it also suffers from system reliability; in the response to these issues, several researchers have designed their mechanism, however they failed to understand cloud complex environment. Therefore, here we have designed a mechanism that efficiently reduces energy consumption, improve the fault tolerance to achieve reliability, performs operations in very less time, and optimize the cost in the workflow model. We have also demonstrated efficient energy optimization techniques by reducing task loads. © 2021

# CSEIJ-22

## Hybrid visual computing models to discover the clusters assessment of high dimensional big data

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## Abstract

Clusters assessment is a major identified problem in big data clustering. Top big data partitioning techniques, such as, spherical k-means, Mini-batch-k-means are widely used in many large data applications. However, they need prior information about the clusters assessment to discover the quality of clusters over the big data. Existing visual models, namely, clustering with improved visual assessment of tendency, and sample viewpoints cosine-based similarity VAT (SVPCS-VAT), efficiently perform the clusters assessment of big data. For the high-dimensional big data, the SVPCS-VAT is enhanced with the subspace learning techniques, principal component analysis (PCA), linear discriminant analysis (LDA), locality preserving projection (LPP), Neighborhood preserving embedding (NPE). These are used to develop hybrid visual computing models, including PCA-based SVPCS-VAT, LDA-based SVPCS-VAT, and LPP-based SVPCS-VAT, NPE-based SVPCS-VAT to overcome the curse of dimensionality problem. Experimental is conducted on benchmarked datasets to demonstrate and compare the efficiency with the state-of-the-art big data clustering methods. 

# CSEIJ-23

## Highly sensitive temperature sensor using one-dimensional Bragg Reflector for biomedical applications

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## Abstract

A theoretical investigation of multi-layer Bragg Reflector (BR) structure to design highly sensitive temperature sensor is proposed to measure the temperature over a wide range. Characteristic-Matrix (CM) mathematical tool is used to design and analyse the proposed temperature sensor. A 1D Distributed Bragg Reflector multi-layer structure is used to design and analyse the sensing characteristics of the proposed sensor. Periodic modulation in the Refractive-Index (RI) of the two materials, high and low, forms DBR multi-layer structure. Germanium and air are used as the two alternate materials of BR for high and low dielectric layers respectively. Parameters of many semiconductor materials, including germanium, varies with temperature. Here we have considered RI variation of germanium with the temperature to model and design the proposed sensor. A defect layer is introduced at the center of multi-layer structure to obtain the resonating mode for an incident electromagnetic wave. The sensor can detect temperature over a wide range from 100 to 550 K. A resonating mode, shifting towards different wavelength region is observed for the temperature variations. The influence of increase in the DBR layers (N) and defect cavity geometrical length (lD) is studied. The obtained results conclude that the cavity defect length and BR layers affects the sensing parameters of the designed sensor. The obtained RI sensitivity, Q-factor, temperature sensitivity and detection limit of the sensor are 2.323 μm/RIU, 115,000, 1.18 nm/K and 9.024 × 10-6 RIU respectively. Theoretically obtained transmission spectrum was validated using Monte Carlo simulation. 

# CSEIJ-24

## Neuro-Cardio-Autonomic Modulations in Children with Duchenne Muscular Dystrophy

**Inbaraj, G., Arjun, K., Meghana, A., Preethish-Kumar, V., John, A.P., Polavarapu, K., Nashi, S., Sekar, D., Udupa, K., Prathuysha, P.V., Prasad, K., Bardhan, M., Raju, T.R., Kramer, B.W., Nalini, A., Sathyaprabha, T.N.**

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**Volume-10, Pages- 227-238, (2023)**

## Abstract

Background and Objective: Duchenne muscular dystrophy (DMD) is a degenerative X-linked muscle disease. Death frequently results from complications in cardiopulmonary systems. Preclinical/early diagnosis of cardiac autonomic abnormalities may aid initiate cardioprotective therapy and enhance prognosis. Methods: A cross sectional, prospective study of 38 DMD boys compared with 37 age-matched healthy controls was conducted. Lead II electrocardiography and beat-to-beat blood pressure were recorded to assess heart rate variability (HRV), blood pressure variability (BPV), and baroreceptor sensitivity (BRS) in a standardized environment. Data were analysed and correlated with disease severity and genotype. Results: In the DMD group, the median age at assessment was 8 years [IQR 7-9 years], the median age at disease onset was 3 years [IQR, 2-6 years], and the mean duration of illness was 4 years [IQR, 2.5-5]. DNA sequencing showed deletions in 34/38 (89.5 %) and duplications in 4/38 (10.5%) patients. The median heart rate in DMD children was significantly higher [101.19 (Range, 94.71-108.49)] /min compared to controls [81 (Range, 76.2-92.76)] /min ($p < 0.05$). All the assessed HRV and BPV parameters were significantly impaired in DMD cases except for the coefficient of variance of systolic blood pressure. Further, BRS parameters were also significantly reduced in DMD, excluding alpha-LF. A positive correlation was found between alpha HF with age at onset and duration of illness. Conclusion: This study demonstrates a distinct early impairment of neuro-cardio-autonomic regulation in DMD. Simple yet effective non-invasive techniques such as HRV, BPV, and BRS may help identify cardiac dysfunction in a pre-clinical state, paving the way for early cardio-protective therapies and limiting disease progression in DMD patients. 

# CSEIJ-25

## Effects of an 18-Week Integrated Yoga Program on Cardiac Autonomic Function in Breast Cancer Patients Undergoing Adjuvant Chemotherapy: A Randomized Controlled Trial

**Inbaraj, G., Udupa, K., Raghavendra, R.M., Ram, A., Patil, S., Rajeswaran, J., Nandakumar, K.K., Belur, S., Arjun, K., Govindaraj, R., Bayari, S.K., Sathyaprabha, T.N.**

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## Abstract

Background: Cardiotoxicity is a commonly observed adverse effect seen in breast cancer (BC) patients undergoing chemotherapy with attributes toward cardiac autonomic dysfunction (CAD). Yoga, a mind-body system of medicine that has been shown to improve cardiac autonomic nervous system (ANS) activity in various health conditions, could be an effective adjuvant approach in addressing CAD. Objective: This study aims to investigate the protective effects of Integrated Yoga Therapy (IYT) on ANS functioning, assessed using Heart rate variability (HRV) in breast cancer patients undergoing chemotherapy. Methods: A total of 68 (stage I-III) BC patients were randomly assigned into 2 groups: Treatment as Usual group (TAU) and TAU with Yoga Therapy group (TAUYT). All patients underwent anthracycline-based adjuvant chemotherapy for a total of 6 cycles with 21 days/cycle. During chemotherapy, the TAUYT group received IYT 5 days a week for 18 weeks, compared with usual care alone in the TAU group. Resting heart rate (RHR) and HRV, measured in both the time and frequency domains, were used to assess the cardiac ANS function of each patient before and after 6 cycles of chemotherapy. Results: A total of 30 subjects in the TAU group and 29 subjects in the TAUYT group were included in the analysis. At baseline (before chemotherapy), there were no significant differences between the TAU and TAUYT groups in terms of RHR and HRV indices. However, after chemotherapy, patients in the TAU group had a significantly higher average RHR ($P < .02$) and lower HRV indices with reduced parasympathetic indices: RMSSD ($P < .01$), pNN50% ($P < .04$), high-frequency power ($P < .001$) and increased sympathetic indices: low-frequency power ($P < .001$) with sympathovagal imbalance: LF/HF ($P < .001$) compared with patients in the TAUYT group. Conclusion: The study showed the protective effects of yoga therapy on CAD in patients receiving anthracycline-based chemotherapy for BC, proposing yoga as a potential adjuvant intervention in improving cardiac health and preventing cardiovascular-related morbidities. Trial Registration: This trial is registered with the Clinical Trials Registry-India (CTRI) database (CTRI/2020/10/028446; October 16, 2020). © The Author(s) 2023.

## CSEIJ-26

### Diabetic Retinopathy Prediction using Modified Inception V3 Model Structure

**Shwetha, G.K., Udaya Kumar Reddy, K.R., Rathod, J.A., Sathyaprakash, B.P., Lolakshi, P.K.**

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**Volume-11, Pages-261-268, (2023)**

## Abstract

The analysis of clinical findings revealed that more than 10% of diabetic individuals have an elevated risk of eye issues. Diabetic Retinopathy (DR) is a type of eye illness that impacts 80-85% of persons suffering for more than 10 years from diabetes. In hospitals, retinal fundus images are commonly employed for the identification and study of diabetic retinopathy. The unprocessed retinal fundus images are difficult for machine learning approaches to analyze. Original retinal fundus images are pre-processed utilizing green channel separation, histogram equalization, contrast enhancement, and scaling procedures. For statistical analysis, 14 attributes are additionally collected from preprocessed images. Technique for the detection of retinal lesions can aid in the earlier identification and treatment of a frequently found condition, diabetic retinopathy. We introduce a new criterion for the identification of the optic disc in which we initially identify the significant blood vessels and then utilize their intersection to estimate the position of the optic disc. Future localized utilizing color characteristics. We also demonstrate that a set of attributes, including blood vessels, mucus, micro aneurysms, and hemorrhages, may be recognized with high precision utilizing different morphological techniques applied suitably. 

# CSEIJ-27

## Np63 overexpression promotes oral cancer cell migration through hyperactivated Activin A signalling

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**Volume-431, (2023)**

## Abstract

Oral cancer is a common malignant tumor of the oral cavity that affects many countries with a prevalent distribution in the Indian subcontinent, with poor prognosis rate on account of locoregional metastases. Gain-of-function mutations in p53 and overexpression of its related transcription factor, p63 are both widely reported events in oral cancers. However, targeting these alterations remains a far-achieved aim due to lack of knowledge on their downstream signaling pathways. In the present study, we characterize the isoforms of p63 and using knockdown strategy, decipher the functions and oncogenic signaling of p63 in oral cancers. Using Microarray and Chromatin Immunoprecipitation experiments, we decipher a novel transcriptional regulatory axis between p63 and Activin A and establish its functional significance in migration of oral cancer cells. Using an orally bioavailable inhibitor of the Activin A pathway to attenuate oral cancer cell migration and invasion, we further demonstrate the targetability of this signaling axis. Our study highlights the oncogenic role of ΔNp63 – Activin A – SMAD2/3 signaling and provides a basis for targeting this oncogenic pathway in oral cancers. © 2023 Elsevier Inc.

# CSEIJ-28

## A multi-user cognitive radio full-duplex channel under imperfect spectrum sensing: Achievable rates and energy efficiency (Article)

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**Abstract**

In this work, the achievable rates and energy efficiency of a multi-user cognitive radio (CR) uplink channel with full-duplex (FD) are studied. For this multi-user CR channel, secondary users can work in FD mode to simultaneously transmit and listen to the channel. We consider a realistic scenario in which both FD operation and spectrum sensing are imperfect. At first, we examine the sensing performance and the rate region through the evaluation of the probability of miss-detection and the probability of false alarm when the primary user (PU) activity is assumed to be non-time-slotted. Due to an imperfect sensing operation, the cognitive radio channel is modeled as a non-Gaussian channel impacted by a Gaussian-mixture (GM) noise plus PU interference. Under this practical assumption, it is not possible to calculate the achievable rates and the rate region directly. Instead, we derive simple approximations of these metrics which can be easily calculated with arbitrarily small errors. In the second part of the paper, we further evaluate the derivatives of these achievable rates at low-power regimes. This calculation helps us evaluate the energy efficiency and obtain the minimum energy per bit Eb/N0min when Gaussian and discrete input signals are used. 

# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
# SCHOOL OF ENGINEERING
# INTERNATIONAL CONFERENCE PUBLICATIONS

## CSEIC-01

### The Detection and Prevention of Lung Cancer using Convolution Neural Networks - A Review

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**Volume:2023, Page- 937-941, (2023)**

## Abstract

Lung cancer is one among malignancies with high risk of morbidity and mortality ration. In each phase of lung cancer detection imagining plays as vital role to develop imaging based AI models which plays potential key role in detection and customized cancer treatment for the patients. Lung nodule detection by computer aided techniques has recast early detection of lung disease. The feasible use of AI approaches has limitations and more screening program required to detect and identify lung cancer patients with high risk factor. The promising results can be obtained by combining clinical laboratory data and image features using AI models to predict patient's outcomes, specific therapy responses, risk factor computation and toxic reaction developments etc. In the research review, which provides an overall overview of AI based imagining tools, an automated lesion detection and its characterization, segmentation process, predictions of the outcomes, to provide exact and on time treatment by radiologist and clinicians with the foundations of specific applications in the medical era. 

## CSEIC-02

### Synthesis of Reversible Logic Circuits-A Technical Review

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## Abstract

Traditional technologies such as CMOS show their limitations with an expanded growth of packing density. The usage of recent modern technologies is needed to address the traditional challenges. In modern technologies, managing the loss of energy is also a primary issue in the digital logic design for both manufacturer and as well as for the customer. Thus, Reversible logic is considered to be one of the efficient solutions to overcome such problems. The applications of reversible logic are in a wide range of domains - Digital Signal Processing, Optical Computing, Cryptography, and CMOS design with low power consumption. Thus, this paper discusses optimal-cost synthesis problems related to reversible logic circuits. The synthesis problem aims to obtain a network of gates with minimum cost that realize a given function by assuming the same cost for each gate, and each gate's cost reflects the actual cost for its implementation. The discussion of various synthesis algorithms and a comparative study of them are presented by giving their essential features and limitations. © 2023 IEEE.

## CSEIC-03

### Enhancement of Channel Capacity in 5G Ultra Dense Network-UDN

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## Abstract

A 5G ultra dense network architecture makes use of a high density of micro cell base stations to provide increased coverage, capacity, and performance for 5G communication systems. This is accomplished by the utilization of a very densely packed network. A 5G ultradense network is another name for this particular category of network. Ultradense networks are built to overcome the limitations of ordinary cellular networks. This is accomplished by increasing the number of base stations that are located inside a given area. This is performed by reducing the coverage area provided by each base station, which ultimately leads to an increase in the capacity of the entire network. The maximum data rate or capacity that may be obtained through a certain wireless channel is referred to as the 'channel capacity' in a 5G ultradense network, when the phrase 'channel capacity' is used. One possibility is that this represents the maximum quantity of data that can be transmitted across the channel. These criteria, which represent the capabilities of the channel, can be used to evaluate the performance of channels and equipment on 5G networks. This article presents for further research a model for improving the channel capacity of the 5G ultradense network. The model can be found at the end of the article. This change will result in an increase in both the usefulness of the channel and the amount of bandwidth that it consumes; both of these aspects will improve. The fact that it uses a very small quantity of energy and power in compared to other methods is the major trait that sets it apart from other methods. This technology is superior to others in terms of both the amount of data it can communicate and the amount of electricity it consumes in the process. © 2023 IEEE.

# CSEIC-04

## Facial Emotion Detection Using Deep Learning: A Survey

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## Abstract

The long history of facial expression analysis has influenced current research and public interest. The scientific study and comprehension of emotion are credited to Charles Darwin's 19th-century publication The Representation of the Sentiment in Man and Animals (originally published in 1872). As Recognition of human emotions from images is one of the utmost important and difficult societal connection study assignments. One advantage of using a deep learning strategy is its independence from human intervention while undertaking feature engineering. This approach involves an algorithm that scans the data for features that connect, then combines them to promote quicker learning without being explicitly told to. Deep learning (DL) based emotion detection outperforms traditional image processing methods in terms of performance. In this analytical study, the creation of an artificial intelligence (AI) system that can recognize emotions from facial expressions is presented. It discusses the various techniques for doing so, which generally involve three steps: face uncovering, feature extraction, and sentiment categorization. This study describes the various existing solutions and methodologies used by the researchers to build facial landmark interpretation. The Significance of this survey paper is to analyze the recent works on facial expression detection and distribute better insights to novice researchers for the upgradation in this domain. © 2023 IEEE.

# CSEIC-05

## Non-Contact Vital Prediction Using rPPG Signals

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## Abstract

In this paper, we present the clinical significance of various cardiac symptoms with the use of heart rate detection, ongoing monitoring and present emotions. The development of algorithms for remote photoplethysmography has drawn a lot of interest during the past decade (rPPG). As a result, using data gathered from the video feed, we can now precisely follow the heart rate of individuals who are still seated. rPPG algorithms have also been developed, in addition to technique based on hand-crafted characteristics. Deep learning techniques often need a lot of data to train on, but biomedical data frequently lacks real-world examples. The experiment described in this work, we looked at how illumination affected the rPPG signals' SNR. The findings show that the SNR in each RGB channel varies depending on the colour of the light source. Paper describes development in video filtering for recognising the comprehending human face emotions. In our method, emotions are deduced by identifying facial landmarks and analysing their placement. 

# CSEIC-06

## Breast Cancer Detection Framework using Evolutionary Search and SVM Classifier

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**ISBN: 9798350318210 (ISBN), DOI-10.1109/ICoAC59537.2023.10249874, (2023)**

## Abstract

Because breast cancer is a common and potentially dangerous disease, early and correct detection is essential for effective treatment. The present research paper, we propose a breast cancer detection framework that combines evolutionary search algorithms and Support Vector Machine (SVM) classifiers help to increase the accuracy and effectiveness of diagnosis. The framework utilizes evolutionary search algorithms to optimize the selection of relevant features from medical imaging data, followed by classification using SVM classifiers. The evolutionary search algorithms aid in identifying the most discriminative features, while the SVM classifiers provide efficient and accurate classification based on these features. By integrating these techniques, the proposed framework offers a comprehensive and automated approach to breast cancer detection. The usefulness of the proposed framework is demonstrated by experimental findings on benchmark datasets, achieving high classification accuracy and outperforming existing methods. The proposed framework has an opportunity to advance development of advanced breast cancer diagnostic tools, enabling early detection and prompt intervention, increasing patient outcomes is the end goal and reducing mortality rates. © 2023 IEEE.

# CSEIC-07

## A Generalized Framework for Brain Tumor and Pneumonia Detection Using Streamlite Application

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## Abstract

One of the dangerous disease pneumonia, which can affect one or both lungs, is frequently brought on by viruses, fungi or bacteria. Radiotherapists with advanced training are required to evaluate chest X-rays used to diagnose pneumonia. Brain tumours are another fatal disease that can have a profound impact on a patient's quality of life and alter everything for them and their loved ones. Therefore, creating an automatic system for diagnosing pneumonia would help treat the disease quickly, especially in remote areas. The work proposes a general framework for MRI and CT images that can automatically detect diseases such as brain tumours and pneumonia with single framework using VGG16. The proposed work focusing on developing streamlit web application for deployment. The proposed work gained an accuracy of 97.87% compared to Inception, Xception and ResNet for brain tumor detection and 94.3% for Pnemonia detection model. The training and testing data are compared using a CNN-based classifier to determine the optimal outcome. © 2023 IEEE.

# CSEIC-08

## Building Accessible Video Games for Children with an Autism Spectrum Disorder

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**ISBN: 9781665493604 (ISBN), DOI-10.1109/ICECCT56650.2023.10179616, (2023)**

## Abstract

Young children, especially those on the autistic spectrum, often do not learn educational subjects and life skills in the same manner as neurotypicals. Recreational activities like games, puzzles and co-curriculars are known to provide additional opportunities for learning while also engaging the child. The proposed project is aimed to design and implement an interactive game that will help shape the behavioral, cognitive and/or life skills of children with Autism Spectrum Disorders (ASD). Such an implementation will be carried out using the Unity engine, which utilizes the language C# for the source code. The final result is expected to be a working solution of a game that will aid healthy development of autistic patients in early childhood, and will be deployed for public use.

# CSEIC-09

## Diabetic Retinopathy Detection & Classification using Efficient Net Model

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**ISBN:978-1-6654-5628-9, DOI: 10.1109/ICAIA57370.2023.10169756,**

## Abstract

Diabetic retinopathy is an eye disease that progressively degrades a person's vision. It affects 40-45% of people with diabetes and it is one of society's leading causes of blindness. Diabetic retinopathy has 4 different phases and with each stage, the eyesight of a person degrades. If diabetic retinopathy is detected in its early phases its effects and progression can be slowed down and save the person from permanent blindness. We aim to utilize ML to detect the disease and classify diabetic retinopathy into its 4 classes based on severity, helping in early detection. This paper gives a glimpse into diabetic retinopathy and proposes a methodology to develop a machine-learning model along with deploying the developed model on an AWS based web-app. 

# CSEIC-10

## Class Room Student Attentiveness Model based on YOLO

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**ISBN:979-8-3503-3510-1, DOI: 10.1109/ICCCNT56998.2023.10306686**

## Abstract

Online classroom discipline is a key concern for teachers now a days. The issue also attracts significant attention from the public and the media. In addition to this using mobile phone in class is one of the reasons for not paying the attention. For avoiding this issue, developed a model called "Class Room Attention Model". The proposed model collects the data using camera, and with the help of machine learning models automatically detects whether the student in the class is paying attention or not. The suggested method uses Tensor Flow to detect the mobile phone and media pipe for extracting the body features using the YOLO model. The model detects presence of mobile in the classroom in addition to the prediction of the students attentiveness. The proposed efficient and accurate model to identify the attention of a student in a class room with the random forest classifier provided an accuracy of 97.65 % for attention of student and 93.81% for mobile detection. © 2023 IEEE.

# CSEIC-11

## Vocals - An App for Vocally Impaired using NLP Conversational Model

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**Print on Demand (PoD) ISBN:979-8-3503-3402-9, DOI: 10.1109/ I2CT57861.2023.10126416(2023)**

## Abstract

Conversations between humans and machines have become an increasingly common occurrence in today's digital age. As technology progresses, automated systems are becoming more adept at comprehending and reacting to human language through advancements in language analysis and computational linguistics. While this has brought many benefits, such as improved customer service and faster access to information, there are also some potential drawbacks to consider. Though technology is advancing rapidly, they still lack in many aspects such as understanding human emotions, intentions, empathy, flexibility, privacy and security. The main challenge here is how the machine responds relevantly and quickly in a continuous conversation with humans. This research is all about developing an android application that helps vocally impaired people to book appointments easily using a bidirectional LSTM model, text-to-speech and speech-to-text to have a natural conversation with human. © 2023 IEEE.

# CSEIC-12

## Classification of Breast Cancer using a Novel Neural Network-based Architecture

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## Abstract

Breast cancer is currently one of the deadliest types of cancer, and the death rate has considerably grown as a result of a lack of knowledge about the disease, its symptoms, and prevention techniques. Therefore, early detection at a nearly stage is crucial and vital in order to limit the progression of cancer. Malignant and benign breast cancer are the two further subtypes. In order to categorise the different forms of breast cancer, an automated system with logistic regression and neural network is proposed. The classification of the breast cancer data utilises the DNN with various levels of processing. The Digital Database for Screening Mammography (DDMS) dataset was used in the proposed study on the Kaggle platform. The dataset was divided into various train-test splits. On the basis of accuracy, ROC AUC cuve the system's performance is evaluated. The outcome demonstrates that proposed-2 outperforms in a comparable sense with a training accuracy of 98.99% and testing accuracy of 98.83%. © 2023 IEEE.

# CSEIC-13

## Detection and Classification of Blood Cancer using an Auto Encoder and a Regularised Extreme Learning Machine

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**Volume 2023-June, 2023, Pages 1497-1502**

**Abstract**

Leukemia is by far the most common type of blood cancer in humans. The length of time it takes to recover from an illness is determines by how quickly it is recognized and treated. Leukemia develops when the bone marrow generates an abnormally large amount of white blood cells. Because images of human blood samples are studied under the microscope, hematologists use techniques such as microscopic color imaging, image segmentation, grouping, and classification to diagnose patients as quickly and precisely as possible. Microscopy can identify blood cancer in visible and immature white blood cells in a variety of methods. Early and correct diagnosis of leukemia is critical for clinicians to properly treat patients. Following the submission of the input image, Image processing in image. © Grenze Scientific Society, 2023.

# CSEIC-14

## Colon Cancer Prediction with Transfer Learning and K-Means Clustering

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**ISBN-978-981-19-5190-9, Online ISBN-978-981-19-5191-6,**
**DOI- 78-981-19-5191-6_16, (2023)**

## Abstract

The automatic diagnosis of colon cancer is important for patients and their prognosis through the analysis of histopathological images. Traditional feature extraction methods extract low-level image features, and prior knowledge is required to choose meaningful features, which may be modified significantly by humans. Hence, unsupervised and supervised deep convolutions neural networks were utilized to analyze histopathological images of colon cancer. To overcome the impact of the unbalanced histopathology images in sub-classes, the balanced sub-classes are turned right and left, up and down, and rotated counter clockwise by $90^{\circ}$ and $180^{\circ}$. The proposed experimental findings for supervised histopathological image classification of colon cancer demonstrate that Inception_V3 and Inception ResNet_V2 outperform current algorithms. These findings suggest that the Inception_ResNet_V2 network is superior deep learning architecture for analyzing histopathological images for diagnosis colon cancers. As a result, in order to perform unsupervised image analysis, Inception_ResNet_V2 is utilized to extract features from colon cancer histopathology images. In addition, a new autoencoder network was created to convert the features collected by Inception_ResNet_V2 to a low-dimensional space for image clustering analysis. The test results demonstrate that the proposed autoencoder network outperforms the Inception_ResNet_V2 network in terms of clustering. 

# CSEIC-15

## ICN based Co-operative Edge Caching Policy for Transient IoT data

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**ISBN:978-1-83953-917-6, DOI: 10.1049/icp.2023.1529, (14-15 July 2023)**

## Abstract

Context: Internet of Things (IoT) devices generate large amounts of data, which is frequently transient and requested by a large number of users. The Information Centric Network (ICN) is a content-centric network that differs from existing IP networks by allowing in-network caching, which improves data dissemination and content retrieval efficiency in the network. Objective: This work aims to deliver fresh IoT data to consumers while optimising network performance through cooperative edge caching. Method: A cooperative edge caching policy with a threephase architecture for gathering and serving content to consumers has been proposed. An edge cluster is formed based on Euclidean distance to enable cooperation between edge devices. Each content is assigned with a content ID, when the content lifetime exceeds the duration, it is removed from the cache. Content with a shorter lifespan is chosen to be replaced in the cache by new content. Result: The proposed caching policy was compared to random, FIFO, and single-edge caching techniques, and the results revealed that the proposed caching policy performed approximately 20% better on average for all evaluated metrics. Conclusion: Proposed ICN-based cooperative edge caching is an efficient technique to retrieve fresh content in an IoT network which improves the overall network efficiency in terms of data transmission and ensures that the cache remains current and efficient. 

# CSEIC-16

## Face Mask detection using Mask R-CNN to control the spread of Covid-19

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**ISBN: 979-835039619-5, DOI: 10.1109/ICRTEC56977.2023.10111905, (2023)**

## Abstract

Business executives are developing cutting-edge digital solutions as the virus outbreak spreads. A face mask detection system is one of them, and it can be used to spot people wearing them. Face mask identification software and applications have already been released by a few businesses, and others have promised to do the same for the service. The proposed work examines face mask detection accuracy using CNN networks. Mask wear is now required in many developed and developing countries worldwide when leaving the house or entering public spaces. It will be difficult to maintain touchless access control in buildings while recognising faces wearing masks on any surveillance systems. Masks covering faces has made face detection algorithms and performance difficult. The proposed work detect face mask labeled no mask or mask with detection accuracy. The work train the system to click images of a face and provide labeled data. The work is classified using Convolution Neural Network (CNN), a Deep learning technique, to classify the input image with the help of the classification algorithm MobileNetV2. The trained system shows whether a person in the video frame is wearing a mask or not. © 2023 IEEE.

# CSEIC-17

## Diabetes Prediction in Teenagers using Machine Learning Algorithms

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**ISBN: 978-938054447-2, 2023, Pages 343-347**

## Abstract

Diabetes Mellitus (DM) is a hazardous condition that can lead to worldwide health problems owing to an increase in blood glucose levels, age, lack of movement, high blood pressure, poor nutrition, and other factors. The aim of this study is to develop a system that can predict diabetes in individuals aged 10 to 30 by merging the results of different machine-learning algorithms. Machine learning is used for increasing performance and forecasting accuracy. Some of the methods used to detect diabetes early include Logistic Regression (LR), Random Forest (RF), Support Vector Machine (SVM), K Nearest Neighbours (KNN), and XGBoost. In comparison to the other methods, the random forest and XGBoost Classifiers algorithm outperformed all other ML algorithms, with a maximum accuracy of 86 © 2023 Bharati Vidyapeeth, New Delhi.

# CSEIC-18

## Breast Cancer Prediction using Feature Selection and Classification with XGBoost

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## Abstract

As a result of high population growth, medical research and early sickness identification has become a responsibility. As the inhabitants grows, the likelihood of succumbing to breast cancer rises. A illness detection system that's automated reduces the danger of mortality, provides dependable, efficient, and rapid reaction, and assists doctors in disease diagnosis. to reinforce the predictive efficacy of current models and To estimate the risk of breast cancer, proposed model used Extreme Gradient Boosting (XGBoost) and compared it to Logistic Regression (LR), The Random Forest (RF), and Support Vector Machines (SVM). In this work, target picking the most weighted features using the XGBoost method and training the model with those features was performed. This approach yielded the identical accuracy as training the model with all features, however training the model with all features takes longer. The suggested approach has produced findings that are comparable and may help radiologists provide opinions © 2023 IEEE.

# CSEIC-19

## Enhancing Reliability in Multi-Path Mobile Wireless Sensor Network

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## Abstract

Mobile Wireless Sensor Network (MWSN) allows rapid and transitory connections among mobile sensor nodes lacking the help of structure. Due to the rapid growth of MWSN, traffic necessitates a severe and unbalanced load. For this reason, an efficient routing approach is necessary to build the load balance. Multi-Path (MP) balances the routing load and minimizes the network delay. This approach presents Enhancing Reliability in multi-path (ERMP) in the MWSN. This approach's main objective is to reduce network congestion and diminish packet losses in the network. This approach balances the network load by evaluating node capacity by queue length and congestion window size. The node capacity cannot access the highest load at a time using Multi-path routing. Thus, equates to the routing load in the MWSN. In addition, the Genetic Algorithm (GA) selects the efficient relay node for transmitting the data efficiently. The simulation results demonstrate that the ERMP approach minimizes the routing load and increases the network throughput in the MWSN. Furthermore, the proposed approach reduces the delay and packet loss rate in the MWSN. © 2023 IEEE.

# CSEIC-20

## Forest-based Underwater Temperature Prediction Model for IoT Devices

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## Abstract

IoT is a booming domain in the field of technology. The main reason for its advancements in recent years has been its applications in various domains such as the environment, healthcare, smart cities, and agriculture. Real-Time data collection and fast exchange of data allow for effective functioning. Underwater temperature detection can be more fruitful and effective when coupled with IoT. This study focuses on building a predictive model that may help Automated Underwater Vehicles (AUVs) detect the ocean bed's temperature in real-Time. The AUV embedded with IoT onboard sensors enables the exploration of submarines in an underwater environment and lives. For this purpose, six machine learning regression models are considered to be trained over a dataset containing underwater temperature records at the corresponding depths near the islands in Brazil. The standard performance metrics were utilized for the evaluation of the performance of the models. Tree-based ensemble models such as Random Forest Regressor and Decision Tree Regressor produced the best predictive results, with their R2 values being 96.13% and 94.21%, respectively. The results clearly indicate that accurate underwater temperature prediction can be achieved by implementing tree-based models. Application of this technology can help AUVs get more insight into marine life and make inferences of any anomalies regarding this whatsoever. 

# CSEIC-21

## Improved Red Deer Algorithm for Scientific Workflow Scheduling in Cloud Environment

**Venkata Srinivas, C.M., Rena, H., Arunarani, A.R., Naitik, S.T., Al Ansari, M.S., Younas, A.**

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## Abstract

One of the most difficult problems in the technological sector is the versatility of cloud computing, which can offer a flexible and responsive infrastructure in the realm of information technology. A significant problem in cloud computing that is addressed in recent research is workflow scheduling. With the quick advancement of cloud computing, scheduling the intricate scientific process on the cloud has grown to be an incredibly difficult task. It has been identified that one of the key challenges to optimizing the performance of cloud computing is scheduling workflow tasks so that it is processed by the most effective cloud network resources. Meta-heuristic optimization algorithms are frequently utilized to find a solution to effective task scheduling because of the intricacy of the problem and the extent of the search space. This research suggests a unique Improved Red Deer Algorithm (IRDA) to shorten execution time subject to a set budget. The performance of the proposed algorithm is evaluated against conventional optimization algorithms by applying it to scientific workflows including Montage and Epigenomics. The experimental results reveal that the proposed algorithm works better than other compared methods in reducing workflow task execution time and cost. © 2023 IEEE.

# CSEIC-22

## Quantitative Analysis of EEG Neurofeedback using optimized 1-DPSO

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**ISBN: Institute of Electrical and Electronics Engineers Inc.,**
**DOI: 10.1109/SPIN57001.2023.10116248, Pages: 373-378, (2023)**

## Abstract

Brain-Computer Interface (BCI) systems are the leading technology in the world related to Neurosciences. Human intelligence and imagination have no bounds and this has led to vast advancement in BCI systems related to Neurological and allied sciences. This system measures the activity of the Central Nervous System (CNS) using biosignals and output is called Electroencephalography (EEG). The main purpose of BCI is to acquire EEG brain signals, identify patterns, extract features, and produce resultant actions. This process communicates with a modest electronic system designed for movements of physically challenged or paralyzed people. The purpose of this BCI system is to design a model to check the attention level of body movement. The movements are based on the EEG signals captured from the 19-electrode EEG headset. This allows gaining control over optimized real-time feature selection for EEG signals. The dataset of 30 subjects' sample EEG signals is recorded for classification and analysis purpose. The EEG signals are classified using Logistic Regression, Decision Tree, and Random Forest algorithms. It is shown that Random Forest is the most efficient classifier with the highest accuracy of 99.47%. © 2023 IEEE

# CSEIC-23

## An approach to forecast team dimensions

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ISBN: 0094243X (ISSN), DOI: 10.1063/5.0148916, Volume-2796, (2023)

## Abstract

Allocating people in a couple of initiatives is an essential trouble thinking about the productiveness of businesses from the standpoint of socialization. The work primarily focuses on determining an optimal number of people with aggressive and passive personality traits. Due to the NP-hard nature of the problem, we recommend using a Genetic-Algorithm to tackle the ensuing optimization problem. Working in a team has also been viewed as a good training for individuals going into business since working in a team allows them to improve their capacity to control and handle project challenges quickly. Most university publications use a group-format to allow students to share their knowledge, improve problem-solving abilities, and improve verbal communication skills. However, not all student groups get along. One of the causes is that the groupings aren't formed in a methodical way. As a result, team building is critical as a starting point for the institution's growth and success. So, keeping the ideal stage of cohesion maintains a group collectively, to be able to convey advantageous influences at the results of a venture. Approaches to group creation have repercussions that experts have looked into. Self-selection and random assignment of participants are the most common strategies utilized in team building in ordinary exercise. These methods aren't beneficial in the development groups as it will now not accelerate the improvement processes. As a result, the concept's purpose is to ensure that the best possible efficacy in terms of social interaction is achieved. As a result, the offered set of guidelines can be used as a selection tool by managers to create people groups for a variety of projects. Computational experiments with benchmarks were carried out and compared to the exhaustive technique in order to investigate the performance of the suggested technique. The results are encouraging, demonstrating that the set of criteria consistently produces near-perfect results in a short amount of time. © 2023 Author(s).

# CSEIC-24

## Simulation of Stock Market Herd Behavior Evolution Model Based on Improved Particle Swarm Optimization

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ISBN: 979-835030541-8, ISBN: 979-835030541-8, (2023)

## Abstract

HB (Herd behavior) is a widespread phenomenon in the financial market, which means that investors adopt the same investment strategy because of the influence of some investment strategies adopted by other investors, that is, investors' choice depends entirely on public opinion, rather than on their own information. This paper introduces the mechanism of biological foraging behavior into PSO (Particle Swarm Optimization). Aiming at the "imitation" characteristics of investors' investment behavior under the network system, an improved PSO simulation model for HB is constructed from two dimensions of investors' self-psychological preference and neighborhood behavior effect. Random initialization is carried out in a certain neighborhood of the local optimal position, and the optimal value is further searched. The results show that with the increase of HB traders to a certain extent, the frequency and range of price fluctuations have declined. Compared with the improved PSO, PSO takes much longer to calculate. No matter in unimodal function or multimodal function, the improved PSO algorithm shows good convergence and search accuracy, and the optimization performance is significantly improved. 

# CSEIC-25

## Randomized Matrix-based Double-Key Cryptographic System

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ISBN: 9781665474511 (ISBN), DOI: 10.1109/IDCIoT56793.2023.10053402,
Pages-118-121, (2023)

## Abstract

Cryptography plays an important role in information security and in secure communication, which defines the security of a particular system. Many modern cryptographic algorithms exist today however they face difficulties in uniform implementation. In addition, different types of cryptographic techniques target different types of text lengths for encryption. Ancient Indian literature has many robust encoding schemes which include Siri Bhoovalaya, Ekakshara Kosha, and Mlecchita Vikalpa. This research work presents a Randomized Matrix-based Double-key Cryptographic System (RMDCS) to encode small to large amounts of information in a matrix. This work is inspired by matrix-based encryption used in one of the ancient Indian techniques called "Siri Bhoovalaya"RMDCS aims to bring forth a modern cryptographic technique that coalesced a randomized matrix approach with Caesar cipher. RMDCS intends to achieve one-time padding by generating a unique key every time while encrypting the same text.

# CSEIC-26

## A Critical Review of Faults in Cloud Computing: Types, Detection, and Mitigation Schemes

**Kaur, R. Revathi, V.**

**ISBN: 18678211 (ISSN); 9783031350801 (ISBN), DOI: 10.1007/978-3-031-35081-8_17, Volume- 471 LNICST, Pages- 202-221, (2023)**


## Abstract

The continuous rise in for demand services in large-scale distributed systems led to the development of cloud Computing (CC). Because it provides a combination of various software resources, CC is considered dynamically scalable. However, due to the cloud's dynamic environment, a variety of unanticipated problems and faults occur that hinder CC performance. Fault tolerance refers to a platform's capacity to respond smoothly to unanticipated hardware or programming failure. Failure must be analyzed and dealt with efficiently in cloud computing in order to accomplish high accuracy and reliability. Over the years, a significant number of techniques and approaches have been proposed for detecting the faults in CC as well as increasing their tolerance ability. In this review paper, we first provided a brief overview of Cloud computing systems, their architecture, and their working mechanism. Moreover, the services provided by Cloud computing and the issues faced by it are also highlighted in this paper. Also, the taxonomy of various faults that occur in the CC environment along with their mitigation techniques is discussed. Furthermore, it has been analyzed that traditional fault detection methods were not generating effective results which resulted in poor performance in cloud environments. Therefore, an ample number of authors stated to use Machine Learning (ML) based models for fault detection in CC. Nonetheless, ML algorithms were not able to handle a large volume of data therefore the concept of Deep Learning was introduced in fault detection approaches. Moreover, it has been also observed that the performance of DL methods can be enhanced significantly by using optimization algorithms along with them. Some of the recently proposed fault detection and tolerant systems based on ML, DL and optimization have been reviewed in this paper. 

# CSEIC-27

## Skeletal Bone Age Determination Using Deep Learning

**Karthik, C.D. Shrada, C., Krishnamurthy, A.**

**ISBN: 21903018 (ISSN); 9789811960673 (ISBN),**
**DOI: 10.1007/978-981-19-6068-0_6, Volume-317, Pages-49-60, (2023)**

## Abstract

In today's clinical diagnosis of dental patients, skeletal maturity assessment is a unique bio-marker. The bone age assessment (BAA) method is use to identify endocrinological as well as growth abnormalities by contrasting the patient's bone age and actual age. A number of approaches for determining skeletal maturity have been devised; however, the two most significant approaches that employ left hand and wrist radiographs are the Tanner-Whitehouse and Greulich-Pyle methods as mentioned in. While these approaches are well known, they are exceedingly time-consuming and need a skilled radiologist who would have to assess the bone age using a hand atlas as a guideline every time. In our paper, we use convolutional neural networks (CNNs) to successfully predict the maturity of bone age from hand X-ray images of patients aged 4–17 years old. The examination effort of radiologists, for example, is a restriction of manual clinical processes. Since the manual methods are subjected to observer variability, developing computer-aided and automated systems for bone age evaluation is advantageous. We compare the existing deep convolutional neural networks (DCNNs) like VGG16, VGG19, inception models to our own custom regression model in this paper. 

# CSEIC-28

## Data Acquisition Techniques from IOT Devices for Smart Transportation: A Brief Overview

**Ranjith, V., Malagi, K.B.**

**ISBN: 23673370 (ISSN); 9789811952234 (ISBN),**
**DOI: 10.1007/978-981-19-5224-1_6, Volume-517, Pages-51-57, (2023)**

## Abstract

Internet of Things has revolutionized the entire world these days. With the advent of the word smart in all the fields, for example, the smart city, huge amount of data gets accumulated every single day. For any application, processing this huge amount of data is very important. Prior to processing, acquisition of this bulk amount of data is very important. In the existing research, there are different ways to collect these data. In this paper, data acquisition using different modern approaches is outlined. These approaches encompass data acquisition using hierarchical deep reinforcement learning, data acquisition using energy efficient UAV, data acquisition using swarm intelligence. This paper outlines these approaches, brings out the assets and liabilities of each one of these approaches for smart com. 

# CSEIC-29

## Cancer Text Article Categorization and Prediction Model Based on Machine Learning Approach

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**ISBN: 979-835034035-8, DOI: 10.1109/MysuruCon59703.2023.10397005, (2023)**

## Abstract

Many research studies have been carried out to identify different variations of cancers in the human body throughout the globe. Due to numerous volumes, the primary concern for healthcare researchers is to segregate the article into a well-thought-out manner. Biomedical text classification is a globally volitional realm due to its numerous uses in different fields. This study motivates us to use a dataset related to cancer articles text containing 7570 research papers with categories into three classes. Like the Word2Vec and BERT models, the word embedding technique converts the text into a numeric vector. The text classification-based prediction model considers nine Machine Learning (ML) classifiers. The models are tested with k-fold cross-validation and evaluate the prediction performances by considering the different standard metrics. The model trade-off between bias and variance is controlled by calculating the standard deviation and k-fold mean accuracy to overcome the overfitting problem of the deployed model. The outcome is observed on the Random Forest (RF) classifier in the case of Word2Vec embedding with a mean accuracy of 99.98%. The BERT models also performed well, with about 97.70% mean accuracy and other parameters compared to the Word2Vec model. The other parameters' evaluation score was near 1.00, promising in multiclass text classification deployed model performances. © 2023 IEEE.

# CSEIC-30

## A Study on Paraphrase Corpus Detection Using Various ML Models

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**ISBN: 9798350340129 (ISBN), DOI: 10.1109/DISCOVER58830.2023.10316665, Page- 43-48,**

## Abstract

Paraphrase detection, a crucial task in natural language processing, involves determining if two given sentences convey the same meaning. This research paper explores the advancements made by Microsoft Research in paraphrase detection using a range of machine learning models, ensemble techniques, and fine-tuned hyper parameters. The paper then presents the significant contributions of Microsoft Research, which involve employing a diverse set of machine learning models and leveraging ensemble techniques to enhance the accuracy and robustness of paraphrase detection. Additionally, the use of grid search cross-validation for hyper parameter optimization is explored to fine-tune the models' performance. The BERT (Bidirectional Encoder Representations from Transformers) model was also trained for paraphrase detection using the ktrain library. Experimental setups, including datasets, evaluation metrics, and preprocessing steps, are described in detail. Results and analysis showcase the effectiveness of the comparative analysis, demonstrating significant improvements over existing methods. Overall, this research paper provides valuable insights into the advancements achieved by Microsoft Research in paraphrase detection through the utilization of diverse machine learning models, ensemble techniques, and fine-tuned hyper parameters, thus driving the progress in natural language processing tasks. 

# CSEIC-31

## A Study on Paraphrase Corpus Detection Using Various ML Models (Conference Paper)

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**ISBN: 9798350335095 (ISBN), DOI: 10.1109/ICCCNT56998.2023.10307762, (2023)**

## Abstract

Paraphrase detection, a crucial task in natural language processing, involves determining if two given sentences convey the same meaning. This research paper explores the advancements made by Microsoft Research in paraphrase detection using a range of machine learning models, ensemble techniques, and fine-tuned hyper parameters. The paper then presents the significant contributions of Microsoft Research, which involve employing a diverse set of machine learning models and leveraging ensemble techniques to enhance the accuracy and robustness of paraphrase detection. Additionally, the use of grid search cross-validation for hyper parameter optimization is explored to fine-tune the models' performance. The BERT (Bidirectional Encoder Representations from Transformers) model was also trained for paraphrase detection using the ktrain library. Experimental setups, including datasets, evaluation metrics, and preprocessing steps, are described in detail. Results and analysis showcase the effectiveness of the comparative analysis, demonstrating significant improvements over existing methods. Overall, this research paper provides valuable insights into the advancements achieved by Microsoft Research in paraphrase detection through the utilization of diverse machine learning models, ensemble techniques, and fine-tuned hyper parameters, thus driving the progress in natural language processing tasks. © 2023 IEEE.

# CSEIC-32

## A community-based cloud music streaming platform with recommendation and comments filtering

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**9798350315905 (ISBN), DOI: 10.1109/ACCAI58221.2023.10199223, (2023)**

## Abstract

The music streaming industry has become increasingly popular, and many existing music apps offer users a wide range of audio content to choose from. The music industry has undergone significant transformation over the years, with the emergence of new technologies leading to the rapid increase of streaming services and changing consumer preferences. Currently existing music streaming services like spotify, wynk music have various features including music discovery, playlist creation, song/artist recommendation, offline playback, lyric integration, and personalization based on user preferences and listening history. Based on the analysis of existing music apps, we are building a new cloud-based music streaming app that not only provides a personalized music recommendation system but also focuses on the artists by providing a platform for independent musicians to showcase their work. The app is designed to cater to artists, with a focus on building a community-driven platform that incorporates comment filtering. 

# CSEIC-33

### A Survey on Artificial Intelligence (AI) based Job Recommendation Systems

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**ISBN- 9781665491990 (ISBN), DOI- 10.1109/ICSCDS56580.2023.10104718, Pages-730-737, (2023)**

## Abstract

Job recommendation systems are AI-powered platforms that aim to provide job seekers with personalized job recommendations based on their skills, experience, and preferences. However, these systems face several challenges such as dealing with sparse data, maintaining data privacy and security, overcoming bias and discrimination, and ensuring transparency and interpretability. Recent techniques used in job recommendation systems include deep learning, reinforcement learning, and knowledge graphs. These techniques help to address the challenges such as dealing with sparse data, improving the accuracy of recommendations, and ensuring transparency as well as interpretability. The results of this study also helps to improve the job search experience for job seekers, reduces the time taken to find suitable job opportunities, and increase job satisfaction. Consequently, the job recommender architecture serves as a mediator. Accordingly, this work presents a detailed comprehensive survey of several filtering, machine learning and deep learning techniques that has revolutionised job recommendation system. Multiple applications and the associated challenges with existing job recommendation system are also discussed briefly. © 2023 IEEE.

# CSEIC-34

## Prediction of Photodetector Response Using Supervised Learning

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**ISBN- 9798350343144 (ISBN), DOI: 10.1109/CSITSS60515.2023.10334238, (2023)**

## Abstract

Responsivity of a photodetector is a significant parameter which describes the response of the detector to a particular wavelength of light. The experimental determination of responsivity of the photodetector requires necessary light source of a particular wavelength. For wavelengths in deep UV region, it is difficult to get a light source, thereby making it difficult to estimate the responsivity of a photodetector experimentally. In this work, Supervised Learning algorithm has been used for predicting the response of a Graphene based photodetector in Field Effect Transistor architecture operating in deep UV range of wavelength. The dataset is collected from an experiment. Exploratory data analysis is done to understand the relationship between the different features of the dataset and the target variable which is the photocurrent flowing through the photodetector. Algorithms like Multiple Linear Regression and Polynomial Regression are used to build predictive models. It was observed that the fit with Polynomial Regression gave much better performance than of that with Multiple Linear Regression. This proves that the dependency of response of the photodetector is not strictly linear. The performance of the model is evaluated in terms of R2 score and mean square error. © 2023 IEEE.

# CSEIC-35

## OrthoSNet: A framework for Identifying and Verifying Tuberculosis in Chest Radio graph images using Discrete Orthonormal Stockwell transform

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ISBN: 9798350335095 (ISBN), DOI: 10.1109/ICCCNT56998.2023.10308237, (2023)

## Abstract

X-ray imaging is one commonly employed method among the range of diagnostic tools available for detecting lung tuberculosis. Pulmonary tuberculosis is often detected and screened through chest X-rays (CXR). Nevertheless, the examination of chest radio-graphs by skilled physicians to identify Tuberculosis (TB) in clinical settings can be time-consuming and prone to subjective inconsistencies. Medical experts analyzing medical data face substantial subjectivity and variation in image quality. Therefore, there is growing interested in the healthcare sector to leverage machine learning to improve the accuracy and efficiency of medical data analysis. Considering this matter, Digital Pathology (DP) and Algorithmic machine-assisted diagnosis (AMAD) systems have the potential to significantly aid in the large-scale examination of pulmonary tuberculosis through the analysis of chest X-ray image features. We propose OrthoSNet: a network architecture that learns image contrast translation invariant features. We have made use of the Tuberculosis Dataset for the development and substantiation of the model. Our experiment validates the practicality and utility of our alternative approach, With a significant improvement in accuracy. The proposed model predicts a superior accuracy of 99 % with a sample size of 1400 images. © 2023 IEEE.

# CSEIC-36

## Emoji Recommendation System Using Deep Learning Algorithms

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9798350334395 (ISBN), DOI: 10.1109/CONECCT57959.2023.10234737, (2023)

## Abstract

Emojis are becoming increasingly prevalent in everyday online communication such as messaging, email, and social networking. To enhance the user experience of expressing emotions and conveying information through emojis, various techniques have been developed. Our proposed system aims to analyze chat conversations, identify different emotions or topics of discussion, and suggest emojis that align with the context of the conversation. Our model considers contextual and personal information derived from the user's chat conversations to predict appropriate emojis. The emoji recommendation system is designed with several key considerations in mind. Firstly, our model considers entire conversations, rather than relying on individual sentences to predict emojis. To suggest suitable emojis based on the chat context, our emoji prediction system should take into account multiple previous messages. This includes not only the text and emojis exchanged between participants but also the identity of the speaker and the sequence of sentences within the chat. Secondly, our model seeks to capture different conversational contexts. Conversations can convey a broad range of emotions, information, and feelings. As such, the selection of emojis should be based on the specific context of the ongoing chat, and our recommendation model should offer users a range of emojis that align with different contexts. © 2023 IEEE.

# CSEIC-37

## Audio-Music Fingerprinting Recognition

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**ISBN: 9798350322842 (ISBN), Pages-270-274, (2023)**

## Abstract

Audio fingerprinting is the method involved with addressing a sound sign minimally with the aid of isolating vital highlights of the sound substance a part of the good sized makes use of of acoustic fingerprinting includes substance-based sound healing broadcast watching and so forth it lets in gazing the sound free of its arrangement and with out the requirement for metadata it really works by using studying frequency styles and tracking down a fit internal its statistics set of tunes this utility tries to understand the songs through the use of a time-frequency graph primarily based on an audio fingerprint that is known as a spectrogram the software program utilizes a cell phone implicit microphone that assembles a concise instance of a legitimate that is played it analyzes the outside sound and seeks a comparable suit on a database in which thousands and thousands of songs are saved based totally on an acoustic fingerprint when the software reveals a in shape it retrieves records such as the album track name original music and so forth. © 2023 IEEE.

# CSEIC-38

## BRCA1 Genomic Sequence-Based Early Stage Breast Cancer Detection

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**23673370 (ISSN); 9789811988240 (ISBN), DOI: 10.1007/978-981-19-8825-7_22, Volume 600, Pages- 249-257, (2023)**

## Abstract

Breast cancer is one of the most common types of cancer found in more than half of women worldwide, and the main cause of breast cancer is due to changes in the genomic sequence of breast tissue caused mainly by environmental factors and genetic mutations. There is a specific genomic sequence associated with the diagnosis of breast cancer. There is a sequence commonly referred to as the breast cancer gene 1 (BRCA1) sequence, the modification of the aforementioned sequence will increase breast cancer. The paper aims at discussing the genomic sequence-based breast cancer detection. The proposed approach identifies the specific changes that occur in the BRCA1 sequence. The approach analyzes the specific affected areas based on the additional studies conducted on the sequence of acquired DNA. Various techniques are used for analysis and tried to find the most accurate methods of DNA analysis and discovery. The approach applies one-hot encoding technique to compare the mutated BRCA1 and normal BRCA1. This identifies the location and degree with which the gene is being altered. Thus, this paper proposes the technique that identifies the place and degree of alteration that causes the breast cancer. 

# CSEIC-39

## Human Emotion Recognition Based on EEG Signal Using Deep Learning Approach

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**23673370 (ISSN); 9789811988240 (ISBN), DOI: 10.1007/ 978-981-19-8825-7_44, Pages: 515-522, Volume:600, (2023)**

## Abstract

Nowadays, emotion recognition and classification plays a vital role in the field of human–computer interaction (HCI). Emotions are being recognized through body behaviors such as facial expression, voice tone, and body movement. The present research considers electroencephalogram (EEG) as one of the foremost used modality to identify emotions. EEG measures the electrical activities of the brain through a bunch of electrodes placed on the scalp. This mechanism is used due to its high temporal resolution with no risks and less cost. Over the last decades, many researchers involved EEG signals in sequence to cope up with brain-computer interface (BCI) and to detect emotions. It includes removing artifacts from EEG signals, extracting temporal or spectral features from the EEG signals, analysis on time or frequency domain, respectively, and eventually, designing a multi-class classification strategy. The paper discusses the approach of identifying and classifying human emotions based on EEG signals. The approach used deep learning technique such as long-short term memory (LSTM) model and gated recurrent units (GRUs) model for classification. The obtained experimental result seems to be promising with good accuracy in the emotion classification. 

# CSEIC-40

## Survey on Chronic Kidney Disease Prediction Using ML

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**9798350348057 (ISBN), DOI: 10.1109/ICAECIS58353.2023.10170671, Pages-27-32, (2023)**

## Abstract

Chronic kidney disease (CKD) is a significant global health problem with a high mortality and morbidity rate that also contributes to other ailments. Since there aren't any evident symptoms during the early stages of the condition, patients may ignore CKD. When the illness is discovered early, patients can receive quick treatment to stop the CKD from getting worse. Given their ability to accurately and quickly identify patterns, machine learning models may be able to help clinicians achieve this. The main objective of this study is to evaluate the performance of ML algorithms in comparison to other existing machine learning approaches in order to assess a person's propensity for CKD or not. The correlation of several methodologies included in this paper's performances can aid to launch a subsequent study beneficial for up-and-coming analysts in the sector. 

# CSEIC-41

## EEG Signal-Based Human Emotion Recognition Using Power Spectrum Density and Discrete Wavelet Transform

**Shaila, S.G., Anirudh, B.M., Nair, A.S., Monish, L., Murala, P., Sanjana, A.G.**

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**18761100 (ISSN); 9789819976218 (ISBN), DOI: 10.1007/978-981-99-7622-5_39, Volume-1104 LNEE, Pages-557-567, (2024)**

## Abstract

Emotion recognition has been a problem in the field of brain–computer interface. Numerous ways are available for recognizing human emotions and one such technique is through Electroencephalogram (EEG) signals. EEG signals are recordings of the subject's electrical activity in the brain. Feature extraction approaches such as Power Spectrum Density (PSD) and Discrete Wavelet Transform (DWT) are fed as features to various machine learning (ML) and deep learning (DL) models. This work aims to develop models that predict emotions from EEG data. In addition, the results of the above-mentioned feature extraction approaches are compared in this work. The proposed feature extraction methods and models are applied on the DEAP dataset. 

# CSEIC-42

## Classification of Brain Tumour Disease with Transfer Learning Using Modified Pre-Trained Deep Convolutional Neural Network

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**ISSN: 23673370**
**ISBN: 978-981997816-8, DOI: 10.1007/978-981-99-7817-5_36 (2024)**

## Abstract

A brain tumour may be a fully overwhelming cancer condition due to the unregulated and peculiar cell division. The division of brain cells is what causes it or contributes to its occurrence. A significant advancement in medical technology has been made in recent years as a result of artificial intelligence and transfer learning, such as the method of processing medical images that enables quick and simple disease diagnosis by medical professionals where, in the past, it was laborious and time-consuming. On the overall, this device learning set of rules uses convolutional neural networks. This paper employed image processing, records augmentation, and the Convolutional Neural Network method to determine if the brain images were malignant and, if so, what type of tumour they were, including gliomas, meningiomas, and pituitary tumours. 

# CSEIC-43

## Deep Learning-Based Three Type Classifier Model for Non-small Cell Lung Cancer from Histopathological Images

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**23673370 (ISSN); 9789811993787 (ISBN), DOI: 10.1007/978-981-19-9379-4_35, Volume-613 LNNS, Pages-481-493, (2023)**

## Abstract

Lung cancer is becoming one of the most menacing cancers to human health. Small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC) are the two kinds of lung cancer, which are classified based on patterns in behavior and treatment response. Non-small cell lung cancer is classified as lung adenocarcinomas, lung squamous cell carcinomas, and large cell carcinoma. The two most prevalent types of NSCLC are lung adenocarcinoma, which accounts for about 40% and lung squamous cell carcinoma (LUSC), which accounts for almost 25–30% of all lung cancers. Building an automated categorization system for these two primary NSCLC subtypes is vital for building a computer-aided diagnostic system (CAD). CAD can improve the quality and efficiency of medical image analysis by increasing diagnosis accuracy and stability, reducing the chance of wrong diagnosis due to subjective factors and missed diagnosis. With the rapid development of Convolutional Neural Networks (CNN) in image processing, a variety of CNN architectures have emerged, that achieve outstanding image classification performance. In this paper InceptionV3, DenseNet-201, and XceptionNet are selected as candidate networks due to their outstanding classification performance with 99.07%, 95.63%, 98.9%, respectively. The results of our study shows that InceptionV3 performs well in the categorization of types of non-small cell lung cancer histopathological images and benign images. © 2023, The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd.

# CSEIC-44

## Review on Ant Colony and Harmony Search Algorithm in MPLS-MANET Network

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**ISSN: 0094243X ISBN: 978-073544849-0, DOI: 10.1063/5.0184821, Volume -742, (2024)**

## Abstract

Mobile Ad-hoc networks MANETs) are easy to use because MANET has the set of nodes that are moved randomly within the network which is infrastructure less. The MANET uses Multi-Protocol Label Switching (MPLS) to handle the network's changeable topology. The performance of the network is hampered by the high energy consumption of the network nodes. ACO and HSA are employed to find the best path in this work. There are three key parameters that are taken into account by the fitness function: distance, residual energy, and hops. ACO-HSA approach is used to select the most energy-efficient path for network data transport. The ACO-HSA approach is compared to existing routing protocols in terms of performance. In this proposed work we have focused only on residual energy and residual energy is increased compared to existing work. 

# CSEIC-45

## Metaverse in Robotics—A Hypothetical Walkthrough to the Future

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3. Indian Institute of Management, Kerala, Kozhikode, India

## Abstract

The Metaverse is a parallel, virtual realm that people may freely explore through avatar representation. Gaming companies such as Rockstar, Second Life, and Unity were early adopters of the Metaverse in order to attract customers. Since this endeavour has proven to be successful, other industries as diverse as education and entertainment are eager to follow suit. In order to maintain their top position among the rapidly growing user applications and software companies, even well-known social media developers have begun to invest significantly in the effective growth of the Metaverse era. The Metaverse has recently emerged as a research subject and expectation, simultaneously, throughout the ages robotics has captured people's imagination greatly. This research aims to provide light on the potential superpower and effect of integrating two developing technologies, the Metaverse and Robotics. 

# NATIONAL & INTERNATIONAL BOOK CHAPTERS

**CSEIB-01**

## Algorithm and Design Complexity

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**ISBN- 9781000865516 (ISBN); 9781032409320 (ISBN), DOI-10.1201/ 9781003355403, Pages-1-181, (2023)**

## Abstract

Computational complexity is critical in analysis of algorithms and is important to be able to select algorithms for efficiency and solvability. Algorithm and Design Complexity initiates with discussion of algorithm analysis, time-space trade-off, symptotic notations, and so forth. It further includes algorithms that are definite and effective, known as computational procedures. Further topics explored include divide-and-conquer, dynamic programming, and backtracking. Features: Includes complete coverage of basics and design of algorithms Discusses algorithm analysis techniques like divide-and-conquer, dynamic programming, and greedy heuristics Provides time and space complexity tutorials Reviews combinatorial optimization of Knapsack problem Simplifies recurrence relation for time complexity This book is aimed at graduate students and researchers in computers science, information technology, and electrical engineering. © 2023 Anli Sherine, Mary Jasmine, Geno Peter, and S. Albert Alexander.

**CSEIB-02**

**Influence of Machine Learning Technique in Unmanned Aerial Vehicle**

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**ISBN:9781000872453 (ISBN); 9781032171685 (ISBN), DOI:10.1201/9781003252085-3, Pages -43-57, (2023)**

## Abstract

Drones grant extra freedom in their ability to operate even when they are away from the ground. The exploration premium on the utilization of UAV alongside Artificial Intelligence (AI) and its calculations in various regions and areas is of great significance. The goal was to blend the extension and significance of AI models in upgrading Unmanned Aerial Vehicles abilities, answers for issues, and various application regions. The AI execution has decreased quantities of difficulties to Unmanned Aerial Vehicles other than improving the capacities and making the way for the various areas. The blend of Unmanned Aerial Vehicles and AI has brought about quick, worthwhile yields, flying at low elevation, little in size, high goal pictures and lightweight. The UAV and AI have massive extensions in logical examination. This examination has blended exploration on UAV and AI execution. The current investigation found that explorers in this space are inconsistent and greater part of them identifies with the PC/remote organization, keen urban areas, military, horticulture, mining, and untamed life measurable examination. © 2023 selection and editorial matter, Saravanan Krishnan and M. Murugappan; individual chapters, the contributors.

**CSEIB-03**

**Recent and Emerging Technologies in Industrial IoT**

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**ISBN: 978-179989268-7;978-179989266-3, DOI: 10.4018/978-1-7998-9266-3.ch003**

## Abstract

The industrial internet of things (IIoT) is evolving through remote monitoring, cognitive analytics, and industrial process control. Through product customization, intelligent monitoring applications for production floor shops and machine health, and predictive and preventive maintenance of industrial equipment, the primary goal of IIoT is to achieve high operational efficiency, increased productivity, and better management of industrial assets and processes. But because the industrial sector is only now beginning to implement full-stack development solutions with IIoT, there is a need to deal with the problems that are emerging. The IIoT keeps industrial equipment, machines, and cloud-based applications connected. The authors emphasize the advantages of IIoT, which is one of the chapter's three key themes, which include emerging IIoT hardware and software technologies followed by the challenges of IIoT. Further, this chapter focuses on recent trends and technologies in industrial IoT and challenges in IIoT. 

**CSEIB-04**

**Deep learning IoT platform for dental disease detection**

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**, ISBN: 978-100090473-4;978-103239272-1, DOI: 10.1201/9781003407300-14, 1 January 2023, Pages 213-238**

## Abstract

Deep learning can be applied in a wide number of areas, such as speech processing, bioinformatics, astronomy, astroinformatics, disease prediction, image analysis and drug discovery. The huge growth of data and the availability of cheap hardware with GPUs and TPUs are among the reasons why deep learning is becoming more acceptable. Methods for the prediction of dental diseases have been confusing and, to a certain level, unsuccessful. Experiments were conducted using YOLO. YOLO cleverly does object detection in real time using Convolution Neural Networks. It is found from literature that YOLO provides very high real-time accuracy. In this study, we have tried to automate the system of identifying dental diseases such as tooth decay, fillings, fluorosis, chipped tooth and oral thrush through an app with an accuracy of 90%, which is shown through good specificity and sensitivity parameters. The challenge faced by most experiments in the medical or dental field is the availability of appropriate data sets. Labelled data consisting of images of the five different classes were used to train the model. Experimental results are provided for all the above diseases and the overall accuracy is very encouraging. 

**CSEIB-05**

**Machine learning algorithms using scikit and tensorflow environments**

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**9781668485330 (ISBN); 9781668485316 (ISBN), DOI- 10.4018/978-1-6684-8531-6, Pages- 1-453, (2023)**

## Abstract

Machine learning is able to solve real-time problems. It has several algorithms such as classification, clustering, and more. To learn these essential algorithms, we require tools like Scikit and TensorFlow. Machine Learning Algorithms Using Scikit and TensorFlow Environments assists researchers in learning and implementing these critical algorithms. Covering key topics such as classification, artificial neural networks, prediction, random forest, and regression analysis, this premier reference source is ideal for industry professionals, computer scientists, researchers, academicians, scholars, practitioners, instructors, and students. 

**CSEIB-06**

## Class activation mapping and deep learning for explainable biomedical applications

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**9788770228848 (ISBN); 9788770228497 (ISBN), Pages-123-143, (2023)**

## Abstract

For a number of medical diagnostic tasks, deep learning (DL) methods have proven to be quite successful, sometimes even outperforming human experts. The algorithms' black-box nature has, however, limited their therapeutic application. Recent studies on explainability seek to identify the factors most responsible for a model's choice. In the biomedical domain, deep neural networks (DNNs) now represent most successful machine learning (ML) technologies. The various topics of interest in this field include BBMI (study of interface between the brain as well as body's mechanical systems), bioimaging (the study of biological cells and tissues), medical imaging (study of human organs through the creation of visual representations), and public and medical health management (PmHM). This study provides an overview of explainable artificial intelligence (XAI) applied in class activation mapping-based DL medical picture analysis. For the purpose of categorizing DL-based medical image analysis (MIA) techniques, a framework of XAI criteria is presented. The papers are then surveyed and categorized in accordance with framework as well as based on anatomical location for use in MIA. 

**CSEIB-07**

**Basics of Healthcare Informatics**

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**9781000962772 (ISBN); 9781032406633 (ISBN), DOI-10.1201/9781003354178-1, Pages-1-33, (2023)**

## Abstract

It is often said that two of the life's greatest blessings are having good health and common sense. These two are vital to handle stress and to live longer with an active lifestyle. The two categories of health discussed are mental and physical health. Balanced diet, regular exercises and adequate amount of rest will contribute to good health. An individual with good corporeal health is expected to have optimal function and process the work at peak. Mental fitness is as important as that of physical fitness, which relates to social, emotional and psychological well-being of an individual. One of the new buzzwords in healthcare sector that has become popular over the years is health informatics. Healthcare professionals must deal with an increasing number of computers and computer programs in their daily work. With rapid growth of digital data, the role of analytics in healthcare has created a significant impact on the healthcare professional's life. Improvements in storage data, computational power and parallelization has also contributed to an uptake of this technology. This chapter is intended for researchers, health informatics professionals, academicians and undergraduate and postgraduate students who are interested in knowing more about health informatics. This chapter aims to provide a brief overview about informatics, its history and area of practice, laws in health informatics, challenges and technologies in health informatics, application of informatics in various sectors and so on. Finally, the research avenues in health informatics along with some case studies are discussed. © 2024 selection and editorial matter, Gururaj H L, Radhika A D, Divya C D, Ravi Kumar V, Yu-Chen Hu; individual chapters, the contributors.

# DEPARTMENT OF COMPUTER SCIENCE & TECHNOLOGY SCHOOL OF ENGINEERING

## Publication Summary

| | | |
|---|---|---|
| **International Journals** | **02** | **(CSTIJ-01) (CSTIJ-02)** |
| **International Conference Publications** | **04** | **(CSTNJ-01) (CSTNJ-04)** |

## CSTIJ-01

### Reinforcement learning strategies using Monte-Carlo to solve the blackjack problem


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**ISSN: 20888708, DOI: 10.11591/ijece.v14i1.pp904-910, Volume 14, Issue 1, February 2024, Pages 904-910. (2024)**


## Abstract


Blackjack is a classic casino game in which the player attempts to outsmart the dealer by drawing a combination of cards with face values that add up to just under or equal to 21 but are more incredible than the hand of the dealer he manages to come up with. This study considers a simplified variation of blackjack, which has a dealer and plays no active role after the first two draws. A different game regime will be modeled for everyone to ten multiples of the conventional 52-card deck. Irrespective of the number of standard decks utilized, the game is played as a randomized discrete-time process. For determining the optimum course of action in terms of policy, we teach an agent-a decision maker-to optimize across the decision space of the game, considering the procedure as a finite Markov decision chain. To choose the most effective course of action, we mainly research Monte Carlo-based reinforcement learning approaches and compare them with q-learning, dynamic programming, and temporal difference. The performance of the distinct model-free policy iteration techniques is presented in this study, framing the game as a reinforcement learning problem.

## CSTIJ-02

### A Survey on Automatic Text Summarization and its Techniques

**Ramya, R.S., Parveen, M.S., Hiremath, S., Pugalia, I., Manjula, S.H., Venugopal, K.R.**

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**ISBN: 21476799 (ISSN), Volume-11, Pages- 63-71, (2023)**

## Abstract

In a world with an ever-growing amount of data available on both offline and online sources, the task of extracting the key information from the documents and summarizing the content creates the need for automatic text summarization. In this paper, we will look into the types of automatic text summarization and how it has been helpful in various fields like social media marketing, legal contract analysis, video scripting, etc. Further, this paper conducts a methodical study on abstractive text summarization and highlights the approach which mimics the human cognitive method of summarizing text. The paper aims to analyze the numerous techniques, difficulties, opportunities, and current state of art of abstractive summarization. A detailed survey of research papers/articles was conducted based on the technologies used to make this task quicker and more accurate in recent years. 

# INTERNATIONAL CONFERENCE PUBLICATIONS

## CSTIC-01

### Accurate Location-based Routing for Emergency Response: A Case Study of an App for First Responders using What3Words

**Amitash, M.S., Rahul, K.P., Hagaldivte, S., Tejaal, M., Venugoplan, B., Shahina Parveen, M.**

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**ISBN:979-8-3503-9663-8, DVD ISBN:979-8-3503-9662-1, Print on Demand (PoD) ISBN:979-8-3503-9664-5, DOI: 10.1109/ICCES57224.2023.10192632, 1-03 June 2023**

## Abstract

The timely delivery of emergency medical services is crucial in saving lives, particularly during the "Golden Hour"following a serious injury. Our study examines how different addressing schemes can impact the accuracy of reaching the exact emergency site on time. This paper discusses the comparison between the accuracy provided by GPS and an Alternate Addressing Scheme system (AAS). The potential benefits of using an AAS namely What3words are discussed in this paper. © 2023 IEEE.

## CSTIC-02

### An Innovation Development of Light Weight Deep Learning Algorithm for Smart Healthcare Neural Science Management

**Chithambarathanu, M., Kumar, V.V., Sreelekha, P., Samson Isaac, J., Ghumman, M.K., Subhahan, D.A.**

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**ISBN:979-8-3503-3436-4, Print ISBN:979-8-3503-3435-7, Print on Demand(PoD) ISBN:979-8-3503-3437-1, DOI: 10.1109/ICECONF57129.2023.10083638, (2023)**

## Abstract

Healthcare occupies a special place in the structure and complexity of economic relations, due to the objective features of the main object of medical activities - an individual. Of these aspects, the key is the pervasive uncertainty in all medical activities: the uncertainty of the dynamics of human health, and the uncertainty of the outcome of medical intervention. The most important issue in healthcare is the problem of the quality of medical care, which is difficult to overestimate because it is related to health, and sometimes human life. In this paper, the neural science-based light weight deep learning algorithm was proposed to manage healthcare issues. The quality problem can only be solved if the neural science management of the medical care system is optimal at all levels by using computational intelligence. In solving these problems, priority is given to the administrative staff of health institutions. The growth and development of neural science management are one of the key levers to improving the performance of its adaptive medical institutions in a particular situation. © 2023 IEEE.

## CSTIC-03

### Cardiovascular Disease Prediction in Retinal Fundus Images Using ERNN Technique

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**ISBN: 23673370 (ISSN); 9789811951909 (ISBN), DOI: 10.1007/978-981-19-5191-6_46, Volume-519 LNNS, Pages- 579-588, (2023)**

## Abstract

In recent years, heart disease increases the humanity rate transversely the world. So, it is required to extend a model to envisage the heart disease incident as early as feasible with an elevated rate of accuracy. In this study, cardiovascular disease is predicted by a novel method with the retinal image data. In this system, the retinal fundus image data are used to indicate heart disease occurrence. The cardiovascular disease gets detected from the changes in the microvasculature, which is imaged from the retina. The prediction of disease is by considering features like age, gender, smoking status, systolic blood pressure, diastolic blood pressure, and HbA1c that can be extracted using Improved GLCM approach. Then the pointed features can be selected using the ICA algorithm. Risk factors for heart disease occurrence are detected from the microvasculature of ERNN-classified retinal fundus image using MATLAB. The input image is taken from the UCI machine learning repository based on Cleveland datasets. The main objective of the proposed system is to predict the occurrence of heart disease from retinal fundus image with a higher rate of accuracy. 

## CSTIC-04

### Implementation of Modeling and Distribution of a Big Data Warehouse

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**ISBN- 9798350300888 (ISBN), DOI- 10.1109/ICOSEC58147.2023.10275865, Peges- 210-218, (2023)**

## Abstract

The exponential growth of data generated by modern applications and devices poses a substantial challenge for organizations in efficiently storing, processing, and accessing large datasets. Traditional data warehousing solutions struggle to handle the scale and complexity of Big Data, leading to performance bottlenecks, increased latency, and limited data availability. Designing an effective Big Data Warehouse can cope with these challenges while providing real-time access to valuable insights remains a pressing concern. The implementation of the system presents significant challenges in managing and processing vast volumes of data while ensuring efficient data distribution and accessibility. This paper created four different types of databases on the data containing information about sales in bakeries. The creation of a database is directly specified by its type. Subsequent processing of data and reports is also different for individual types. In the practical part, it will then implement individual types of databases and their options for storage, analytical processing and subsequent reports. I will then compare the individual prototypes. © 2023 IEEE.

# SCHOOL OF ENGINEERING

# DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

## Publication Summary

| | | |
|---|---|---|
| International Journals | 40 | (ECEIJ-01 – ECEIJ-40) |
| International Conferences | 11 | (ECEIC-01 – ECEIC-11) |
| International Book chapters | 03 | (ECEIB-01 - ECEIB-03) |

# SCHOOL OF ENGINEERING

# DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING INTERNATIONAL JOURNAL PUBLICATIONS

## ECEIJ-01

### Lifetime enhanced energy efficient wireless sensor networks using renewable energy

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**ISBN: ISSN: 20888708, DOI: 10.11591/ijece.v13i3.pp3088-3098, Volume 13, Issue 3, June 2023, Pages 3088-3098**

## Abstract

In this paper, we consider a remote environment with randomly deployed sensor nodes, with an initial energy of E0 (J) and a solar panel. A hierarchical clustering technique is implemented. At each round, the normal nodes send the sensed data to the nearest cluster head (CH) which is chosen on the probability value. Data after aggregation at CHs is sent to the base station (BS). CH requires more energy than normal nodes. Here, we energize only CHs if their energy is less than 5% of its initial value with the use of solar energy. We evaluate parameters like energy consumption, the lifetime of the network, and data packets sent to CH and BS. The obtained results are compared with existing techniques. The proposed protocol provides better energy efficiency and network lifetime. The results show increased stability with delayed death of the first node. The network lifetime of the proposed protocol is compared to the multi-level hybrid energy efficient distributed (MLHEED) technique and low-energy adaptive clustering hierarchy (LEACH) variants. Network lifetime is enhanced by 13.35%. Energy consumption is reduced with respect to MLHEED-4, 5, and 6 by 7.15%, 12.10%, and 14.975% respectively. The no. of packets transferred to the BS is greater than the MLHEED protocol by 39.03%. 

**ECEIJ-02**

# An efficient ultra-wideband digital transceiver for wireless applications on the field-programmable gate array platform

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**ISBN: 20888708 (ISSN), DOI-10.11591/ijece.v13i4.pp4432-4440, Volume-13, (2023)**

## Abstract

The ultra-wideband (UWB) technology is a promising short-range communication technology for most wireless applications. The UWB works at higher frequencies and is affected by interferences with the same frequency standards. This manuscript has designed an efficient and low-cost implementation of IEEE 802.15.4a-based UWB-digital transceiver (DTR). The design module contains UWB transmitter (TX), channel, and UWB-receiver (RX) units. Convolutional encoding and modulation units like burst position modulation and binary phase-shift keying modulation are used to construct the UWB-TX. The synchronization and Viterbi decoder units are used to recover the original data bits and are affected by noise in UWB-RX. The UWB-DTR is synthesized using Xilinx ISE® environment with Verilog hardware description language (HDL) and implemented on Artix-7 field-programmable gate array (FPGA). The UWB-DTR utilizes less than 2% (slices and look-up table/LUTs), operates at 268 MHz, and consumes 91 mW of total power on FPGA. The transceiver achieves a 6.86 Mbps data rate, which meets the IEEE 802.15.4a standard. The UWB-DTR module obtains the bit error rate (BER) of 2×10-4 by transmitting 105 data bits. The UWB-DTR module is compared with similar physical layer (PHY) transceivers with improvements in chip area (slices), power, data rate, and BER. 

# ECEIJ-03

## A comparative study of reduced graphene oxide synthesized through different techniques for UV-C radiation detection application

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**ISBN: ISSN: 00318949, DOI: 10.1088/1402-4896/ad274b, Volume 99, Issue 3, 1 March 2024, Article number 035949**

## Abstract

In this work, reduced Graphene oxide (rGO) is synthesized through three different chemical routes of synthesis and they are used for the fabrication of UV radiation detectors working in the 100-280 nm range. The fabricated device is a Silicon based radiation detectors with these different synthesized samples of rGO as the sensing material. The photon detector has an architecture of a field effect transistor working in the back-gate mode of operation. The device response is studied in presence of UV rays for all the three types of devices in the back-illumination mode of operation. A comparative analysis of the performance of these three devices is done to analyze the effect of rate of reduction on the device performance and its correlation with the properties of rGO. It was observed that higher the rate of reduction, better is the performance of the device. The effect can be correlated with the improved electrical conductivity and reduced bandgap of rGO. © 2024 IOP Publishing Ltd.

## ECEIJ-04

**Distributed bragg reflector biosensor for medical applications**

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**ISBN: 9781000771138 (ISBN); 9781774912539 (ISBN), Pages-27-44, (2023)**

## Abstract

Distributed Bragg reflector (DBR) is a one-dimensional (1D) photoniccrystal (PC) structure having two different materials arranged alternatively. It has the property of refractive-index variation periodically in a single direction. Advancements in modern technology are introducing many new methods for the diagnosis of major life-threatening diseases. An accurate diagnosis of the disease in its early stages will reduce the factor of risk at higher stages and also saves the life of a person. Various methodologies have been researched and implemented successfully in recent years. Optical sensing technology is growing tremendously for the detection of many diseases in their early stages. Major benefits of optical sensors include small in size and weight, very high accuracy, no electromagnetic interference, small sample requirement, high Q factor, good sensitivity, and can be easily integrated with lab-on-chip (LOC) devices. Refractive index (RI) is one of the key optical parameters which can be used for bio-sensing applications. Using this method, many diseases, malignant cells, bacteria, viruses, foreign bodies, etc., can be effectively detected in their initial stages. The medical diagnosis uses initial laboratory tests like enzyme-linked immunosorbent assay (ELISA), reverse transcription-polymerase chain reaction (RT-PCR), micro-immunofluorescence (MIF), etc., for the detection and identification of bacteria, virus, fungi, or any other immigrant cells. These tests regularly use blood, urine, or saliva as a bio-analyte for diagnosis purposes. These bio-analytes have distinguished or unique optical properties like RI, light absorption capability, light scattering, and so on. As the normal and infected cells in the biosample exhibit different RI, it can be easily detected using optical detection techniques. There exists a number of optical detection techniques like surface plasmon resonance (SPR), optical reflectometric interference, bioluminescent, evanescent wave fluorescence, ellipsometry, interferometry, and many more. The optical biosensors can be designed and analyzed using advanced technologies such as micro-electro-mechanical systems (MEMS), micro-electronics, biochemistry, microbiology, molecular biology, nanotechnology, and so on. Fabrication of the optical biosensor is also possible by using advanced micro-machining techniques. Biosensors use different signal transductions like piezoelectric or magnetic or resistive, optical, thermometric, electrochemical, etc., for the detection of target bodies. The optical sensing method has the benefit of label-free sensing, i.e., it does not require any chemical reagents for the detection of target species. Whereas, the normal clinical laboratory tests use chemical stains and reagents for the identification of disease-causing infectants. In an optical sensor, a beam of input light or

the optical field interacts with the sample under test and gives the signature at the output. The optical signature can be either the change in amplitude, frequency, wavelength, or intensity of the input light. By comparing the input transmitted signal and the output received signals, with and without bio-analyte, the conclusion can be drawn for the presence or for the absence of diseases in the sample under test. It is also possible to detect the various stages or cycles of infected cells using these optical methods. In the human body, the cells or tissue from the specific organ have unique RI values. The body fluids, viz, blood, saliva, and urine is also exhibiting a different index of refraction in the presence and absence of the malignant cells. Therefore, the RI of a cell or bio-analyte can be effectively used for the identification of various diseases. In this chapter, a 1D photonic crystal-based DBR is used for the detection of foreign bodies like cancer cells or the infected stages of blood cells for quick medical diagnosis. The one-dimensional (1D) Bragg Reflector sensor can also be fabricated by using electron beam lithography or chemical vapor deposition (CVD) techniques. 

## ECEIJ-05

### Secure cluster-based routing using multi objective-trust centric artificial algae algorithm for wireless sensor network

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**ISBN: ISSN: 20888708, DOI: 10.11591/ijece.v13i2.pp1618-1628, Volume 13, Issue 2, April 2023, Pages 1618-1628**

# Abstract

Nowadays, wireless sensor network (WSN) is developed as a key technology to observe and track applications over a wide range. However, energy consumption and security are considered as important issues in the WSN. In this paper, the multi objective-trust centric artificial algae algorithm (M-TCAAA) is proposed to accomplish a secure broadcasting over the WSN. The proposed M-TCAAA is used to choose the secure cluster head (SCH) as well as routing path, based on the distinct fitness measures such as trust, communication cost, residual energy, and node degree. Hence, the M-TCAAA is used to ensure a secure data transmission while decreasing the energy consumed by the nodes. The performance of the M-TCAAA is analyzed by means of energy consumption, packet delivery ratio (PDR), throughput, end to end delay (EED), normalized routing load (NRL), and network lifetime. The existing researches namely energy aware trust and opportunity-based routing with mobile nodes (ETOR-MN), grey wolf updated whale optimization (GUWO), secure cluster-based routing protocol (SCBRP), secure routing protocol based on multi-objective ant-colony-optimization (SRPMA) and multi objective trust aware hybrid optimization (MOTAHO) are considered for evaluating the M-TCAAA. The PDR of the M-TCAAA for 100 nodes is 99.87%, which is larger than the ETOR-MN, GUWO, SRPMA and MOTAHO. 

## ECEIJ-06

### Design and Simulation of Conformal Array Antennas for Avionics Applications

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**ISSN: 23488379, DOI: 10.14445/23488379/IJEEE-V10I9P116, Volume 10, Issue 9, September 2023, Pages 167-180**

## Abstract

Conformal array antennas have become an integral part of avionics and many other diversified applications because of their capacity to provide increased gain, conformity to the shape of the mount on which they are placed and durability. The present paper presents a novel approach plus meticulous design, simulation and comparison of results obtained for two configurations of microstrip patch antennas and arrays fed with an inset feed technique for avionics applications in 5G technology. The inset feed technique optimizes the impedance matching of the antennas. The resonating frequencies of 3.6 GHz and 3.4 GHz are selected for uplink and downlink, respectively, from the n78 band of 5G communication in India. The methodology used for designing single antenna elements is extended to a 1x2 array. The parameters used for assessing simulation results using CST (Computer Simulation Technology) Studio Suite, version 2017.0224 software, are Antenna Bandwidth (Return Loss) plots, VSWR plots, impedance plots, and gain plots of radiation patterns in both 2D and 3D. The simulated results show a considerable increase in gain, SWR and return loss for a 1x2 array compared to a single radiating patch. Antennas and arrays thus designed find applications invariably in aircraft, air traffic control management, drones and navigation systems as point-to-point communication links. © 2022 Seventh Sense Research Group®.

# ECEIJ-07

## Highly Accurate Technique for CO-OFDM Channel Estimation Technique Using Extreme Learning Machine

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## Abstract

In wireless systems, channel estimation is considered a problematic technology, due to the fact of the difference in time between wireless channels and the noise effect. Orthogonal frequency-division multiplexing (OFDM) is a promising candidate for future optical communications and has received wide concern. The article proposed a Coherent Optical (CO) orthogonal frequency division multiplexing (OFDM) scheme, which gives a scalable and flexible solution for increasing the transmission rate, being extremely robust to chromatic dispersion as well as polarization mode dispersion. Nevertheless, both coherent detection and OFDM are prone to phase noise due to the phase mismatch between the laser oscillators at the transmitter and receiver sides and the relatively long OFDM symbol duration compared to that of single carrier communications. An Extreme Learning Machine (ELM) with Pilot Assisted Equalization (PEM) is proposed for compensation of impairments caused by fibre nonlinearity in coherent optical communication systems. Channel estimation using ELM and the value of distortion is sent to the OSTBC receiving end based on the distortion information the data is decoded and pilot data is removed. FFT is applied to the data and QPSK demodulation is done in the data to get its original form. In addition, the article utilized a free-space optical communication system of multi-input multi-output orthogonal frequency division multiplexing (MIMO-OFDM) with a modified receiver structure. Simulation reveals that the proposed model exhibits significant BER (0.0112) performance and provides better spectral efficiency as compared with conventional systems and less computational complexity. This suggested that the proposed method shows better performance by using the CO-OFDM-FSO-MIMO-ELM-based channel estimation technique for high-speed data communication networks in real-time scenarios respectively. 

## ECEIJ-08

### Digital Twin for Image-Based Particle Pollutant Matter Prognosis

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**ISBN: 22502106 (ISSN), Pages-351-357, Volume-104, (2023)**

## Abstract

The never-ending evaluation in the fields of Internet of Things and machine learning has given rise to the development of a variety of environmental parametric estimation models. Regardless, the problem of accurately anticipating or forecasting the environmental parameters is still persistent. In the current scenario, calculating and estimating the concentration of particulate matter (PM) in bulk is done at the weather forecast control stations set up at specific locations, and this provides for a limited degree of air quality measurements. This paper combines time series analysis with IoT and machine learning approximations to estimate the PM emission and concentration levels. ML algorithms and AI techniques are used to create an evolutionary PM2.5 Concentration prediction model using evidence from one of the highest PM2.5 levels observed regions (Mongolia). A simple real-time data acquisition scenario is used for testing the model, with a GUI interface for real-time data and digital twin model. The results revealed that the model could estimate the PM concentration to an accuracy of 94.3% with a wider range of precision. 

## ECEIJ-09

# Neuromorphic Processor Design and FPGA Implementation for Handwritten Digits Employing Spiking Neural Network

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## Abstract

Spiking Neural Network (SNN) is very popular and effective in modelling the physical neurons compared to other models of the neural network. Besides the software implementation of the neuromorphic processors, hardware implementation of the neuromorphic processors is also very important in order to apply it in real-time domain. In this work, a hardware efficient architecture of the neuromorphic processor is proposed. The proposed architecture is efficient in terms of low usage of memory elements and other hardware resources. Virtex-6 field programmable gate array (FPGA) development board is used to validate the proposed design. Fixed data format of width 18 is used in this work and 10-bit is reserved for the fractional part. The proposed architecture is applied to detect the handwritten digits. In this work, MNIST database is used to train and validate the SNN. The proposed architecture achieves 90% accuracy when used to recognize the handwritten digit data. 

## ECEIJ-10

# Self-compensating gold-encapsulated tilted fiber Bragg grating for peak tracking based biosensing applications

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**ISBN: ISSN: 09728821, DOI: 10.1007/s12596-023-01369-6, (2023)**

## Abstract

Fiber Bragg Grating sensors are playing decisive role in clinical decisions, where its ability to show chemical-inertness, small in size and high-sensitivity makes it superior over the electric-sensors for both in vivo as well as ex vivo examinations. In the recent years, different FBG sensors are proposed for biosensing task(s); yet, ensuring high-resolution, accurate and high-sensitive sensing under complex operating environment remains challenge. The fiber Bragg grating coating or grating-encapsulation(s) by using metals or polymers enables better spectral efficiency; yet, inappropriate coating and allied grating might cause varied spectral-responses or reflectivity, causing multiple peaks over response. Demodulating such ambiguous spectral responses might be difficult and can cause false positive result. Its severity can be more frequent over biosensing involving viscous analytes-antibody or aqueous (test)-solutions. The local conditions like viscosity-strain and temperature caused noises too give rise to the different peaks over fiber Bragg grating spectra response that might impose wrong clinical diagnosis decisions. With such inference, this research proposes a robust self-compensating gold-encapsulated tilted fiber Bragg grating structure for peak-tracking-based biosensing. It involves two sequential phases, where initially a gold-encapsulated tilted fiber Bragg grating is designed with grating's tilt angle of 9°. Simulating the sensor, the spectral responses are obtained for the different Bragg wavelengths, which are subsequently processed for cross-correlation-based matched filtering for peak identification to make clinical decisions. Toward self-compensation, cross-correlation was performed between the reference spectra and the measured fiber Bragg grating responses. Employing Mexican-Hat wavelet response as the reference signal and measured spectra, zero-crossing points and correlation-vectors were obtained signifying the peak locations. Thus, retaining the correlation vectors with higher peak intensity over the Bragg wavelength, the target peak for the tilted fiber Bragg grating was tracked. Simulation results confirmed that the proposed tilted fiber Bragg grating with self-compensation ability can achieve 0.9 nm/refractive index unit sensitivity while suppressing noise elements and false-peaks caused due to local artefacts like viscosity, strain, temperature, etc. Such abilities make the proposed gold-encapsulated sensor suitable for both biosensing as well as physio-mechanical sensing tasks, and hence can be suitable for in vivo and/or ex vivo biosensing tasks. 

## ECEIJ-11

# Analytical modeling, fabrication and characterization of a 3-DOF MEMS gyroscope based on UV-LIGA process

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**ISSN: 09728821, DOI: 10.1007/s12596-023-01258-y, Volume 53, Issue 2, April 2024, Pages 1068-1078**

## Abstract

This paper reports a structural configuration of a capacitive gyroscope having 1-DOF drive and anchored 2-DOF sense modes that allows a wide sense bandwidth and high gain without much scaling down the mass on which the sensing comb fingers are attached. The use of the additional anchoring beam in the sense direction also causes the enhancement in the coupling strength of sense mode resonance frequencies. This device has been mathematically modeled considering decoupled frame anchoring effect, designed and then fabricated by using the economical UV-LIGA technology with nickel as a key structural layer of 9-μm thickness with unequally spaced sense comb fingers with 4 μm and 12 μm capacitive gap, respectively. The overall miniature device size is 3 mm × 3 mm. Vibration characterization of the fabricated devices shows sense mode resonances at 4.96 kHz and 5.58 kHz and drive resonance at 5.48 kHz. 

# ECEIJ-12

## Developing analytical models for the post-detection SINR of TSVD-based techniques with imperfect CSI

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**ISBN: ISSN: 10745351, DOI: 10.1002/dac.5705, Volume 37, Issue 6, April 2024, Article number e5705**

## Abstract

In massive multiple input multiple output (m-MIMO) uplink, the performance gap between zero forcing (ZF) or direct pseudo-inverse and minimum mean square error (MMSE) detection schemes increases with an increase in the load factor. To report this issue, truncated singular value decomposition (TSVD) is used in both ZF and direct pseudo-inverse detection techniques using dynamic threshold. Moreover, the analytical models for the post-detection signal-to-interference-plus-noise ratio (PDSINR) of TSVD-based detection schemes are derived with imperfect channel state information (CSI), and subsequently, bit error rate (BER) is evaluated. Later, an optimum hard threshold for the TSVD-based detection schemes is deduced from the empirical analysis. Further, the tightness of the analysis is verified through Monte Carlo trails. The simulation result shows that at lower values of average signal-to-noise ratio (SNR), TSVD-based detection schemes with imperfect CSI offer comparable performance and low complexity when compared with the MMSE technique. However, the BER of TSVD-based detection schemes decreases and gets saturated with an increase in the average SNR, whereas the BER of the MMSE detection scheme increases and approaches the BER of ZF or direct pseudo-inverse detection schemes. 

## ECEIJ-13

# Optomechanical behaviour of optical sensor for measurement of Wagon weight at different speeds of the train

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**ISBN: ISSN: 09728821, DOI: 10.1007/s12596-022-01047-z, Volume 52, Issue 2, June 2023, Pages 751-762**

## Abstract

This work includes the design and simulation of optical fiber as strain sensor to measure equivalent elastic strain generated on the rail due to the load of the train wagon at different speeds when train passes over it. It presents a behavioural study of maximum elastic strain and von Mises stress due to wheel-rail contact of a freight train with varying speed from 20 to 80 km/h. It is observed that, a maximum stress of 1016.4 MPa, a strain of 708.8 με, and a total deformation of 1.8029 mm, is obtained after experimentation at a constant wagon weight of 57.3 t. At 80 km/h, the shift in Bragg's wavelength is 1559.35 nm. In the first part, finite element analysis of rail -wheel model has been done to analyse equivalent strain on the rail at various speeds of train. Strain is estimated on the nodes of rail by changing the train running speed, and introducing wagon weight as a bearing load. The second part uses the optical simulator to construct and design an optical sensor fibre Bragg grating to find the shift in Bragg's wavelength caused by the equivalent strain is explained graphically. The sensor strain sensitivity of fiber is 1.87 pm/με at speed 70 km/h which is the maximum running speed for freight trains. 

## ECEIJ-14

### Asynchronous Wrapper-Based Low-Power GALS Structural QDMA

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**ISBN: ISSN: 03772063, DOI: 10.1080/03772063.2021.2021814, Volume 69, Issue 10, 2023, Pages 7208-7217**

## Abstract

The design of System-on-Chip systems using synchronous circuits involves complex clock distribution strategies, which envisage challenges for designers to integrate large-scale systems. Globally Asynchronous Locally Synchronous architectures containing asynchronous port controllers encapsulated in the self-timed wrapper have been adopted in this work. These port controllers communicate through Asynchronous Finite State Machines defined by Signal Transition Graphs are implemented adopting the C element. This GALS architecture implemented for the point-to-point interface can also be modified for the multipoint interface. The proposed methodology uses a two-phase handshake protocol to communicate between two Locally Synchronous modules as it has fewer signal transitions, which, in turn, reduces latency. In this paper, the Queue Direct Memory Access subsystem is implemented using the Vivado simulator on UltraScale+™ device at a maximum frequency of 257.4MHz, and various parameters are reported. A comparison shows that the proposed wrapper has improved latency time of 53%, with a reduction in power dissipated by 27% and an increase in gate count by 13%. © 2023 IETE.

## ECEIJ-15

### WeaveSense: IoT Infrastructure for Rapier Loom Condition Monitoring and Analysis

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**ISBN: ISSN: 23488379, DOI: 10.14445/23488379/IJEEE-V10I12P104, Volume 10, Issue 12, December 2023, Pages 27-36**

## Abstract

Various machines and equipment are involved at different stages of the textile manufacturing process. The rapier looms are used to produce high-quality fabrics and other traditional textiles. The rapier looms are exposed to mechanical and frequently occurring electronic problems, which disrupts their operation and production efficiency. The condition monitoring of the rapier loom is helpful to ensure optimal performance. The IoT infrastructure for condition monitoring is designed and implemented at the industrial level, and ground truth data is captured. Weavesense targets temporal analysis of Service-Oriented Architecture (SOA) based on an IoT framework implemented for condition monitoring of rapier loom. The study of captured streaming data involves pre-processing, feature extraction and behaviour pattern recognition. The supervised machine learning approach permits correlating extracted features and captured data. The application scenario of the rapier loom and sequence of observations clearly show the consequences on the performance of the rapier loom. © 2023 Seventh Sense Research Group.

# ECEIJ-16

## SCEHO-IPSO: A Nature-Inspired Meta Heuristic Optimization for Task-Scheduling Policy in Cloud Computing

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**ISBN: ISSN: 20763417, DOI: 10.3390/app131910850, Volume 13, Issue 19, October 2023, Article number 10850**

## Abstract

Task scheduling is an emerging challenge in cloud platforms and is considered a critical application utilized by the cloud service providers and end users. The main challenge faced by the task scheduler is to identify the optimal resources for the input task. In this research, a Sine Cosine-based Elephant Herding Optimization (SCEHO) algorithm is incorporated with the Improved Particle Swarm Optimization (IPSO) algorithm for enhancing the task scheduling behavior by utilizing parameters like load balancing and resource allocation. The conventional EHO and PSO algorithms are improved utilizing a sine cosine-based clan-updating operator and human group optimizer that improve the algorithm's exploration and exploitation abilities and avoid being trapped in the local optima problem. The efficacy of the SCEHO-IPSO algorithm is analyzed by using performance measures like cost, execution time, makespan, latency, and memory storage. The numerical investigation indicates that the SCEHO-IPSO algorithm has a minimum memory storage of 309 kb, a latency of 1510 ms, and an execution time of 612 ms on the Kafka platform, and the obtained results reveal that the SCEHO-IPSO algorithm outperformed other conventional optimization algorithms. The SCEHO-IPSO algorithm converges faster than the other algorithms in the large search spaces, and it is appropriate for large scheduling issues. 

# ECEIJ-17

## Enhancing pressure sensing through Bragg's well-structured one-dimensional photonic crystal

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**ISBN: ISSN: 09728821, DOI: 10.1007/s12596-023-01599-8, (2024)**

## Abstract

This paper presents a novel pressure sensor design employing a strain-sensitive Bragg's well-structured one-dimensional (1-D) photonic crystal (PC). The Bragg's well-structured configuration within the one-dimensional photonic crystal enables a controlled pathway into the photonic bandgap. By utilizing the pressure-dependent refractive index of the material, the sensor's channel can be tailored accordingly. The tunability of this channel, in response to applied pressure, is harnessed for high-pressure sensing applications. Notably, the proposed sensor is optimised for operation within the mid-infrared wavelength range, broadening its potential applications. The obtained simulation results demonstrate remarkable sensor performance, with achieved values of 14,617 for the quality factor, 25.5 nm/MPa for sensitivity, and 21.25 /MPa for the figure of merit (FOM). These outcomes underscore the efficacy of the Bragg's well-structured photonic crystal as a platform for advanced pressure sensing, offering a path toward enhanced sensitivity and precision in pressure measurements. 

## ECEIJ-18

### System Identification and Fuzzy Controller Design of Tethered Unmanned Underwater Vehicles (Tuuv) Using Deep Reinforcement Learning Controller to Avoid Collision

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**ISBN- 19928645 (ISSN), Pages- 236-245, Volume-101, (2024)**

## Abstract

In this paper, the main aim is to develop an effective method to avoid collisions underwater. Therefore, a novel method on fuzzy logic controller (FLC) (Fuzzy type 2) method and system identification have been designed with the standard vehicle depth and pitch control dynamics parameters, along with the equations of tethered Unmanned underwater vehicles (TUUV) are elaborately discussed in order to avoid movable obstacles found in underwater. Moreover, the fuzzy controllers help to accumulate appropriate information from the sonar system. Hence utilizing the obtained sonar data or information, the fuzzy controller defines the attack angle and speed using the movement captured through the underwater vehicle. The current research has used Deep Reinforcement Learning Controller for avoiding collision and normally helps to acquire knowledge in accordance with the success rate. The information gathered was utilized to provide an effective outcome in the process. The simulation results of the current study with the appropriate definition of variables and the performance evaluation will be estimated with the obtained output in terms of controlling parameters, including Depth for both positive and Negative, Depth rate, Pitch response, Trajectory, and Tracking for TUUV has been explained. The intelligent framework characteristics of the system identification and fuzzy controller design of TUUV utilizing a novel method - Deep Reinforcement Learning Controller to avoid collision has the capability to procure efficient and better results in avoiding movable obstacles found underwater. Eventually, the simulation results of the proposed novel technique allow the underwater vehicle to securely navigate by avoiding the obstacles in the desired path. 

## ECEIJ-19

# Efficient Frequency Reconfigurable Antenna for 4G, Sub-6 GHz, 5G Portable Devices Applications

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**ISBN: 09296212 (ISSN), DOI- 10.1007/s11277-023-10254-1, Volume-129, Page-2711-2725, (2023)**

## Abstract

This research investigates a frequency-switchable, multi-mode operation antenna contingent on ground structure slots and suitable for 4G, 5G/sub 6 GHz and other modern systems. In earlier research work, researchers used the approach of putting slots on the radiator or ground to create frequency-reconfigurable antenna designs. This antenna acquired benefits, in particular compactness, wide-bandwidth, and a consistent far-field pattern due to the amalgamation of slots on the patch and defects in the ground. The proposed antenna used various slots on the substrate's top and a π shaped DGS on the bottom layer. The pin-diodes embedded in the defects of the ground ensured the frequency agility and permitted the design to tune to various resonances. Data observed from experiment is used to demonstrate the antenna's performance. The modelling approach and analytical values manifest that this antenna could indeed reconfiguration between different operating bands, encompassing the frequency range from 2.2 to 8.9 GHz, by switching between four operating modes. The antenna can operate in a wide range of commercial bands, including WLAN, Bluetooth (2.4 to 2.5 GHz), 4G-LTE (2.3 to 2.7 GHz), S-band (2 to 4 GHz), Radio-Navigation (2.7 to 2.9 GHz), and 5G-sub6GHz (3.2 to 4.7 GHz). The antenna presented has narrowband to wideband characteristics, an omnidirectional radiation, fair gain (1.6 dB to 5.9), and an efficiency from 87 to 93%. 

## ECEIJ-20

### A New Diminutive Wide-band MIMO Antenna with Frequency Agile Features for 4G and 5G Diverse Wireless Applications

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**ISBN: 20818491 (ISSN), DOI: 10.24425/ijet.2023.144381, Pages-439-448, Volume-69, (2023)**

# Abstract

This paper demonstrates a low-profile, wide-band, two-element, frequency-reconfigurable MIMO antenna that is suitable for diverse wireless applications of 4G and 5G such as WLAN/Bluetooth (2.4–2.5 GHz), WLAN (2.4–2.484 GHz, 5.15–5.35 GHz, and 5.725–5.825 GHz), WiMAX (3.3–3.69 GHz and 5.25–5.85 GHz), Sub6GHz band proposed for 5G (3.4–3.6 GHz, 3.6-3.8GHz and 4.4–4.99 GHz), INSAT and satellite X-band(6 to 9.6 GHz). Proposed MIMO favour effortless switching between multiple bands ranging from 2.2 to 9.4 GHz without causing any interference. Both antenna elements in a MIMO array are made up of a single module comprised of a slot-loaded patch and a defective structured ground. Two PIN diodes are placed in the preset position of the ground defect to achieve frequency-reconfigurable qualities. The suggested MIMO antenna has a size of 62 ×25 ×1.5 $mm^3$. Previous reconfigurable MIMO designs improved isolation using a meander line resonator, faulty ground structures, or self-isolation approaches. To attain the isolation requirements of modern devices, stub approach is introduced in proposed design. Without use of stub, simulated isolation is 15dB. The addition of a stub improved isolation even more. At six resonances, measured isolation is greater than 18 dB, the computed correlation coefficient is below 0.0065, and diversity gain is over 9.8 dB. 

# ECEIJ-21

## Improving Software Requirements - Analysis of Petri Net Models for Inconsistency and Incompleteness

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**ISBN: 23490918 (ISSN), DOI: 10.14445/22315381/IJETT-V71I2P248, Volume-71, Pages-466-491, (2023)**

## Abstract

Stakeholders of most software projects express requirements in natural language. (English is taken as the natural language here). To minimize errors in the requirements, an analysis of requirements is necessary. Direct analysis of requirements expressed in natural language is complex. Hence it is preferable that they be expressed using some formal method before they are analyzed and used for specifications development. In this paper, we have made the assumption that specification documents and Petri net models of the software requirements are available to us. We propose methods to analyze these Petri net models for inconsistency and incompleteness in the software requirements. Results obtained from the analysis are used to redefine the given user requirements such that inconsistency and incompleteness are removed. The example of an Automated Teller Machine has been used to demonstrate our approach. © 2023 Seventh Sense Research Group®

## ECEIJ-22

### An Efficient Digital Code Shifted Reference (CSR) Based UWB Transceiver on FPGA Platform

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**ISBN: 17962021 (ISSN), DOI: 10.12720/jcm.18.9.537-544, Volume-18, Pages-537-544, (2023)**

## Abstract

The Ultra-wideband (UWB) system is a wireless technology that offers flexible data rate with better energy efficiency and is used for short-range communications. The Code-shifted-reference (CSR) UWB radio uses the Walsh codes technique to distinguish between the data pulse and reference pulse sequences. The Code-shifted-reference (CSR) UWB transceiver is designed at different code lengths in this manuscript. The CSR-UWB Transmitter is designed using shifting and reference codes, data frame, and pulse generation units. The CSR-UWB receiver is designed using an autocorrelator, data detection, and decoder unit. The data detection unit performs detection and synchronization mechanisms to improve the chip area. The CSR-UWB transceiver is designed and implemented on Artix-7 FPGA on Xilinx environment using Verilog HDL. The CSR-UWB transceiver utilizes the < 1% chip area (Slices) and operates at 267.236 MHz by consuming the total power of 103 mW on Artix-7 FPGA. The CSR-UWB transceiver achieves a throughput of 27.4 Mbps, 356.98 Mbps, and 713.95 Mbps at code lengths 2, 4, and 8, respectively. The hardware efficiency of 0.61 Mbps/Slice, 6.99 Mbps/Slice and 12.1 Mbps/Slice is obtained at code lengths 2, 4, and 8, respectively using proposed Transceiver. The performance metrics like chip area, frequency, power, and throughput of the proposed CSR-UWB transceiver are improved compared to those of existing CSR-UWB transceivers and other PHY transceiver designs. 

## ECEIJ-23

# Closely Spaced Target Detection and Tracking under Spatial Ambiguity in Marine Surveillance Radar

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**, ISBN: 23488379 (ISSN), DOI: 10.14445/23488379/IJEEE-V10I9P119, Volume-10, Pages-206-212, (2023)**

## Abstract

Target detection in radar is based on the strength of the received signal. Received echoes are processed to identify the target of interest by comparing the strength of the baseband signal to the surrounding noise. Radar processors will generate two plots for two targets if the radar can resolve both targets. Two closely spaced targets will fall within a beam resolution cell, which results in the generation of a single plot for both targets by radar. In this article, a new centroid algorithm based on the flattening and holding technique is proposed. The received sensor data is processed for each Azimuth Change Pulse (ACP) to identify all possible plots. At this point, the plotted intensity values for the detected targets are identified at individual azimuth angles. The proposed centroid algorithm consists of two stages. In the first phase, a unique averaging process is applied to smooth the intensity curve when two target azimuths have different intensity values. In the second stage, a dynamic threshold is computed and applied to the smoothed curve to identify and extract the original targets along the target spread in the ambiguity region. 

## ECEIJ-24

### Real-time implementation of optical sensor on lab rig model for speed estimation

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**ISBN: 09728821 (ISSN), DOI: 10.1007/s12596-023-01431-3, (2023)**

## Abstract

The Indian railway traffic is increasing and is expected to increase more in the future, thus making safety a critical issue to focus on. However, there is very little work on smart monitoring with respect to railway infrastructure in India. This paper analyses this problem and proposes an optical sensor-based smart monitoring solution for railways. A fibre Bragg grating-based sensor is deployed on the sleeper of a lab train model, and an effective algorithm is proposed to successfully detect the train speed and the axle count using the sensor data. The train speed and axle count are fundamentals in the process of detecting railway faults such as derailments, wheel flats and corrugation or unbalanced loads. For a moving train, the instantaneous train speed is not readily available for monitoring purposes and thus the system proposed here focuses on analysing the safety of the moving train instantaneously by calculating the train speed and counting the axles of the train at a point. A lab train with one coach and two axles is moved to and from on the track over the sleeper which holds the sensor. Here, three iterations of to and from movement of the lab train are conducted to arrive at accurate results. For each of the iterations, four axles are detected—two when the train moves forwards and two when the train moves backwards. With the data collected and the algorithm proposed, the lab train speed is calculated to be 8.2739 km/hr which matches the known actual speed of 8.2 km/hr. 

## ECEIJ-25

**Numerical modelling of 1-dimensional silicon photonic crystal sensor for hydrostatic pressure measurement**

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**ISBN: 09320784 (ISSN), 10.1515/zna-2022-0261, Volume-78, Pages-355-367, (2023)**


# Abstract

In this work, a highly sensitive hydrostatic pressure sensor using one-dimensional (1D) photonic-crystal (PC) is designed and analyzed numerically for its sensing performance. The device design has silicon (Si) sensing layer at the top to sense the applied pressure. The proposed sensor performance has been studied for its pressure sensing, by applying boundary load on the sensing layer. The structure is designed, simulated and analyzed using an FEM tool. As the applied pressure is varied from 0 MPa to 10 MPa, resonant mode shifts towards the higher wavelength region. The effect of defect cavity length and the number of periods are also analyzed to choose the optimized value which enhances the sensor performance parameters. Simulation result shows that the proposed sensor has a very high sensitivity of 250 nm/GPa and Q-factor of 11,120 with the transmission of 99.99%. 

## ECEIJ-26

# 1-Dimensional silicon photonic crystal pressure sensor for the measurement of low pressure

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**ISBN: 26669501 (ISSN), DOI:10.1016/j.rio.2023.100352, Volume-10, (2023)**

## Abstract

In this article we proposed a one-dimensional (1D) silicon photonic-crystal (PC) as a highly sensitive pressure sensor to measure the applied hydrostatic pressure. A 1D flexible silicon layer is formed at the top of the proposed structure. The proposed sensor is designed to measure the low pressure in the range of 10kpa to 20kpa. An FEM tool Comsol Multiphysics is used to design, simulate and analyze the structure. A central cavity is created to support the resonant mode and shift in the resonant mode is observed with the varying boundary load. With the variation in the applied pressure from 10kpa to 20kpa, shift in the resonant mode towards higher wavelength region was observed. The defect cavity length and number of layers were tuned to get optimized results. The novelty of this work includes, use of silicon material to sense the applied pressure, design and its simulation to obtain electric field distribution in the multi-layer structure and its analysis for sensing the applied boundary load using an FEM tool. Simulation results shows that the proposed sensor has a very high sensitivity of 350 nm/GPa and Q-factor of 40,104 with the transmission of 99.99 %. © 2023

## ECEIJ-27

### DDoS mitigation using blockchain and machine learning techniques

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**ISBN: 13807501 (ISSN), 10.1007/s11042-023-18028-4, (2023)**

## Abstract

Online services are vulnerable to Distributed Denial of Service (DDoS) attacks, which overwhelm target servers with malicious traffic. These attacks are on the rise and challenging to detect due to their various forms, protocols, and the use of botnets. This paper presents a novel system that leverages machine learning algorithms for real-time DDoS attack detection and employs blockchain technology to store and block malicious IP addresses through software-defined networking. The system enhances security measures beyond traditional DDoS mitigation systems. In this paper, machine learning classification techniques are trained and tested using the Canadian Institute of Cyber Security's CICDDoS2019 dataset. Artificial Neural Network (ANN) outperformed KNN, Decision Tree, and Random Forest, achieving the best results. Additionally, the Ethereum blockchain is utilized to maintain a blacklist of malicious IP addresses. To assess the system's performance, a virtual network was established for testing using Mininet and the Python based Open-Source and OpenFlow (POX) controller. In real-time testing on the virtual network, ANN achieved an accuracy of 72.49%. This research presents a promising approach to combatting DDoS attacks while emphasizing the need for continuous improvement in cybersecurity. 

## ECEIJ-28

**Confidentiality Enhancement Using Spread Spectrum Modulation Technique for Aggregated Data in Wireless Sensor Networks**

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**ISBN:17962021 (ISSN), DOI: 10.12720/jcm.18.5.294-300, Volume 18, Pages-294-300, (2023)**

# Abstract

Wireless Sensor Networks (WSN) play a crucial role in transmitting bulk data remotely on Internet of Things (IoT). The data transmitted by the tiny sensor nodes of the network are basically the physical parameters of the environment like temperature, vibration, pressure etc. There exists a huge co-relation in the data sent by the nodes. This bulk data needs to be aggregated in order to conserve the energy of the network and thereby enhance the network lifetime. Although the aggregation might lead to loss of actual data, aggregating helps in reducing energy requirement during transmission which is of primary importance and hence is considered as a suitable method in WSN. Adding confidentiality to aggregated data helps in sending the data more securely. Spread spectrum modulation is a widely used technique to provide confidentiality in communication systems. In this research work, we implement a data aggregation technique and apply the spread spectrum modulation technique to provide confidentiality to the aggregated data that needs to be transmitted from the cluster head node to the gateway. Here, data aggregation process consists of averaging the number of data that are sensed by a sensor node and transmitting only its average value to the gateway. This reduces the amount of data transmission and helps in conserving energy. Further, the spread spectrum technique implements Binary Phase Shift Keying (BPSK) method with Frequency Hopping Spread Spectrum (FHSS) carried out using six different frequencies on MATLAB 2020a. The simulation results evaluate the performance of the system. The graphs are plotted for modulated and demodulated signals, spread and de-spread sequences, Bit Error Rate (BER) of BPSK/ FHSS over Rayleigh flat fading channel, Power Spectral Density (PSD) and Fast Fourier Transform (FFT) of frequency hopped signal. The results show that BER value decreases with increase in Signal to Noise Ratio (SNR). The maximum power consumption in the network is 7.518 mW at 5MHz frequency, for adding confidentiality to the aggregated data to be transmitted. Thus, the proposed work promises efficient energy consumption, longer network lifetimes with added confidentiality. 

## ECEIJ-29

### Simulation Study of Critical Aspects of Miab Welding for Analysis of Potential Factors Governing the Performance of Weld Formation

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**ISBN: 12214639 (ISSN), DOI: 10.35219/awet.2023.05, Volume-34, Pages-49-56, (2023)**


# Abstract

Magnetically Impelled Arc Butt (MIAB) welding, is a solid-state welding technique. The magnetic system of this technique is pivotal for the generation of the Lorentz force, which impels an arc to rotate along the periphery of the weld tubes and thus facilitates the heating of faying surfaces. The magnetic arrangement and the arc dynamics significantly impact the effectiveness of the welding process, eventually dictating the efficiency. This study case investigates the impact of the magnetic arrangement on the arc rotation and possible factors that cause irregularities in the (MIAB) welding through COMSOL simulation. The COMSOL simulation has served as a powerful tool to comprehensively analyse various arc dynamics and magnetic systems and extrapolate the observations to analyse the arc dynamics and magnetic systems involved in MIAB welding. By employing simulation studies, the research aims to unravel critical insights for an efficient design of the MIAB welding system. This work includes a study of the effect of magnetic forces on arc dynamics using various models and attempts to develop an analogy to the MIAB welding process. This is further utilized to explain the process variations in the form of arc displacement, electric potential distribution, and the possibility of self-demagnetization of AlNiCo magnets. Thus, it provides a foundation for advancing the technological aspects of MIAB welding to overcome the limitations and irregularities. This research is instrumental in enhancing the understanding of magnetic interactions involved in the MIAB process, which can further pave the way for improved welding machine designs and consequently, enable research on these lines that can help in establishing an optimized parametric window. 

# ECEIJ-30

## Optimization of Thinned Circular Antenna Array Pattern using Dynamic Differential Evolution

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**ISBN: 23488549 (ISSN), DOI: 10.14445/23488549/IJECE-V10I5P112, Volume-10, Pages-128-137, (2023)**

## Abstract

Thinning array antennas have become one of the best approaches towards minimizing side lobes and achieving the required FNBW and SLL. Unlike all element arrays, thinning systematically removes some fraction of elements and activates the remaining element to obtain the intended pattern without degrading the performance of the antenna array. An evolutionary algorithm is gaining growth in providing better optimization solutions than other computational algorithms. In this research, Standard Differential Evolution (SDE) and Dynamic Differential Evolution (rDE) utilizing a range of binary mapping possibilities have been used to achieve thinning of Circular Antenna Array (CAA). Experimental result shows that D.E. with dynamic mutation factor technique has outperformed in fulfilling the desired radiation pattern for thinned CAA compared to all the variants of D.E. and also has exhibited finer solution compared to All Element Array (AEA) and Fire Fly Algorithm (FFA). © 2023 Seventh Sense Research Group®.

# ECEIJ-31

**Thinning Approach based on Sides Lobe Level Reduction in the Linear Array Antenna using Dynamic Differential Evolution**

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**ISBN: 23488379 (ISSN), DOI: 10.14445/23488379/IJEEE-V10I2P106, Volume-10, Pages-61-74, (2023)**

## Abstract

This novel work has considered the problem of minimizing the side lobe level of linear array antenna patterns using the concept of thinning. In comparison to all element arrays, thinning approach activated only a fraction portion of the total available number of array elements at the suitable positions to achieve the objectives. The thinning problem has been transformed into a constrained optimization problem with the objective of minimizing the total number of activated array elements while simultaneously satisfying the desired side lobe and first null beam width. A new approach based on dynamic value assignment of mutation factor in the differential evolution has been proposed, which carries the random value assignment for each component of the differential vector. The proposed dynamic mutation factor assignment helped to explore and converge on a better solution compared to the standard approach. Fundamentally Differential evolution explores the solution over a continuous domain; hence a transformation is needed to convert the solution into the binary domain for thinning. The different existing forms of transformation, including sigmoid function-based S-shaped and V-shaped functions, have been considered under probabilistic and threshold-based binary conversion processes. It has been observed that the proposed form of differential evolution has explored a better solution by rounding the obtained real value to the nearest integer value and later assigning the binary value according to closeness to their binary value limit. For the linear array detail, experimental analysis has given and observed that the proposed solution has outperformed not only other variants of differential evolution but also performed better than particle swarm optimization results available in past literature. © 2023 Seventh Sense Research Group®

# ECEIJ-32

## PID-FUZZY Control System for Autonomous Underwater Vehicles (AUV): Highly Accurate FPGA Implementation

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**ISBN: 00317683 (ISSN), Volume-152, Pages-999-1006, (2023)**

# Abstract

Because of the linear and nonlinear variations in the operating environment, autonomous underwater vehicles (AUVs) are one of the most difficult applications. The complexity of the control algorithm should be less for real-time implementation in a field programable gate array logic (FPGA) device. In this work, a highly accurate FPGA implementation of PID-Fuzzy control strategy is proposed for an AUV operation that is extremely precise. Parameters such as weight, water density, and depth are used to perform highly efficient and accurate control for the proposed system. A type II fuzzy logic controller and accompanying proportional-integral-derivative controller are used to confine pitch and depth boundaries. The proposed design is modeled using SIMULINK software, and Verilog code is generated using hardware description language coder from MATLAB. Xilinx software is used to synthesize the Verilog code for spartan FPGA. The proposed technique improves the accuracy and reduces the response time when compared to the conventional control strategy. 

# ECEIJ-33

## Effective K-Way Partitioning of VLSI Circuits with Hetero-Homo Status Based Models using Evolutionary Computation

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**ISBN- 23490918 (ISSN), DOI: 10.14445/22315381/IJETT-V71I5P225, Volume-71, Pages-240-250, (2023)**

## Abstract

In this paper, the circuit-level partitioning problem in VLSI has been considered. The concern objectives of partitioning have been considered in terms of minimizing the number of interconnections between partitions as well as satisfying the desired area of each partition. The need for k-way partitioning has also been satisfied without further computational cost. The problem has been solved through the heuristic approach. Based on the natural process, the new approach in the standard Genetic Algorithm has been included to define the selection process of parents. The proposed model presented the concept of hetero-homo status-based group formation to define parent selection. This model eliminates the biased nature of the standard tournament selection process. Based on the natural extinction process, an extinction operator has also been introduced. The proposed model has shown the relative benefit of the extinction operator against the standard genetic algorithm. The presented hetero-homo status-based group mechanism, along with the extinction operator, has shown benefits in terms of faster convergence with better solution exploration. Comparison of performances of proposed hetero-homo group model in association with extinction operator has shown against the dynamic weighted particle swarm optimization as well as different variation of standard genetic algorithm, and supremacy observed. 

## ECEIJ-34

### Smart Healthcare System Using IoT, Cloud and AI/ML

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**ISBN: ISSN: 17919320, DOI: 10.25103/jestr.166.14, Volume-16, Page- 117-123, (2023)**

## Abstract

This survey presents various insights on the IoT system and its architecture used to implement a smart health-care system, along with the implementation of the latest technologies such as Cloud Computing for storing data, Machine Learning for predicting various diseases. These technologies are also used to improve the existing management and administration system in hospitals. Various solutions for tackling the health-care crisis have been proposed most of them sound promising but a practical low-cost implementation and feasibility of IoT and ML integrated system is yet to be designed. The present chapter also deals with the standard protocols designed for body area networks for health monitoring applications. The IEEE 802.15.6 standard is used for the body area network which provides high data rate and low-range communication. The integration of the standard body area network protocols with 5G technology can be used for high throughput real-time reliable operations. 

# ECEIJ-35

## Power Quality Improvement in Grid Integrated PV Systems with SOA Optimized Active and Reactive Power Control

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**ISBN: 19750102 (ISSN), DOI:10.1007/s42835-022-01226-9, Volume-18, Page- 735-750, (2023)**

## Abstract

Power quality (PQ) is the prime constraint in grid-connected photovoltaic (PV) systems. In this paper, the reactive and active power controller is utilized with a three-phase grid-connected PV system to improve the PQ using seagull optimization algorithm (SOA). This proposed system comprises two key controllers as the Fly back converter with bacterial foraging optimization algorithm (BFOA) to track maximum power of PV panels and the suggested SOA optimized controller for the grid-integrated three-phase inverter. The grid integration of PV is utilizing a three-phase modular multilevel inverter, which manages the active and reactive powers by functioning the SOA optimized controller using the grid voltage. The novelty of the proposed system is to improve the PQ by utilizing the BFOA and SOA optimization algorithm for generating the maximum power and improve the active power from the non-linear PV. The proposed control strategy has to minimize power dropping into the inverter, by regulating the instantaneous active and reactive powers, for the improvement of PQ. Moreover, it can reduce the harmonic and reactive power compensation. The proposed system is established and replicated in the MATLAB/Simulink platform and its outcomes are examined and equated with existing methods. 

# ECEIJ-36

## Critical Review on Magnetically Impelled Arc Butt Welding: Challenges, Perspectives and Industrial Applications


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# Abstract


Magnetically Impelled Arc Butt (MIAB) welding is a cutting-edge joining method that replaces the conventional welding procedures such as resistance, friction, flash and butt welding. It is a solid-state process that uses a rotating arc to heat up the butt ends of tubes, being followed by a forging process that completes the joining of the workpieces The magnetic flux density and the current interact to develop the Lorentz force that impels the arc along the faying surfaces. This process is found to produce high tensile strength and defect-free welds in ferrous materials and for this reason, it is predominantly employed in automobile applications for joining metallic tubes. Also, this joining procedure can be applied in the fabrication of boilers, heat exchangers, furnace piping in petrochemical industry and other safety-critical high-pressure machinery parts. The MIAB method has several advantages such as a shorter welding cycle, lower input energy requirement and lower loss of material. Compared to other solid-state welding processes, the MIAB welding has an important advantage in terms of cost-efficient welds with better control and reliability. Moreover, there are researchers who have investigated the joining of non-ferrous dissimilar materials using this welding procedure. The studies have been focused on process parametric analysis that involves optimizing and forecasting the magnetic field and thermal profile distribution. This review article provides competitive insights into various design features, computational methods, tests and material characterization, technical issues and workarounds, as well as automation aspects related to the MIAB-welding process. This work will prove to be a quick reference for researchers, useful to identify the research gaps and conflicting ideas that can be further explored for advancements in joining the similar and dissimilar materials.

# ECEIJ-37

## Computer-aided analysis of tapered roller bearings for rail transport system

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**ISBN: 25112104 (ISSN), DOI: 10.1007/s41870-023-01645-5, (2023)**

**Abstract**

The major objective of this research is to estimate the effects of temperature on tapered roller bearings through the investigation of strain and thermal behaviors. Autodesk Fusion 360 is chosen to design the geometry in the manner specified and employing ANSYS Workbench to perform Finite Element Analysis. The stresses between the roller, interior, and exterior rings can be evaluated by bearing studies. This study focuses on thermal and static analysis to determine the temperature at various bearing locations and to simulate the bearing's condition to anticipate its condition. From our computational analysis of coupled finite element analysis for range of temperatures between 150 and 190 °C we observe inner racer temperature is higher than outer racer. At 190 °C inner racer and outer racer values obtained are 181.06 °C and 165.88 °C respectively. The outcome provides a clear picture of the temperature distribution on the bearing in relation to the stress and strain from structural analysis. Equivalent wavelength shift is calculated using the ANSYS result. GratingMOD optical tool is used to design and simulate Fibre Bragg Grating (FBG) sensors. 

# ECEIJ-38

## The Impact of Hot Carrier Injection-Induced Device Degradation for Lower-Power FinFETs

**Chen, Y.-L., Yeh, W.-K., Hsu, H.-T., Chen, K.-H., Lien, D.-H., Lin, W.-C., Yu, T.-H., Chiu, Y.-S., Godwinraj, D., Godfrey, D., Wu, C.-H.**

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**Abstract**

The impact of hot carrier injection (HCI) on the performance of standard and low-VT FinFETs are investigated and benchmarked with each other. For this investigation, these FinFETs were fabricated with various gate lengths (L) from 16 to 36 nm. HCI-induced transconductance degradation in standard devices for gate length variations of 36 nm down to 16 nm was 75%, while it was 35% for low-VT devices. Similarly, the degradation of threshold voltage in standard devices for gate length variations of 36 nm down to 16 nm was 39%, while it was 36% for low-VT device. In this work, as the device is subject to HCI, we found that: (1) short-channel devices cause severe degradation on the threshold voltage and transconductance (gm) compared to long-channel devices, owing to the higher electric field for short-channel devices at the gate edge, (2) standard devices exhibit a more stable threshold voltage than that of low-VT power devices, since the TiN barrier layer prevents Al atom diffusion into the HfO2 layer, and (3) the transconductance efficiency of standard devices is better than that of low-VT power devices. Further, the lower-VT devices show lower transconductance degradation than standard devices. However, the transconductance degradation of the long-channel standard and low-VT devices are the same. Compared to short-channel low-VT devices, extended-channel standard devices are more immune to the HCI effect. 

# ECEIJ-39

## Hot Carrier Injection Reliability of Fabricated N- and P-Type Multi FinFETs with Different TiN Stacks

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**ISBN: 21628769 (ISSN), DOI: 10.1149/2162-8777/acc138, Volume-12, (2023)**

## Abstract

Device degradation due to hot carrier injection (HCI) in multi-fin 20 nm and 10 nm N- and P-type FinFET devices are thoroughly analyzed. To further understand the HCI reliability of the four FinFET devices, the device is fabricated with a standard Vt base and low Vt base gate stacks with different work functions. It is evident that: (i) The standard Vt device sustains lower effective stress bias due to the difference in threshold voltage, resulting in a more stable threshold voltage than the low Vt base device, and (ii) the transconductance of the single N- and P-type FinFET is more severely degraded than the multi-fin N- and P-type FinFET, mainly because multi N- and P-type Finfet has coupe effect, which effectively reduces the impact of HCI. 

# ECEIJ-40

## Hot Carrier Injection (HCI) Reliability of Fabricated Y-gate HEMT with Various Top Length

**Chen, Y.-L., Yeh, W.-K., Chen, K.-H., Hsu, H.-T., Hsu, C.-T., Godwin Raj, D., Chou, H.-T., Wu, J.-S., Yu, T.-H., Godfrey, D.**

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## Abstract

Device degradation due to hot carrier injection (HCI) in different Y-gate HEMT devices is thoroughly analyzed. To further understand the HCI reliability of the Y-gate HEMT devices, the device is fabricated with AlGaN/GaN structure with different top lengths (Ltop). An HCI stress time of 6000 s was conducted on these devices, while V t stability in other stress time domains, leakage current, and transconductance degradation are also discussed. In this work, we have demonstrated that increasing the LTop length could avoid the virtual gate effect and disperse the influence of the electric field under HCI stress. Furthermore, the effects of trapping in various locations, such as in the bulk SiN or AlGaN/GaN interface has been discussed. These trapping effects caused by the HCI stress might be the source of the Vth shift. Overall, The large Y-gate HEMT showed the lowest degradation of DC characteristics after the long HCI stress test. 

## INTERNATIONAL CONFERENCE PUBLICATIONS

## ECEIC-01

### An Innovation Development of Light Weight Deep Learning Algorithm for Smart Healthcare Neural Science Management

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**ISBN: 9798350334357 (ISBN), DOI-10.1109/ICECONF57129.2023.10083638, (2023)**

## Abstract

Healthcare occupies a special place in the structure and complexity of economic relations, due to the objective features of the main object of medical activities - an individual. Of these aspects, the key is the pervasive uncertainty in all medical activities: the uncertainty of the dynamics of human health, and the uncertainty of the outcome of medical intervention. The most important issue in healthcare is the problem of the quality of medical care, which is difficult to overestimate because it is related to health, and sometimes human life. In this paper, the neural science-based light weight deep learning algorithm was proposed to manage healthcare issues. The quality problem can only be solved if the neural science management of the medical care system is optimal at all levels by using computational intelligence. In solving these problems, priority is given to the administrative staff of health institutions. The growth and development of neural science management are one of the key levers to improving the performance of its adaptive medical institutions in a particular situation. © 2023 IEEE.

## ECEIC-02

### Double-Core Photonic Crystal Fiber for Liquid Sensing Detection

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**ISBN: ISSN: 18761100ISBN: 978-981990972-8, DOI: 10.1007/978-981-99-0973-5_64, Volume 1024 LNEE, 2023, Pages 837-845**

## Abstract

In this paper, photonic crystal fiber with two cores is designed for sensing application and numerically studied using the finite element method-based COMSOL Multiphysics software. One central air hole forms the two cores can be filled with different liquids for sensing applications. The significant mode of the fiber structure is examined, and the designed sensor has a maximum coupling length of is 90.1, 104.4, 110.3, and 119.1 mm, respectively, for sensing pentanol, benzene, alcohol, and water at the wavelength of 1800 nm. According to theoretical analysis, the suggested photonic crystal fiber-based sensor with a length of only 0.03 cm has a sensitivity of 3750 nm/RIU, 4166.666 nm/RIU, 5000 nm/RIU, and 7500 nm/RIU, respectively, for pentanol, benzene, alcohol, and water. 

## ECEIC-03

### A Framework of Computer Network Security (NS) System and Its Application

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**ISBN: ISSN: 23674512, DOI: 10.1007/978-981-99-1157-8_8, Volume 168, 2023, Pages 58-65**

## Abstract

With the rapid improvement and development of computer technology and Internet technology, a global integrated information society has been formed. Therefore, people's dependence on computer network has increased rapidly. Computer network has become one of the important tools in people's daily work, life and learning. The development of society cannot leave the network. Only by continuously improving security protection technology, strengthening security management and discovering the security threats that enterprises may face, can we better use information tools to promote the better development of society. This paper roughly tests the risk value of computer network through DS theory and conducts a questionnaire survey on NS problems. The survey results show that more than 70% of people believe that NS problems are due to imperfect supervision, And 84% said that the risk to the network should be punished, which also shows that the NS problem in the Internet environment has become a highly valued security problem at present; At the same time, combined with DS theory and algorithm, the risk value of computer network is evaluated, and the framework and application of computer NS system are studied. 

## ECEIC-04

### Bacterial Detection in Contaminated Water Using a Photonic Crystal Sensor

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**ISBN: ISBN: 979-835034729-6, DOI: 10.1109/ICSSES58299.2023.10199921, (2023)**

## Abstract

This research proposes the design of an optical sensor that may be used to identify the presence of bacteria in contaminated water. We have taken a 2D photonic crystal structure into consideration for the design of the proposed sensor. An MIT-MEEP simulation tool is used to analyse the sensor. Studying the optical characteristics of various bacteria in water allows us to provide the refractive index value as an input to MEEP. Different bacteria's final responses to the proposed structure are analysed. The photonic crystal's refractive index profile changes when bacteria's refractive index varies. Because of the variation in bacteria's refractive index, the central frequency and wavelength are affected. The change in refractive index can be picked up by recording changes in the wavelength and frequency of the light transmitting through the structure. The analysis of the transmission and reflection spectra is made by using the MIT Electromagnetic Equation Propagation (MEEP) simulation tool. As bacteria's refractive index changes, it is shown that the wavelength and frequency shifts are significant. © 2023 IEEE.

## ECEIC-05

### Numerical Analysis for Flat Wheel Detection at Different Wagon Load

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**ISBN: 9789380544472 (ISBN), Pages- 525-529, (2023)**

# Abstract

As there are many ways of locomotion in many parts of the country, but the most common and the least expensive locomotion for travelling and transporting heavy goods from one place to another place are railways, the most preferred ones. As the country develops, the transportation also develops from time to time. The most main criteria for improvement in railways are to improve the contact system of railway wheel to the tacks. A constant and consistent study on the rail-wheel system contact was tested for improve the values of railways. Our paper presents the finite element analysis with a rail-wheel model to get more accurate values of flat wheel contact. Optical sensors like fiber Bragg grating sensors gives the wavelength shift for various train conditions unloaded 22.3t to 70t, with sensitivity of 1.39 pm/με. This work gives idea on the improved process of the setup and the synthesis of the prospective exploratory techniques followed by ascendable, automotive, and working analysis. 

## ECEIC-06

### Implementation and Performance Analysis of PEGASIS and MIEEPB Protocols in Wireless Sensor Networks

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**ISBN: 23673370 (ISSN); 9789811919756 (ISBN), DOI: 10.1007/978-981-19-1976-3_5, Volume-459, Pages-45-54, (2023)**

## Abstract

Wireless Sensor Networks (WSNs) are deployed in geographical regions with less accessibility to monitor its physical conditions, and also, the data needs to be transmitted to the sink for further processing and analysis. Sensor nodes form the basic element of a WSN. The primary requirement of WSN is to enhance the lifetime of network. Accordingly, different types of routing protocols are implemented and categorized into flat routing, hierarchical and location-based protocols. Here, we consider the implementation and performance analysis of chain-based protocol: Power Efficient Gathering in Sensor Information Systems (PEGASIS), in which the sink is fixed at a location, and its improved version: Mobile Sink Improved Energy-Efficient PEGASIS-based Routing Protocol (MIEEPB) where the sink is dynamic. MATLAB tool is used for simulation of protocols for various parameters. The analysis proves that MIEEPB is a better technique with mobile sink support when compared to PEGASIS which has a fixed sink location. 

## ECEIC-07

### IoT And GSM Applications for Industrial Health Monitoring

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**9798350322842 (ISBN), DOI: 10.1109/ICPCSN58827.2023.00171, Pages- 1005-1012, (2023)**

## Abstract

In recent years, IoT and wireless technology have mostly dominated the industrial sector, especially since the demand to support numerous industries has increased. Recently, a lot of unexpected incidents have occurred in a variety of businesses. As a result, security is now a major concern for everyone. In the current research study, a novel intelligent smart security system for the industrial sector based on various wireless sensors, NodeMCU microcontroller with IoT network, and GSM module is proposed. This invention, the Industrial Protection System, uses IoT and GSM to detect any chemical spills or leaks, gas leaks, fires or boiler explosions, short circuits, and temperature and humidity readings from a variety of smart sensors. As a result, it is capable of measuring any environmental variation, keeping track of the most recent industry conditions, and alerting the proprietor by SMS via the internet. Knowing the situation allows for the right course of action that will safeguard industry from accidents and save several lives. Any computer, mobile device, or other smart device can be used to monitor it from anywhere at any time. The work's major accomplishment is the merging of embedded electronics and computer programming. The fact that this device is portable and can connect to both a computer and a mobile device over the internet is one of its additional benefits. 

## ECEIC-08

### A Cooperative Global Sequencing Algorithm for Distributed Wireless Sensor Networks

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## Abstract

Data gathering is a very fundamental use for wireless sensor networks. The area to be monitored has sensor units distributed. They can tell how much demand there is. Temperature, pressure, humidity, sun rays, and other factors could be involved. The detected data is sent to a centralized device called a sink or just a base station. Networks are frequently distributed in character, meaning that more than one kind of instrument is placed in a particular area. There is only one kind of component in uniform networks. A tree is created and anchored at the sink after the nodes have been distributed. In distributed networks, flawless aggregation is challenging to accomplish. In contrast to uniform networks, nodes may receive and transmit multiple types of packets. Every message should be forwarded by the node to a parent so that it can be combined in order to increase the likelihood of aggregation. As a result, a node might need to choose more than one progenitor. This implies that various parameters should be taken into account while forming trees. We have improved the literature's suggested combined distributed scheduling and tree generation for distributed networks. We discover that the expanded method maximizes aggregation, schedules the network with fewer time slots, and uses less energy. Additionally, it is discovered that distributed networks require more management costs to schedule than uniform networks do. © 2023 IEEE.

## ECEIC-09

### Transforming Natural Language Requirements into Petri Nets - A Semi-Automated Approach

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**Volume-2023-June, Pages-176-2188, (2023)**

## Abstract

Software requirements are mostly specified in natural language (say English) and may contain errors. To prevent such errors, the requirements need to be transformed using formal methods, as analysis, identification and subsequent removal of errors are easier. But expression of requirements using formal methods is laborious. We propose a simple, semi-automated methodology that transforms natural language requirements into Petri nets. Petri nets allow better modeling and analysis of the requirements and hence have been chosen as the target method. A practical example of Automated Teller Machine has been used to demonstrate our approach. A tool NLTOPNGEN to implement this approach has been developed. © Grenze Scientific Society, 2023.

## ECEIC-10

### Exploring the Challenge of Controller Placement in Software-Defined Networking: A Comprehensive Review

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**ISBN: 979-835034023-5, DOI: 10.1109/ICACRS58579.2023.10405236,**
**Pages 1950-1955, (2023)**

## Abstract

The placement of controllers is a critical issue that can significantly impact network performance and efficiency in Software DefinedNetworking (SDN). The optimal placement of controllers should take into account various factors such as network topology, resource requirements, and potential failures. For the purpose of determining the optimal placement of controllers, various approaches have been proposed in the literature, including mathematical optimization models, game theory, and simulation-based methods. These approaches aim to minimize latency, maximize network capacity, and improve network reliability in the face of failures. Overall, the optimal placement of controllers in SDNs remains an active area of research, and there is a need for continued exploration of new and innovative approaches to this problem. By taking into account the various factors that influence network performance and efficiency, researchers can continue to develop solutions that improve the design and operation of SDN networks. © 2023 IEEE.

# ECEIC-11

## FEM Analysis of Railway Brake Disc for Safety of Train

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**ISBN- 9789380544472 (ISBN), Pages-316-320, 2023**

## Abstract

Monitoring the temperature of disc brakes is crucial for ensuring their optimal performance in railway applications. To address this issue, a finite element analysis is conducted using Ansys software to assess temperature fluctuations in various parts of the brake under different conditions. Various factors such as payload, speed, and other variables can affect the braking mechanism and lead to brake failure. By installing a FBG sensor on the axle near the contact surface between the brake and the axle, it is possible to detect temperature changes as heat flows from the brake's outer frictional surface towards the axle. This is significant because a small temperature variation near the axle can have the same impact as a large temperature variation near the frictional surface. 

## ECEIB-01

## INTERNATIONAL BOOK CHAPTERS

### A Survey of Deep Learning Region Proposal and Background Recognition Techniques for Moving Object Detection

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**ISBN: ISSN: 23674512, DOI: 10.1007/978-981-19-3035-5_12, Volume 141, 2023, Pages 147-164**

## Abstract

Object detection is the technique of locating targets in an image scene. Moving object detection is to track the object in successive frames which forms the video. Moving object detection forms the primary step in surveillance applications and traffic monitoring systems. With the advent of deep learning remarkable performance is observed in object detection. But the following challenges of detecting small and low-resolution moving objects in the region of interest (ROI), objects with infrequent motion still remain. Deep learning background detection techniques aim at cancelling global camera motion and background movements. The review focuses on the strengths and weaknesses of various deep learning-based moving target region proposal networks and background separation methods. 

# ECEIB-02

## Studies on Single and Double Actuator Based DC Attraction Type Levitation Systems: Optimization Techniques

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**9781668473900 (ISBN); 9781668473887 (ISBN), DOI: 10.4018/978-1-6684-7388-7, Pages- 1-231,(2023)**

## Abstract

The field of DC attraction-type levitation systems (DCALS) faces challenges that hinder its optimal performance in various industrial applications. The inherent instability, nonlinearity, and unmodeled dynamics of DCALS make achieving precise control and stability a complex task. Moreover, there are unexplored aspects within the field that require interdisciplinary research and development to unlock its full potential. Studies on Single and Double Actuator Based DC Attraction Type Levitation Systems: Optimization Techniques, authored by Dr. Rupam Bhaduri provides a comprehensive solution to the challenges faced by DCALS. This book offers an in-depth analysis, design, and optimization of DCALS, focusing on single and double actuator systems. It equips academic scholars with the knowledge and tools to overcome system complexities through advanced optimization techniques. Dr. Bhaduri explores interdisciplinary approaches, integrating concepts from electromagnetism, electronics, power electronics, mechanical engineering, and control systems to achieve stability and precise control in levitation systems. The book is an invaluable resource for academic scholars, researchers, and engineering professionals specializing in electromagnetism, electronics, power electronics, mechanical engineering, and control systems. This book caters to individuals seeking a deeper understanding of DC attraction-type levitation systems and provides interdisciplinary approaches to address their challenges. By leveraging the insights and advanced optimization techniques presented in this book, scholars can contribute to the advancement of DCALS through innovative research and development, unlocking its full potential and enabling precise control and stability in industrial applications. 

## ECEIB-03

### Eye-based cursor control and eye coding using hog algorithm and neural network

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**9781119792161 (ISBN); 9781119791638 (ISBN), Pages-209-225, (2023)**

# Abstract

For the physically challenged people cursor control using the eye movement plays a major role in helping them to perform the necessary task. Non-intrusive gaze estimation technique can help in the communication between humans and computers. The eye-gaze will be handy for the communication between physical challenged person and the computer. The pupil movement patterns also called as Eye Accessing Cues (EAC) is related to human brain's cognitive processes. This method in particular will be beneficial to the physical challenged people with disabilities such as Amyotrophic Lateral Sclerosis (ALS). In this chapter, a technique is proposed to control the mouse cursor in real time using the pupil movements. With the application of the image processing and graphic user interfacing technique (GUI) the cursor control can be rolled into reality using blink detection and gaze estimation. Hog algorithm helps in identifying the eye blink and pupil movements. Based on the detection the cursor control is carried out either directly tracking the pupil movement or tracking the same with the help of camera connected to the system. In this chapter the gaze direction is performed using Hog algorithm and machine learning algorithm. Finally, the cursor control is implemented by GUI automation. The same technique can be expanded to help the physically challenged person to write content and also to do python coding. 

# SCHOOL OF ENGINEERING

# DEPARTMENT OF MECHANICAL ENGINEERING

## Publications Summary

| | | |
|---|---|---|
| **International Journals** | **13** | **(MEIJ-01 – MEIJ-13)** |

**SCHOOL OF ENGINEERING**
**DEPARTMENT OF**
**MECHANICAL ENGINEERING**

**MEIJ-01**

**INTERNATIONAL JOURNAL PUBLICATIONS**

# Study of Wear Behavior of Silicon Carbide and Boron Carbide Reinforced Alumiium Alloy (Al6061) Matrix Composites

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**ISBN: ISSN: 22502122, DOI: 10.1007/s40033-023-00625-0, (2024)**

## Abstract

The current investigation employs Al6061 as the matrix material. Silicon carbide and Boron carbide particles are utilized as reinforcing materials. The stir casting technique is employed for the fabrication of Al6061–SiC–B4C composites. The percentage of SiC carbide particles was maintained at 3% throughout the study. The B4C particle concentration is changed from 2 to 8% in steps of 2%. A tribological test is being carried out with varying parameters of load, sliding distance, and a constant speed for the developed composites. The EDAX of the Al6061+3% SiC+6% B4C composite confirmed the presence of Al6061, SiC, and B4C components. The SEM microstructure analysis demonstrates that the reinforcing particles were distributed evenly throughout the matrix. The findings of a wear test show that the developed composites are more resistant to wear than the base material. The results show that, for a given load, an increase in sliding distance results in a greater amount of wear loss. On the surface that has been worn, the Al6061–SiC–B4C composite exhibits fewer grooves and areas that have delaminated than the Al6061 alloy. The developed Al6061–SiC–B4C composites are used in automotive components such as connecting rods, pistons, and break drums. © 2024, The Institution of Engineers (India).

## MEIJ-02

### A novel study on the development of sisal-jute fiber epoxy filler–based composites for brake pad application

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**ISBN: ISSN: 21906815, DOI: 10.1007/s13399-023-04219-4, (2023)**

## Abstract

The aim of this research was to develop a lightweight, asbestos-free brake friction material using sisal, jute, and sisal/jute hybrid composites along with fillers and frictional additives. Sisal, jute, and sisal/jute hybrid fiber–reinforced epoxy polymer-filler-based composites were prepared using a compression molding process, and their mechanical and tribological properties were evaluated as per ASTM standards. The results were compared with commercial brake friction material. The study found that the compressive strength of sisal, jute, and hybrid composites increased by 21%, 11.6%, and 16.65%, respectively, while the hybrid composite (S3 + J3) exhibited nearly equivalent compressive strength. The impact strength, hardness, and water and oil absorption behavior of the hybrid composite exhibited the same performance as that of commercial brake pads. A pin-on-disc experiment was conducted and the results showed that wear loss and coefficient of friction decreased with an increased weight percentage of fiber. Scanning electron microscopy images depicted uniform dispersion, distribution, and defect-free laminates with a uniform wear track. Overall results suggest the potential use of these composites in brake pad applications. Therefore, this study presents the development of sisal-jute fiber epoxy filler–based hybrid composites for lightweight applications, which can be used as a substitute for asbestos in brake pads. 

# MEIJ-03

## An investigation of process parameter influences on dissimilar friction stir welding of cast aluminum alloy joints

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**ISBN: ISSN: 10426914, DOI: 10.1080/10426914.2023.2260459,**
**Volume 39, Issue 2, (2023), Pages 188-206**

## Abstract

Cast alloys find suitable employability in industrial applications favoring automotive and aerospace sectors owing to their high specific strength, low porosity, excellent fluidity, and machinability. The present study focuses on friction stir welding of cast aluminum alloys (AA356 and AA2014) with a varied range of process parameters, namely, tool pin shape (cylinder, cone, square, and threaded cylinder), tool speed (1800–2100 rpm), and tool feed (5–20 mm min−1). The novelty of the present work spotlights/features the implementation of L 16 orthogonal design with the analysis of variance, grey relational analysis, fuzzy logic system, and artificial neural network approaches to contemplate the weld quality of cast joints. The microstructural analysis and grain size estimation is comprehended in the study. Regression models have been developed based on the analysis of variance. The prime factors favoring the ultimate tensile strength and microhardness were 2100 rpm, 10 mm min−1, and threaded cylinder shape. The findings from the analysis of variance and grey relational analysis are in concurrence with each other. The results of fuzzy logic showcased a substantial improvement in terms of grey relational grade. The results from the artificial neural network deliver rational evidence for the analysis of variance conducted on the selected tool pin shapes. 

# MEIJ-04

## Hydrogen, helium and thermo-acoustic refrigerators

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**ISBN: ISSN: 20101325, DOI: 10.1007/s44189-023-00038-4, Volume 31, Issue 1, December 2023, Article number 22**

## Abstract

In this work the design and analysis of 1 kW thermo-acoustic refrigerators with hydrogen and helium for the temperature difference of 38 K is discussed. Helium is the best for thermoacoustic refrigerators compared to the other competent gases. But hydrogen is chosen since it is less expensive and better thermophysical properties compared to helium. The best parallel plates geometry with 15% blockage is chosen for the stack and heat exchangers. The effect of resonance frequency of hydrogen and helium varying from 400–600 Hz on the theoretical performance is discussed. The coefficient of performance and the power density of 1.65 and 40.3 kW/m3 for hydrogen, and 1.58 and 19.2 kW/m3 for helium is reported for the optimized designs, respectively. The theoretical results are compared with the DeltaEC software results, shows the cooling power and coefficient of performance of 590 W and 1.11 for hydrogen, and 687 W and 1.25 for helium, respectively. 

## MEIJ-05

### Influence of Heat Variation on Thermal and Mechanical Performance of Al-7075-Based Hybrid Composites

**Santhosh Kumar, B.M., Swamy, G.M., Aprameya, C.R., Bavan, S., Venkatesh, B.N., Kumar, P., Nagaraja, T.K.**

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**ISBN: ISSN: 22502122, DOI: 10.1007/s40033-023-00614-3, (2023)**

## Abstract

Al-7075 as matrix and E-glass fibre and tungsten carbide powders as reinforcement materials were mixed to develop composite materials. Standard testing techniques were used to assess the mechanical characteristics, such as tensile strength, hardness, and impact resistance. Furthermore, the thermal properties of the composites, such as thermal conductivity and coefficient of thermal expansion, are examined to assess their suitability for applications involving temperature variations. The hardest and greatest tensile yield strength aluminium alloy is the heat-treated AA7075 alloy. Composites' thermal conductivity declined as the quantity of reinforcement grew because reinforcements low thermal conductivity values made them less efficient. 

## MEIJ-06

### Analysis and Optimization of Process Parameters to Develop Nanohybrid Composites of Vanadium Pentoxide/Reduced Graphene Oxide

**Chakraborty, S., Math, M.M., Vijaykumar, R.S., Bavan, S., Keshav, M., Nandini, B., Krishna, M., Prasad, C.D.**

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**ISBN: ISSN: 22502122, DOI: 10.1007/s40033-023-00618-z, (2023)**

## Abstract

By adjusting process variables such as the content of rGO (0.1, 0.5, and 1 g), hydrothermal temperature (150, 170, and 190 °C), and hydrothermal duration (5, 10, and 15 h), gas sensors based on V2O5/rGO nanohybrid composites were created. The prepared V2O5/rGO nanohybrid composites, particularly the flower-like structures, demonstrated favorable characteristics for gas sensing systems. At ambient temperature (30 °C) to 350 °C, the V2O5/rGO nanocomposites sensors' ethanol gas detection capabilities were simulated over ethanol vapor. The prepared V2O5/rGO nanocomposites were characterized by PXRD, FESEM, and EDAX. The surface morphology was confirmed by SEM, the crystal structure of V2O5/rGO nanocomposites, peak intensity, and lattice constants was confirmed by PXRD, and the presence of vanadium, oxygen, and carbon elements in the nanocomposites was confirmed by EDAX. The COMSOL Multiphysics 5.5 simulation was conducted for a better understanding of the sensing mechanism. The V2O5/rGO nanocomposite sensor, which resembled a flower, demonstrated flawless reversibility and quick response-recovery qualities to ethanol gas at two operating temperatures. The research's results have implications in the building of intelligent materials that can detect ethanol fumes for the chemical and food industries. 

## MEIJ-07

### An experimental investigation of papaya oil methyl ester (POME) blends as potential alternate fuel for CI engine application

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**ISBN: ISSN: 01430750, DOI: 10.1080/01430750.2022.2162124, Volume 44, Issue 1, 2023, Pages 1067-1075**

## Abstract

When reliance on fossil fuels increased and costs escalated as a consequence of the precipitous decline in oil security and increased emissions, encourage green energy alternatives such as renewable fuels. The papaya seed, a second generation feedstock in this study, is used to produce papaya biodiesel by methanolysis. The properties of the test biodiesel and its mixtures are measured using a CI diesel engine at 1500 rpm. The load is applied to the engine in increments of 20% until it reaches its maximum level. The blend B25 is recommended as ideal as it resulted in better performance and emission characteristics, with the exception of nitrous oxide emissions. The ideal blend's specific fuel consumption, brake thermal efficiency, exhaust gas temperature, and smoke density are 0.27 kg/kW-hr, 30.93%, 3180C, and 49.02 HSU at maximum load. The emissions of carbon monoxide, hydrocarbon, and nitrous oxide were, 0.095 percent, 55, and 988 ppm. Highlights Performance emission and combustion of a compression ignition engine fueled with conventional fuel and papaya biodiesel and its blends were carried out. Engine parameters were determined for each blend of fuel at varying loads. Results revealed that the blend B25 is found optimum. 

## MEIJ-08

### Machinability Study of Cu-Al-Mn Shape Memory Alloys using Taguchi Method

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**ISSN: 22502122, DOI: 10.1007/s40033-023-00629-w, (2024)**

## Abstract

Shape memory alloys (SMAs) based on copper have higher transformation temperatures throughout a wide range of compositions, as well as excellent ductility, which results in superior machinability. The main goal of this work is to determine the CNC turning machining parameters for Cu-Al-Mn SMAs made by the induction melting procedure in an induction furnace. Taguchi's DOE was used to choose the L9 orthogonal array (OA). A performance analysis, comprising an experimental study of Surface Roughness (Ra) and Material Removal Rate (MRR), was conducted using Cu-Al-Mn SMAs' turning parameters. The objective of this study is to determine the effects of feed rate, depth of cut and cutting speed on MRR and Ra. Using ANOVA, it was possible to pinpoint the main cause of both MRR and Ra. Based on the S/N curve, the optimal Cu-Al-Mn SMA parameter configuration to optimise MRR and reduce Ra was chosen. The Taguchi technique has been used to improve the CNC turning of Cu-Al-Mn SMAs that were machined using tungsten carbide tip tools. 

## MEIJ-09

### A comparative study of reduced graphene oxide synthesized through different techniques for UV-C radiation detection application

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**ISSN: 00318949, DOI: 10.1088/1402-4896/ad274b, Volume 99, Issue 3, 1 March 2024, Article number 035949**

## Abstract

In this work, reduced Graphene oxide (rGO) is synthesized through three different chemical routes of synthesis and they are used for the fabrication of UV radiation detectors working in the 100-280 nm range. The fabricated device is a Silicon based radiation detectors with these different synthesized samples of rGO as the sensing material. The photon detector has an architecture of a field effect transistor working in the back-gate mode of operation. The device response is studied in presence of UV rays for all the three types of devices in the back-illumination mode of operation. A comparative analysis of the performance of these three devices is done to analyze the effect of rate of reduction on the device performance and its correlation with the properties of rGO. It was observed that higher the rate of reduction, better is the performance of the device. The effect can be correlated with the improved electrical conductivity and reduced bandgap of rGO. 

## MEIJ-10

### Stress Propagation in the Craniofacial Skeleton on Frontal Impact—A Virtual Simulation Study

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**ISBN: 09728279 (ISSN), DOI: 10.1007/s12663-023-01979-4, Volume-22, Pages-1027-1033,, (2023)**

# Abstract

Background: The research paper emphasizes on virtual simulation of craniofacial skeleton to understand its Biomechanics. Methods: In this study, a 3D finite element model of the skull was created using CT scan data. All complexities of the skull geometry are simulated using ABAQUS software. The model was validated and then, subjected to frontal impact. Energy plots for the same were obtained. Impact analysis was done, and weak areas susceptible to fracture and hence, failure are identified. Results & Discussion: One of the emerging areas of applications of computational bio-mechanics is to understand the behavior of the skull during a traumatic injury, such as head impact during accidents. Finite element study is one such part where significant amount of research is being carried out to understand and predict the craniofacial injuries. For the head and brain trauma analysis, there are many software packages available, including ANSYS, LS-DYNA and ABAQUS. Research is being carried out towards developing high-fidelity human models, especially of the human skull to understand the bio-mechanical behavior when subjected to external impact. Impact analysis done in our study showed that a small change in impact velocity can result in a large change in damage that can happen. Conclusion: The study is expected to complement the existing treatment methodologies. Further, appropriate knowledge of fracture biomechanics can be used to design and develop safety measures in automobiles, sport guards, helmets to prevent and reduce facial injuries. 

## MEIJ-11

### Esterified Papaya Oil and its Blends as a Fuel on Single Cylinder Diesel Engine with Standard and Coated Piston

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**ISBN: 09753060 (ISSN), DOI: 10.4273/ijvss.15.1.25, Volume:15, Pages- 133-138,, (2023)**

## Abstract

The gradual depletion of non-renewable fossil fuels, increase in their price, the toxic exhausts emitted during their combustion, risk associated in their import and its storage made many researchers to focus on deriving suitable alternate fuels. In the present investigation the performance and emission characteristics of the blends and neat methanolized papaya oil were determined on a test engine consisting of single cylinder fuelled by diesel and running at 1500 rpm. The results revealed that the blend B25 of the test biodiesel is found optimum, as it recorded better specific fuel consumption and brake thermal efficiency. Further coating on the piston enhanced the performance of the optimum blend when compared with the standard engine. 

## MEIJ-12

**View factors from a longitudinal strip to cylindrical segments and disk sectors**

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**ISBN: 00224073 (ISSN), DOI: 10.1016/j.jqsrt.2022.108434, Volume-296, (2023)**

## Abstract

Analysis of temperature distribution and net radiation heat exchange in a cylindrical enclosure, when the temperature varies with the directions, requires view factors between relevant finite surfaces, viz. between a pair of finite cylindrical segments on the lateral surface, and between a finite cylindrical segment and a sector on the base disk. A review of literature shows that analytical expressions or data are not available for the referred view factors. In this paper, analytical expressions for the view factors from a differential area on the lateral surface of cylinder to cylindrical segments, and also to sectors on the base disk are derived by contour integration method. Such expressions are integrated analytically to obtain the view factors from a longitudinal strip element on inner lateral surface of cylinder to segments of cylinder, and sectors on base disk. A representative parametric study is carried out for the latter view factors. These expressions are applicable for the two-dimensional analysis of space radiator tubes. © 2022 Elsevier Ltd

## MEIJ-13

### Experimental investigation on impact of water in diesel emulsion in a single-cylinder research diesel engine

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**ISBN: 01430750 (ISSN), DOI: 10.1080/01430750.2022.2128411, Volume:44, Pages- 399-412, (2023)**

# Abstract

The current study focuses on assessing the impact of water-emulsified fuel on single-cylinder diesel engine. The effect of water concentration, homogeniser speed and surfactant concentration on the stability of water in diesel emulsion is studied. The performance, emission, and combustion analysis have been carried out by varying compression ratio, injection timing, and injection pressure. It is noted from stability analysis that for 10% water at 15,000 RPM homogeniser speed, 1% surfactant mixture is the optimal parameter to achieve stability of WD emulsion. Ignition delay period and combustion duration increase as water concentration is increased in the emulsion. At a compression ratio of 18, injection timing 23bTDC and pressure 210 bar show reduced carbon monoxide, hydrocarbon, oxides of nitrogen, and smoke emission by 8.3%, 8.57%, 21.25%, and 43.07%, respectively, compared to standard diesel. The injection pressure of 250 bar shows enhanced brake thermal efficiency compared to 210 and 230 bar. 

# COLLEGE OF BIOLOGICAL SCIENCES SCHOOL OF BASIC AND APPLIED SCIENCES

## Publication Summary

| | | |
|---|---|---|
| International Journals | 27 | (BIOIJ-01 – BIOIJ -27) |
| International Conference | 02 | (BIOIC-01–BIOIC-02) |
| Book Chapters | 02 | (BIOB-01- BIOB-02) |

# SCHOOL OF BASIC AND APPLIED SCIENCES

## INTERNATIONAL JOURNAL PUBLICATIONS

## BIOIJ-01

### Bioremediation of soils polluted with hexavalent chromium using bacteria

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**ISBN:9789819924899 (ISBN); 9789819924882 (ISBN), DOI:10.1007/978-981-99-2489-9_13**

## Abstract

Chromium (Cr) is a highly toxic metal that is continually being accumulated in the environment through natural processes and anthropogenic activities. Also, with the advent of industrialisation, the release of untreated effluent enables uncontrolled Cr to spread beyond groundwater and aquatic systems. United States Environment Protection Agency (USEPA) has marked Cr as a "Class A" pollutant, as one among the 17 hazardous chemicals posing a serious threat to mankind. Unlike trivalent chromium Cr (III), which is essential in trace amounts, hexavalent chromium Cr (VI) is a highly toxic form of chromium that persists in the soil owing to its high mobility. Also, its high bioavailability and solubility exert toxic effects including carcinogenicity in humans and mutagenicity/teratogenicity in most organisms. This chapter provides an overview of the popular remediation strategies (physical, chemical and biological) employed in the detoxification of Cr (VI). In recent times, biological mediated detoxification strategy is the most pursued due to its environmentally friendly and sustainable approach. Some members of bacteria show chromium resistance and successfully reduce Cr (VI) to Cr (III), which is a less toxic form. Physicochemical factors, immobilisation of bacterial cells and genetic engineering strategies are described and compared to offer evidences which further enhances the bioremediation efficiency by attaining resistance towards Cr (VI) and biotransforming Cr (VI) to less toxic Cr (III). 

## BIOIJ-02

### A novel peptide isolated from Catla skin collagen acts as a self-assembling scaffold promoting nucleation of calcium-deficient hydroxyapatite nanocrystals

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**ISSN: 17562651, DOI: 10.1093/jb/mvac103, Volume 173, Issue 3, 7 March 2023, Pages 197-224**

## Abstract

Catla collagen hydrolysate (CH) was fractionated by chromatography and each fraction was subjected to HA nucleation, with the resultant HA-fraction composites being scored based on the structural and functional group of the HA formed. The process was repeated till a single peptide with augmented HA nucleation capacity was obtained. The peptide (4.6 kDa), exhibited high solubility, existed in polyproline-II conformation and displayed a dynamic yet stable hierarchical self-assembling property. The 3D modelling of the peptide revealed multiple calcium and phosphate binding sites and a high propensity to self-assemble. Structural analysis of the peptide-HA crystals revealed characteristic diffraction planes of HA with mineralization following the (002) plane, retention of the self-assembled hierarchy of the peptide and intense ionic interactions between carboxyl groups and calcium. The peptide-HA composite crystals were mostly of 25-40 nm dimensions and displayed 79% mineralization, 92% crystallinity, 39.25% porosity, 12GPa Young's modulus and enhanced stability in physiological pH. Cells grown on peptide-HA depicted faster proliferation rates and higher levels of osteogenic markers. It was concluded that the prerequisite for HA nucleation by a peptide included: a conserved sequence with a unique charge topology allowing calcium chelation and its ability to form a dynamic self-assembled hierarchy for crystal propagation. 

## BIOIJ-03

# Formation of hierarchical assemblies by collagen peptides derived from fish skin and bladder and their subsequent application as antiperoxide agents in lipid-rich food

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**ISBN: 0021924X (ISSN), DOI:10.1093/jb/mvac111, Volume-173, Pages-353-373,**

## Abstract

This study attempts to identify the significant role played by the secondary and tertiary structure of collagen-derived peptides that are involved in lipid peroxide quenching in food products. Fish collagen hydrolysate (CH) was extracted with an efficiency of 70%. The constituent peptides of CH (8.2-9.7 kDa) existed in a polyproline-II (PP-II) conformation and at a minimum concentration of 1 mg ml-1 and pH range 7 to 8, assembled into a stable, hierarchical, quasi-fibrillar (QF) network. The peroxide quenching activity of this QF-CH increased with increasing ionic stability of the assembly and decreased upon proteolytic dismantling. Upon being used as an additive, the QF-CH reduced peroxide formation by 84.5% to 98.9% in both plant and fish-based oil and increased the shelf life of soya oil by a factor of 5 after 6 months of storage. The addition of QF-CH to cultured cells quenched peroxide ions generated in situ and decreased stressor activity by a factor of 12.16 abundant peptides were identified from the CH. The reason behind the high efficacy displayed by CH was attributed to its unique charge distribution, prevalence of proton-donating amino acid residues and proximal charge delocalization by the QF network, making fish derived CH a suitable substitute for antiperoxide agents in lipid-rich food. 

## BIOIJ-04

### Antioxidant, Antilipidemic and Antimicrobial Properties of Isolated Phytochemicals in Natural Honey from Nilgiris Biosphere, India

**Gowda, H.P., Alqahtani, Y.S., More, S.S., Shaikh, I.A., Bhargavi, D.R.M., Latha, G.S., More, V.S., Khan, A.A., Sangeetha Gowda, K.R., Muddapur, U.M.**

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**ISBN: ISSN: 03262383, Volume 42, Issue 6, 2023, Pages 1155-1163**

## Abstract

The current study sought to isolate phytochemicals in honey from the Nilgiris biome, India, and assess their antioxidant and anti-bacterial activities against six different pathogens. Phytochemicals in honey were extracted and tested using methanol and water extract. Currently, natural products available from plants are being exploited for therapeutics, since they can also serve as nutraceuticals. In this study, phyto-chemicals were isolated, namely, phenolics, carotenoids, and tannins from the honey mixture. Out of all the samples, the higher concentration of tannins, carotenoids, and phenolics was seen in the aqueous extract. The antioxidant data from nitric oxide, DPPH, and superoxide assays was found to have significant antioxidant activity in phenolic and tannin methanol extract when compared to carotenoid extracts. The phytochemical samples were also treated against six different bacterial strains. All of the phytochemical samples were found to have active antibacterial activity except against Bacillus cereus and E-coli. In addition, all the isolated phytochemicals were subjected to LDL oxidation inhibition activity. The observation here was again found to have a higher inhibition percentage in tannin methanol extract in honey. Hence, it was found to have good antioxidant capacity. As a result, tannin methanol extract was subjected to HPLC which matched to that of the standard tannic acid which confirmed the presence of tannin compound that could be responsible for anti-oxidant and antibacterial properties. Therefore, it is evident from the preceding findings that it can be used to inhibit oxidation, halt the growth of atherosclerosis, and aid in the management of cardiovascular disorders. 

## BIOIJ- 05

# Reaching the Goldilocks zone: A novel implant coating based on fish peptide stimulate superior osteogenicity compared to contemporary materials

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**ISBN: ISSN: 02540584, DOI: 10.1016/j.matchemphys.2024.128985, Volume 315, 1 March 2024, Article number 128985**

## Abstract

Majority of biomimetic implant coatings display high deviation in component HAp crystal sizes from the Goldilocks range of 25–50 nm resulting in low osseointegrative potential, consequently leading to delay in implant acceptance and, in extreme situations, complete rejection. The present study attempts to use a novel peptide to crystallize HAp coating with a higher percentage of crystals in the desired Goldilocks zone, ideally leading to faster osteoblast-implant surface bonding. Collagen hydrolysate was extracted from fish scales and a novel HAp-nucleating peptide (PF) was isolated by sequential chromatography. It displayed a widely conserved sequence with a PP-II conformation that further coiled to form triple helices. At physiological pH, these triple helices self-assembled into a quasi-fibrillar network (QFN) with dimensions of 842.2 ± 229 nm. The HAp synthesized on PF-QFN (PFC) displayed lower N1s binding energy in XPS indicating greater dynamicity, while an augmented Ca2p bond in XPS and intense FTIR bands at 1384 cm−1 revealed strong carboxyl-calcium interaction, which, coupled with a prominent (002) plane along the QFN-axis, culminated in augmented crystallinity (89.2 %). Consequently, PFC crystals were 29 % harder (162 MPa) with a 75 % elevated Young's modulus (4.7 GPa) when compared to currently used collagen-based composites (CLC). The average PFC crystal dimensions were 48 × 28 nm2, which, upon being used as a coating, was 98 % anti-bacterial, 94 % higher corrosion-resistant, and 15 % more osteoinductive with an average 25 % increase in osteogenic markers when compared to present biomimetic coatings. Overall, the results established that the PF based nanocomposite was a suitable agent for implant and bone graft coating material. 

## BIOIJ-06

### Essential oil and phytoconstituent (Linalool) from Homalomena aromatica Schott. rhizomes exhibit antibacterial and synergistic effects with beta-lactam antibiotics against Carbapenem-resistant Enterobacteriaceae (CRE) and Methicillin Resistant S. aureus (MRSA) pathogens

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**ISBN: ISSN: 09266690, DOI: 10.1016/j.indcrop.2023.116666, Volume 198, August 2023, Article number 116666**

## Abstract

Homalomena aromatica Schott. (HA) locally known as “Sugandhmantri” in India is a perennial herb commonly found in Assam, Northeast India and popular for its aromatic and medicinal properties. The main aim of this study was to determine the phytoconstituents of the essential oil (HA-EO) extracted from the rhizomes of Homalomena aromatica, purify its major phytoconstituent (HA-EOC-L) and examine the antibacterial activity. Further the study investigated the synergistic effect of both HA-EO and HA-EOC-L with beta lactam antibiotics against a panel of multi drug resistant (MDR) bacterial pathogens comprising CRE (Carbapenem resistant Enterobacteriaceae namely Escherichia coli & Klebsiella pneumonia genetically harboring NDM/OXA enzymes that deactivates major β-lactam antibiotics including carbapenem) and MRSA (Methicillin Resistant Staphylococcus aureus harboring mecA gene that encodes PBP2a protein and attributes to antibiotic resistance). Gas chromatography – Mass spectrometry (GC-MS) analyses of HA-EO displayed a total of 177 phytoconstituents with Linalool (mono-terpene alcohol) (38.6 %), terpinen-4-ol (9.5 %), gamma terpinene, and gamma muurolene (3.6 %) as the major class. The major phytoconstituent (Linalool) HA-EOC-L of this lot was purified by fractional distillation. In vitro investigation of the antibacterial activity of HA-EO and HA-EOC-L demonstrated its potential antibacterial activity with MIC 134–1075 µg/ml and 75–606 µg/ml against MDR bacteria (CRE & MRSA) respectively. Further, testing the combinatorial activity of HA-EO and HA-EOC-L with β-lactam antibiotics [(ceftriaxone-CRO (third generation cephalosporin) and meropenem-MEP (carbapenem)], by checkerboard test and time kill assay, demonstrated its synergistic effect towards MDR bacteria with HA-EOC-L showing better adjuvant activity with fractional inhibitory concentration index values (FICI) ranging from 0.13 to 0.49. The results emphasize the significant use of HA-EO and its constituent (HA-EOC-L) as an antibiotic-adjuvant agent to combat MDR infections propounded by the MRSA and CRE indicating HA with its beneficial secondary metabolites as a useful plant that can help human health, animal health besides food and cosmetic industry to combat MDR pathogens. © 2023 Elsevier B.V.

**BIOIJ-07**

**Bioinformatic Evaluation of Features on Cis-regulatory Elements at 6q25.1(Review)**

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**ISBN: 11779322 (ISSN), DOI:10.1177/11779322231167971, Volume-17, (2023)**

## Abstract

Eukaryotic non-coding regulatory features contribute significantly to cellular plasticity which on aberration leads to cellular malignancy. Enhancers are cis-regulatory elements that contribute to the development of resistance to endocrine therapy in estrogen receptor (ER)-positive breast cancer leading to poor clinical outcome. ER is vital for therapeutic targets in ER-positive breast cancer. Here, we review and report the different regulatory features present on ER with the objective to delineate potential mechanisms which may contribute to development of resistance. The UCSC Genome Browser, data mining, and bioinformatics tools were used to review enhancers, transcription factors (TFs), histone marks, long non-coding RNAs (lncRNAs), and variants residing in the non-coding region of the ER gene. We report 7 enhancers, 3 of which were rich in TF-binding sites and histone marks in a cell line-specific manner. Furthermore, some enhancers contain estrogen resistance variants and sites for lncRNA. Our review speculates putative models suggesting potential aberrations in gene regulation and expression if these regulatory landscapes and assemblies are altered. This review gives an interesting perspective in designing integrated in vitro studies including non-coding elements to study development of endocrine resistance in ER-positive breast cancer. 

## BIOIJ-08

**Exploring the therapeutic potential of green tea phytocompounds for pancreatic cancer: An mRNA differential gene expression and pathway analysis study**

**Sunkadakatte Venugopal, B., Dinesh, S., Sharma, S., Govinda Srinivasan, S., Sosalagere Manjegowda, D.**

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**ISBN: 09702067 (ISSN), DOI:10.51248/.v43i4.2869, Pages-1231-1238, Volume-43, (2023)**

# Abstract

Introduction and Aim: Pancreatic adenocarcinoma, which develops from the exocrine pancreas, is the most prevalent and aggressive type of pancreatic tumour having increased global prevalence, and has more than doubled over the 30 years. The aim of this study is to explore therapeutic potential of Camellia sinensis for pancreatic cancer using mRNA datasets and molecular docking technology. Materials and Methods: The purpose of the current study is to use computational methods to assess the effectiveness of several Camellia sinensis phytochemicals against Pancreatic cancer. The IMMPAT databank is utilized to retrieve the possible ligands. Molecular docking was methodically carried out using the virtual screening tool PyRx and the BIOVIA Discovery Studio Visualizer to forecast the binding affinity among the phytochemicals and the targeted proteins. Using ADMET filters, the ligands' pharmacological assessment was completed. Results: The fifty-two phytochemicals identified from Camellia sinensis were initially screened based on their affinity towards the targeted proteins. The ligand binding affinity score suggested that the phytochemical Vitamin E had the greater affinity towards the two targeted proteins and can be a promising therapeutic potential for the study of pancreatic cancer. Conclusion: The outcomes of this investigation suggested that the phytocompound Vitamin E, upon molecular docking exhibited the highest binding affinity which can be used as a drug candidate for pancreatic cancer. 

## BIOIJ-09

### Integrating network pharmacology and molecular docking for the identification of key genes and therapeutic targets of Nigella sativa in multiple sclerosis treatment

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**Volume-43, Pages-936-944,**

## Abstract

Introduction and Aim: Multiple sclerosis (MS) is a chronic neurodegenerative disease affecting around 2.8 million people worldwide. MS pathophysiology is not yet explained up to the mark, which is the cause of difficulty and complexity in treating the illness. Most present-day scenarios are engrossed in inhibiting central nervous system (CNS) inflammation. However, this is not enough, hence the present study aims at finding best neuroprotective treatment without adverse effects. Materials and Methods: In silico attempt to validate the phytocompounds from Nigella sativa and showcase their use for targeting the neuroprotective mechanism involved in management of MS by finding the key potential genes which were derived from mRNA datasets of previous research. Various bioinformatics tools and software such as GEO, String, ShinyGO, PyRx were used to carry out the current study. The leading steps involve retrieval of targets from mRNA datasets, molecular docking of phytocompounds with the targets and pharmacological analysis. Results: These phytocompounds from seeds of N. sativa showed promising results as therapeutic agents against target genes RPL27, RPS14 and FAU for management of MS during current in silico study, but any treatment prior its clinical practice should validate with large robust data, which lies as the future prospective here. Conclusion: In summary notable progress in management of MS with better understanding of pathology has been made and many disease modifying therapies (DMT) are made available but the question of safety and efficacy is still challenging due to adverse effects associated with these therapies. Hence properties of N. sativa must be explored as a therapeutic agent that can reduce the neuronal degeneration. 

## Investigating the molecular mechanisms of Ashwagandha phytocompounds in epilepsy through differential gene expression and pathway analysis

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**ISBN: 09702067 (ISSN), DOI:10.51248/.v43i5.2870, Pages-1476-1486, Volume-43, (2023)**

# Abstract

Introduction and Aim: Withania somnifera (Ashwagandha) is a traditional Indian herb used in Ayurveda and Unani medicine, particularly in anti-inflammatory, anti-cancer, anti-stress, antioxidant, immune-boosting, and rejuvenating effects. Epilepsy is a severe neuropsychological condition that occurs sporadically and has a long-term effect on the electrical signals that travel between brain cells. The disorder is characterized by recurrent seizures that are brought on by a sudden increase in brain electrical activity. This is the outcome of abnormal neuronal discharges or coordinated neuronal hyperexcitability. The study's main objective is to find out the therapeutic phytocompound in treating Epileptic disorder. Materials and Methods: This study investigated the potential use of phytochemicals from the Ashwagandha plant as epileptic seizure treatments that target key genes strongly associated with the disease. To forecast the binding affinity between the phytochemicals and the receptors, molecular docking simulations (PyRx) were used for the virtual screening. Results: The preliminary screening of the twenty-two phytocompounds from Withania somnifera was based on their affinity for epilepsy. The results showed that withasomnine exhibited great binding affinity to the receptors, indicating their potential as targeted epileptic seizure therapeutics. The ligands revealed stronger binding with the epilepsy targets, and the binding score less than-7 kcal/mol was taken into consideration for further exploration. This research lays the groundwork for upcoming in-vitro and in-vivo studies to confirm the effectiveness of these phytochemicals as cancer therapies. Conclusion: The results suggest that withasomnine derivatives from Withania somnifera could be a promising source of epilepsy therapies. 

## BIOIJ-11

### Microbial enzymes used in textile industry

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**ISBN: 9780443190599 (ISBN); 9780443190605 (ISBN), DOI:10.1016/B978-0-443-19059-9.00006-2, Pages= 649-684,(2023)**

## Abstract

Microbial enzymes are the biological catalysts owing to their capability to favor more efficiently and fast industrial reactions. Microorganisms produce enzymes utilized in textile industries more cost-effectively than animals and plants. The most commonly utilized enzymes in textile industries are amylases, peroxidases, catalases, cellulases, and laccases. However, ligninases, collagenases, lipases, proteases, pectinases, and nitrilases are also used, but to less extent. They remove the starchy soils, degrade excess hydrogen peroxide and lignin, and take part in desizing, scouring, bleaching, garment washing, denim washing, dyeing and denim, and biofinishing. Chemicals used in the textile industries are expensive and toxic, cause environmental pollution, and thus are dangerous to the worldwide population's health. Enzymes are currently used in textile industries as they are nontoxic, reduce energy and water used, are cost-effective, lead to the best final products, remove/decolorize dyes in the textile effluents, and thus reduce environmental pollution. In addition, the use of eco-friendly enzymes in textile industries may lead to the manufacture of textile products with good characteristics that may be sold and boost the economy of various countries, including underdevelopment countries. One of the objectives of this chapter is to show how to produce inexpensively microbial enzymes used in textile industries in considerable amounts to replace optimally the chemicals used in them. The isolation and identification of microorganisms able to produce significant amounts of textile enzymes are highlighted with emphasis on genetic materials manipulation. 

## BIOIJ- 12

### Fungal-based synthesis to generate nanoparticles for nanobioremediation

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**ISBN: 9783031305580 (ISBN); 9783031305573 (ISBN), DOI:10.1007/978-3-031-30558-0_4, Pages83-108,(2023)**

## Abstract

Nanotechnology has gained immense popularity with its innumerable biological agents, which are replacing toxic chemicals with an advanced technique for reducing and stabilizing nanoparticles (NPs). Fungal nanotechnology has represented exceptional technique in this area, owing to its nontoxicity, eco-friendly nature for fungal NPs, and nanostructure synthesis by reducing enzymes using either intracellular or extracellular techniques. Further, ease lies in the scale up-and downstream process owing to the increased surface area of the mycelial cells. Fungi and yeast are highly potential secretors of extracellular enzyme, grow fast, and are simple to maintain. Biogenic fungal NPs have been applied in the field of industry, agriculture, medicine, and other sectors too, and are used as bioremediators, drug delivery, biosensors, MRI, medical imaging, cancer therapy, etc. Mycoremediation can serve as a facilitator in bioremediating the toxins by immobilizing or inducing the synthesis of enzymes. Fungal NPs have shown an effective and efficient clean-up of the environment from the chemical pollutants and heavy metals, reducing total time consumption and total cost reduction. Fungal species of A. flavus and T. harzianum have shown promising crude oil degrading abilities with silver NPs at a very low concentration. Other fungal species used as resources for metal NPs that have been useful as bioremediators include Aspergillus, Fusarium, Penicillium, and Verticillium. 

## BIOIJ- 13

### Malabar Spinach (Basella alba), an Exotic Wonder Herb: A Review of Biomedical Applications

**Shaikh, I.A., More, V.S., Rao, A.S., Nair, A., Mahnashi, M.H., Habeeb, M.S., Khan, A.A., Nayak, A.N., Gowda, C.C., Salu, H.A., Pooja, K.R., Meghana, C.A., Reddy, N., Muddapur, U.M., More, S.S., Mohammed, T., Iqubal, S.M.S.**

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**ISBN: 03262383 (ISSN), Volume-42, Pages-917-923, (2023)**

# Abstract

Basella alba Linn. is an exotic herbaceous and medicinal plant distributed across South Asian and Tropical African countries. It is a perennial vine native to India, China, Bangladesh and Nepal. It is one of the important leafy vegetables utilized as a part of cuisine across India. It is packed with Vitamin A, Vitamin C and Iron. Owing to its high concentration of phenolic phytochemicals and flavonoid content in B. alba, it exhibits antioxidant properties that potentially make it an effective anti-cancerous drug. The herb, because of its ability to manage oxidative stress, can be a promising agent for treating diabetes mellitus. Also, several studies suggest that the herb is having anti-angiogenic and antiatherosclorotic properties. Hence, the herb can be a good choice to prevent and treat the related diseases and disorders. The plant extract also known to show insecticidal and antihelminthic activity. Apart from these, the fruit extract can also be used as natural colorant in food formulations like ice creams. Several such studies are underway to isolate and understand the properties of various compounds present in B. alba. Although the advantages of the herb are forestretched, the house-hold utility of it remains to be learnt, especially in urban areas. Hence, the present paper reviews some of the multi-facetted benefits that have been explored for this wonderful herb. This, consequentially, would help in promoting its effective utilization in the betterment of health and wellbeing. 

## BIOIJ-14

### Eco-friendly synthesized nanoparticles as antimicrobial agents: an updated review

**Borehalli Mayegowda, S., Roy, A., Manjula, N.G., Pandit, S., Alghamdi, S., Almehmadi, M., Allahyani, M., Awwad, N.S., Sharma, R.**

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**ISBN: 22352988 (ISSN), DOI:10.3389/fcimb.2023.1224778, Volume-13, (2023)**

## Abstract

Green synthesis of NPs has gained extensive acceptance as they are reliable, eco-friendly, sustainable, and stable. Chemically synthesized NPs cause lung inflammation, heart problems, liver dysfunction, immune suppression, organ accumulation, and altered metabolism, leading to organ-specific toxicity. NPs synthesized from plants and microbes are biologically safe and cost-effective. These microbes and plant sources can consume and accumulate inorganic metal ions from their adjacent niches, thus synthesizing extracellular and intracellular NPs. These inherent characteristics of biological cells to process and modify inorganic metal ions into NPs have helped explore an area of biochemical analysis. Biological entities or their extracts used in NPs include algae, bacteria, fungi, actinomycetes, viruses, yeasts, and plants, with varying capabilities through the bioreduction of metallic NPs. These biosynthesized NPs have a wide range of pharmaceutical applications, such as tissue engineering, detection of pathogens or proteins, antimicrobial agents, anticancer mediators, vehicles for drug delivery, formulations for functional foods, and identification of pathogens, which can contribute to translational research in medical applications. NPs have various applications in the food and drug packaging industry, agriculture, and environmental remediation. 

**BIOIJ-15**

# Green-synthesized nanoparticles and their therapeutic applications: A review

**Mayegowda, S.B., Sarma, G., Gadilingappa, M.N., Alghamdi, S., Aslam, A., Refaat, B., Almehmadi, M., Allahyani, M., Alsaiari, A.A., Aljuaid, A., Al-Moraya, I.S.**

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## Abstract

Antibiotic-resistant microorganisms are a rising issue when it comes to human health. Microbial pathogens that cause harmful infections are quickly becoming resistant to the antimicrobial action of traditional antibiotics. Nanotechnology, an innovative sector being an indispensable part of healthcare and research, has in-depth and extensive applications. Nano-compounds have been promising antimicrobial agents, anti-cancerous mediators, vehicles for drug delivery, formulations for functional foods, identification of pathogens, food and drug packaging industry, and many more. However, the chemical synthesis of nanoparticles (NPs) has certain drawbacks such as causing toxicity and other adverse effects. For more than a decade, the use of NPs that are conjugated or green-synthesized has gained popularity due to the two-fold action of metallic NPs mixed with biological sources. In contrast, NPs synthesized using plant or microbial extracts, conjugated with biologically active components, appear to be a safe alternative approach as they are environmentally friendly and cost-effective. Such environmentally safe techniques are referred to as "green nanotechnology"or "clean technology"and are feasible alternatives to chemical methods. Furthermore, NPs conjugated with natural biomolecules have improved bioavailability and have minimal side effects, as they are smaller in size and have higher permeability in addition to being reducing and stabilizing agents possessing excellent antioxidant activity. NPs serve as potential antimicrobial agents due to their affinity towards sulphur-rich amino acids, adhere to microbial cell walls by means of electrostatic attraction, and disrupt the cytoplasmic membrane along with the nucleic acid of microbes. They possess anticancer activity owing to oxidative stress, damage to cellular DNA, and lipid peroxidation. The green-synthesized NPs are thus a promising and safe alternative for healthcare therapeutic applications. © 2023 the author(s), published by De Gruyter.

**BIOIJ-16**

**Pseudomonas aeruginosa biofilm and their molecular escape strategies**

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## Abstract

Microbes, the tiny creatures with huge complexity have been the topic of interest in microbiology which has to be explored with a double-edged sword approach. Pseudomonas aeruginosa is the most problematic, opportunistic human bacterial pathogen that has to be addressed with high priority. Understanding their microenvironments at a molecular level becomes important for deciphering the puzzle of their adoptable and virulent behavior in the host cell. The current review attempts in highlighting the secretion systems, especially the Type III secretion system (T3SS) in P. aeruginosa as a potential target to block virulence. This is mainly facilitated through the potent phytochemicals or their formulations (phyto-quoromones) for a synergistic mode of action on T3SS. These phyto-inhibitors will hamper cell signaling through T3SS thus affecting the growth, survival, and replication of the pathogen. The prospects mentioned in the review will provide a newer dimension for the design and development of better and smart therapeutics against Pseudomonas infections. 

# BIOIJ-17

## Management of bovine brucellosis in organized dairy herds through the identification of risk factors: A cross-sectional study from Karnataka, India

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## Abstract

Background and Aim: Brucellosis is an infectious disease caused by Brucella species. This study aimed to identify the risk factors associated with bovine brucellosis seropositivity in organized dairy farms to control the disease in unvaccinated adult bovine herds in Karnataka, India. Materials and Methods: In total, 3610 samples (3221 cattle and 389 buffaloes) were subjected to parallel testing using the Rose Bengal plate test and protein G-based enzyme-linked immunosorbent assay, followed by analyses of animal- and farm-level epidemiological datasets to identify the risk factors. Results: The apparent brucellosis prevalence at the animal level was higher in buffaloes (8.2%, 95% confidence interval [CI] = 5.9–11.4) than in cattle (6.1%, 95% CI = 5.3–7.0). In a multivariable logistic model, animals calved 3–5 times (odds ratio [OR] = 2.22, 95% CI = 1.50–3.1, reference [ref]: animals calved <2 times); animals with a history of abortion (OR = 54.73, 95% CI = 33.66–89.02), repeat breeding (OR = 19.46, 95% CI = 11.72–32.25), and placental retention (OR = 13.94, 95% CI = 4.92–39.42, ref: no clinical signs); and dogs on farms (OR = 2.55, 95% CI = 1.48–4.40, ref: absence of dogs); disposal of aborted fetus in open fields (OR = 4.97, 95% CI = 1.93–12.84) and water bodies (OR = 2.22, 95% CI = 1.50–3.1, ref: buried); purchase of animals from other farms (OR = 6.46, 95% CI = 1.01–41.67, ref: government farms); hand milking (OR = 1.98, 95% CI = 1.02–10.0, ref: machine milking); and use of monthly veterinary services (OR = 3.45, 95% CI = 1.28–9.29, ref: weekly services) were considered significant risk factors for brucellosis in organized bovine herds ($p < 0.01$). Conclusion: The study identified that the animals calved 3–5 times or with a history of abortion/repeat breeding/placental retention, and disposal of aborted fetus in open fields/water bodies as the potential risk factors for bovine brucellosis. These risk factors should be controlled through the implementation of best practices to reduce the brucellosis burden in bovine farms. Copyright: Shome, et al.

## BIOIJ- 18

# An alkalophilic and thermostable polygalacturonase (PGase) from Pseudomonas sp. 13159349: purification, biochemical characterization and its efficacy in olive oil extraction

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**ISBN: 00063088 (ISSN), DOI: 10.1007/s11756-022-01310-5, Volume-78, Pages 1813-1824, (2023)**

## Abstract

The present study deliberates on the biochemical characterization of a highly alkalophilic and thermostable polygalacturonase (PGase) from Pseudomonas sp. 13,159,349. Further, its efficacy in olive-oil extraction was also assessed. The PGase enzyme was produced using wheat bran solid substrate fermentation (SSF) media that was statistically optimised using Placket-Burman and RSM. The extracellularly secreted PGase was purified by gel permeation chromatography with a fold purification of 6.42 and a specific activity of 192.97 U/mg. 12% SDS-PAGE and LC-MS spectra confirmed that the enzyme has a molecular weight of 44.5 kDa. PGase exhibited optimum activity at pH 9 and 45 – 50 °C and the enzyme retained > 50% stability at alkaline pH 9, 10, as well as 45 and 50 °C even after 8 h. The enzyme's kinetic parameters (Km and Vmax) with pectin substrate were found to be 0.0663 mg/ml and 209.60 mol. min-1, respectively. Metal ions $Co^{2+}$ and $Mn^{2+}$ enhanced enzyme activity while $Ag^{2+}$, $Hg^{2+}$, and ethylenediaminetetraacetic acid (EDTA) reduced it. Activity could be restored by removing EDTA by dialysis, demonstrating PGase as a metalloenzyme. In addition, the use of non-ionic surfactants displayed considerable stability, while Triton-X 100 increased the activity significantly, indicating a greater interaction between enzyme and substrate. Furthermore, treatment of olive paste with 300 U and 600 U of PGase remarkedly ($P < 0.05$) increased the olive oil output by 1.96 to 2.35-fold ($p < 0.01$) in comparison to the control. It also improved the total polyphenol content by 23 and 33% ($p < 0.05$) respectively. Overall, the biochemical characterization of PGase has provided substantial insights into the enzyme characteristics and revealed its prospective applicability in the oil sector. 

## BIOIJ-19

### Thermoalkalophilic polygalacturonase from a novel Glutamicibacter sp.: Bioprospecting, strain improvement, statistical optimization and applications

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## Abstract

The current research discusses a multidimensional bioprocess development, that includes bioprospecting, strain improvement, media optimisation, and applications of the extracted enzyme. A potent alkalophilic polygalacturonase (PG) producing bacterial strain was isolated and identified as a novel Glutamicibacter sp. Furthermore, strain improvement by UV and chemical mutagenesis not only improved the enzyme (PGmut) production but also enhanced its temperature optima from 37 °C to 50 °C. The use of solid substrate fermentation, followed by statistical optimisation through PB and RSM, substantially increased PGmut production. A 10-fold increase in enzyme production (632 U/gm) was observed when sugarcane bagasse with a pH of 10.5, 66.8 % moisture, and an inoculum size of 10.15 % was used. The model's accuracy was supported by p-value ($p < 0.0001$), and an R2 of 0.9940. A pilot-scale experiment, demonstrated ≈ 62,229 U/100 gm PG activity. Additionally, the enzyme's efficacy in demucilization of coffee beans, and bioscouring of jute fibre indicated that it is a valuable biocatalyst. © 2023 Elsevier Ltd.

## BIOIJ-20

### Biophysical and in vitro wound healing assessment of collagen peptides processed from fish skin waste

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**ISBN: 08839115 (ISSN), DOI: 10.1177/08839115221138773, Volume-38 , Pages-25-40, (2023)**

## Abstract

The present study was conducted to examine the bioactive and wound healing properties of collagen hydrolysate derived from Piaractus brachypomus (pacu) fish skin waste. Collagen type I (P coll.) yielding 72.25% was isolated from skin waste by following acid-soluble collagen extraction method. Further, collagen was fragmented using bacterial collagenase and the processed collagen hydrolysate (peptides) was in the range of 10–15 kDa that was further purified using ion-exchange chromatography. The FTIR spectra of both P coll. and collagen hydrolysate (PSCH) were nearly similar showing that PSCH retained the structural and chemical composition similar to its parent molecule (P coll.). Solubility analysis revealed that PSCH has slightly better solubility compared to P coll. Similarly, scanning electron micrographs also exhibited more uniform and porous microstructure of PSCH compared to P coll. Further, PSCH was found to be efficient in peroxide quenching (64.5%) and radical scavenging activities (85.74%). MTT studies confirmed PSCH to be non-toxic displaying 84.68% cell viability at the highest concentration (3 mg/ml) and hemocompatibility test revealed PSCH to be non-hemolytic with minimal lysis of only 2.1% of human RBCs. In addition, PSCH also displayed a remarkable wound closure ability of more than 80% at 12 h and 100% within 24 h. Hence, these findings suggest that recycled PSCH has potent wound healing ability and can be produced economically on a large scale for possible biological applications in regenerative medicine. © The Author(s) 2022.

## BIOIJ-21

### Statistical bioprocess optimization for enhanced production of a thermo alkalophilic polygalacturonase (PGase) from Pseudomonas sp. 13156349 using solid substrate fermentation

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**ISBN: 24058440 (ISSN), DOI: 10.1016/j.heliyon.2023.e16493, Volume-9, (2023)**

## Abstract

In this study, a polygalacturonase (PGase) producing bacterial strain was isolated and identified as Pseudomonas sp. 13159349 from fruit market soils, and TLC analysis confirmed its pectinolytic activity. Additionally, SSF, Plackett-Burman design (PB), and response surface methodology (RSM) were used to optimize the production of this thermostable and alkalophilic PGase. Wheat bran demonstrated the highest activity (60.13 ± 3.39 U/gm) among the various agricultural wastes used as solid substrates. To further enhance the enzyme production, statistical optimization of media components was investigated using the PB design. Among the 11 variables tested, pH ($p < 0.0001$), inoculum size ($p < 0.0001$), incubation time ($p < 0.0001$), and temperature ($p < 0.0041$) were found to have a positive effect on the production. The interaction and concentration of the selected factors were examined by RSM, which demonstrated the optimal conditions for maximum production (315.65 U/gm) of the enzyme using wheat bran as the solid substrate were pH 10.5, 61–66 h of incubation, and 6–7.5% inoculum size. The model was highly significant, with a p-value of <0.0001, an F-value of 95.33, and a low CV of 2.31. The RSM model was validated by a laboratory-scale experiment showing 30600 ± 400.32 U/100 gm PGase activity. Thus, SSF and the statistical design of media components resulted in a significant 5.2-fold increase in PGase output solely by using agro waste and optimizing the physical parameters, making this a highly cost-effective bioprocess. © 2023 The Authors

## BIOIJ-22

### Carbohydrases: a class of all-pervasive industrial biocatalysts

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## Abstract

Carbohydrases represent a group of most sought-after enzymes spanning a wide range in the industrial sector. Carbohydrases are enzymes capable of hydrolyzing complex carbohydrates into simple sugars. Enzymes such as maltases, amylases, xylanases, mannases, glucanases, etc., have been profoundly used in several industrial steps offering multifaceted benefits. Industries such as food and detergents use these enzymes as potent catalysts and ingredients in their productions. Alternate novel applications also include using carbohydrases in exogenous forms to improve the digestibility and nutritional availability of plant-based foods in pisciculture. Leather processing has been traditionally performed with a barrage of potentially hazardous chemicals. Carbohydrases have presented themselves here as greener alternatives by either eliminating the use of these chemicals or by partly replacing them. This approach proved to be ecofriendly and aided in reducing the net process duration. The primary source for almost all industrial carbohydrases is microbial in origin. All major groups such as bacteria, yeasts, and fungi have demonstrated optimal consistency in producing these enzymes. Short life span and near negligible ambient effects make microbes ideal production houses. Despite the broad-spectrum applications and the ease of synthesis, the production costs and active lifetime of the biocatalysts have been an issue of concern in recent times. Genetically modified enzymes via recombinant DNA technology have proved fruitful in meeting industrial demands while cutting down on the overall cost of production. In the present chapter, the most important studies on the origin and potential applications of carbohydrases are extensively reviewed. 

## BIOIJ-23

### Isolation and Biochemical Properties of Extremophilic Keratinase from Bacillus cereus FC1365

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**ISBN: 03698211 (ISSN), DOI: 10.1007/s40011-023-01472-5, Volume-93, Pages-721-729,**

**Abstract**

Keratinases secreted by microorganisms belong to proteolytic enzymes with unique characteristics to efficiently degrade tough, fibrous, and hydrolysis resistant keratin proteins. In this study, the biochemical characterization of a highly thermoactive and alkalophilic keratinase enzyme (FCnase) was reported that was isolated from the soil samples procured from a Bengaluru-based poultry dump yard, India. The screened isolate was identified as Bacillus cereus FC1365 (# MN712509—accession number) by 16S rRNA gene sequencing. FCnase production was carried out in minimal salt media supplemented with feather meal, and partial purification of the extracellularly secreted enzyme was achieved by acetone precipitation method. 3.4-fold purification of the enzyme was attained with a maximum activity of 21.4 U/ml. The enzyme was optimally active at pH 10 and 70 °C. K m and V max of the enzyme were 0.396 mg/ml and 2.86 U/ml, respectively. SDS-PAGE and Zymogram confirmed the molecular weight of the FCnase as 63 kDa. Metal ions like $Ca^{2+}$ and $Mg^{2+}$ enhanced the enzyme activity while the ethylenediaminetetraacetic acid inhibited it, proving it to be a metalloprotease. Efficient feather degradation was demonstrated by the isolated robust enzyme making it suitable for feather waste management and other industrial applications. 

## BIOIJ-24

### Bio-Decolorization and Degradation of Reactive Blue 222 by a Novel Isolate Kucoria marina CU2005

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## Abstract

In this study, a novel bacterial strain, Kucoria marina CU2005, was isolated and identified using 16S rRNA gene sequencing from an industrial wastewater sludge sample capable of degrading Reactive Blue 222 (RB222) dye. Batch mode bio stimulation studies were performed with minimal salt media to optimize key physiological parameters for effective decolorization of RB222. When cultured at 35 °C and pH 7 under static conditions, this bacterium decolorized 82 percent of the dye after 24 hours. Decolorization was monitored using UV-vis spectrophotometry. Isolate's ability to decolorize the complex dye was attributed to its degradation potential rather than a passive surface adsorption. FTIR, HPLC, GC-MS studies were used to confirm microbial dye metabolism. The results indicated breakdown of dye upon decolorization as some peaks were shifted and generation of aromatic amine for monosubstituted benzene ring as intermediates of dye degradation in decolorized solutions. This study has shown the potential of Kucoria marina CU2005 to decolorize RB222 dye at a better pace and efficiency than previously reported bacterial strains. Thus, we propose that our isolated strain can be utilized as a potential dye decolorizer in environmental biotechnology as effluent treatment for decolorization of RB 222. 

## BIOIJ-25

# Identification of a potential inhibitor for New Delhi metallo-β-lactamase 1 (NDM-1) from FDA approved chemical library- a drug repurposing approach to combat carbapenem resistance

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## Abstract

Superbugs producing New Delhi metallo-β-lactamase 1 (NDM-1) enzyme is a growing crisis, that is adversely affecting the global health care system. NDM-1 empowers the bacteria to inactivate entire arsenal of β-lactam antibiotics including carbapenem (the last resort antibiotic) and remains ineffective to all the available β lactamase inhibitors used in the clinics. Limited therapeutic option available for rapidly disseminating NDM-1 producing bacteria makes it imperative to identify a potential inhibitor for NDM-1 enzyme. With drug repurposing approach, in this study, we used virtual screening of available Food and Drug Administration (FDA) approved chemical library (ZINC12 database) and captured 'adapalene' (FDA drug) as a potent inhibitor candidate for NDM-1 enzyme. Active site docking with NDM-1, showed adapalene with binding energy −9.21 kcal/mol and interacting with key amino acid residues (Asp124, His122, His189, His250, Cys208) in the active site of NDM-1. Further, molecular dynamic simulation of NDM-1 docked with the adapalene at 100 ns displayed a stable conformation dynamic, with relative RMSD and RMSF in the acceptable range. Subsequently, in vitro enzyme assays using recombinant NDM-1 protein demonstrated inhibition of NDM-1 by adapalene. Further, the combination of adapalene plus meropenem (carbapenem antibiotic) showed synergistic effect against the NDM-1 producing carbapenem (meropenem) resistant clinical isolates (Escherichia coli and Klebsiella pneumoniae). Overall, our data indicated that adapalene can be a potential inhibitor candidate for NDM-1 enzyme that can contribute to the development of a suitable adjuvant to save the activity of carbapenem antibiotic against infections caused by NDM-1 positive gram-negative bacteria. Communicated by Ramaswamy H. Sarma. © 2022 Informa UK Limited, trading as Taylor & Francis Group.

## BIOIJ-26

### Reverse vaccinology & immunoinformatics approach to design a multiepitope vaccine (CV3Ag-antiMRSA) against methicillin resistant Staphylococcus aureus (MRSA)–a pathogen affecting both human and animal health

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## Abstract

Infections caused by drug resistant bacteria is a silent detrimental pandemic affecting the global health care profoundly. Methicillin resistant Staphylococcus aureus (MRSA) is a pathogen that causes serious infections in different settings (community, hospital & veterinary) whose treatment remains highly challenging due to its powerful characteristics (antibiotic resistance strategies, virulence factors). In this study, we used reverse vaccinology (RV) approach and designed an immunogenic multi epitope vaccine (CV3Ag-antiMRSA) targeting three potential antigen candidates viz., mecA encoding transpeptidase (PBP2a) protein responsible for conferring methicillin resistance and two virulence determinants - hlgA encoding gamma-hemolysin component A (a pore forming toxin) and isdB encoding iron regulated surface determinant B (heme transport component that allows S. aureus to scavenge iron from host hemoglobin and myoglobin). We employed an array of immunoinformatic tools/server to identify and use immunogenic epitopes (B cell and MHC class) to develop the chimeric subunit vaccine V4 (CV3Ag-antiMRSA) with immune modulating adjuvant and linkers. Based on different parameters, the vaccine construct V4 (CV3Ag-antiMRSA) was determined to be suitable vaccine (antigenic and non-allergen). Molecular docking and simulation of CV3Ag-antiMRSA with Toll Like Receptor (TLR2) predicted its immuno-stimulating potential. Finally, in silico cloning of CV3Ag-antiMRSA construct into pet28a and pet30 vector displayed its feasibility for the heterologous expression in the E. coli expression system. This vaccine candidate (CV3Ag-antiMRSA) designed based on the MRSA genomes obtained from both animal and human hosts can be experimentally validated and thereby contribute to vaccine development to impart protection to both animal and human health.

## BIOIJ-27

**Silver nanoparticles synthesis from Crinum moorei: Optimization, characterization, kinetics and catalytic application**

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## Abstract

Nanotechnology has been developing tremendously since the 1970s. Various types of nanoparticles such as carbon, metal, bio-originated, etc. have been synthesized by a variety of physical, chemical and biological methods. Biological methods which employ bacteria, fungi and plants for the synthesis of metal nanoparticles are found to be a sustainable and eco-friendly approach. Among biological methods, plants being a cleaner and greener source are widely accepted. The present work includes screening the synthesis of silver nanoparticles using the roots and leaves extract of 15 different Indian Crinum species, optimization, characterization and kinetic studies of silver nanoparticles. Among all the species, the highest synthesis was observed by Crinum moorei which was detected by apeak at 390 nm in UV–visible spectrophotometry. The optimization of silver nanoparticle synthesis from C. moorei roots was performed based on extract concentration (1 %), salt concentration (1.5 mM), pH (9) and temperature (30°C). The kinetics study of silver nanoparticles showed a rate constant of 0.0609 $h^{-1}$. Furthermore, the characterization of synthesized silver nanoparticles was conducted using TEM, SEM, FTIR, XRD, NTA and DLS. These synthesized AgNPs exhibited catalytic activity for Congo red dye decolorization, which could serve as an initiative for the further studies to control the environmental pollution caused by dyes and colorants. © 2024 SAAB

## BIOIC-01

### Green synthesis, characterization of gold nanoparticles using Justica wynaadensis leaf extract and its biological activities

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## Abstract

In this experiment plant mediated method used to prepare Au nanoparticles using Justica wynaadensis leaf extract. The leaf extract solution chemically acts as the reducing agent for the synthesis of gold nanoparticles. The formation of Justica wynaadensis Au nanoparticles was immediately noticed, the colour of the reaction mixture changed from brown colour to dark purple colour and monitored by UV-visible spectroscopy at a wavelength between 500nm to 650nm for Au nano particles. Synthesized gold nanoparticles were subjected to characterization by using XRD, TEM, FTIR. TEM analysis of Au nanoparticles are in triangular shape with size 50nm. The Au nanoparticles showed significant result for antibacterial activity and tested against cell line A549, anti-diabetic and anti-inflammatory activity proved that synthesized Au nanoparticles is good alternatives in medicine and industrial application. © 2023 Author(s).

## BIOIC-02

### A Design and Implementation of Real-Time Product Selection with Matrix Factorization, Collaborative Filtering

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## Abstract

Product quantified collaboration Filtering and its modification were suggested in this assignment to learn semiorganized inactive components for items (or clients) based on rating data. As the number of assessments increased, so did the difficulty of the block arrange drop upgrades? Six real-world, clear-cut datasets were used to inform the computations. With the same recovery time and just a few more recalls, the suggested computations outperformed the best-in-class hashing-based communitarian separation. PQCF also exhibited a greater recommendation precision than one of most outstanding ANN libraries' equal recovery time that suggested computations lead to more easily compromise between the efficacy and accuracy of top-k proposal. 

# INTERNATIONAL BOOK CHAPTERS

## BIOIB-01

### Microbial Pigments: Applications in Beverage Industry

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**ISBN: 978-100383794-7;978-103239263-9, DOI: 10.1201/9781003353980-5, (2024), Pages 84-91**

## Abstract

Sensory attributes are critical for enhancing the richness of food. Food colour is seminal in any food preparation. Beverage industries use several food colorants in the preparation of juices, energy drinks, milk products, soft drinks, alcoholic products, nutritional drinks, and other consumables. Consumer demand for natural ingredients in these kinds of beverages is high; therefore, the search for natural colourants has recently become a prime area of research. Microorganisms offer a wonderful source for exploring varieties of pigments; the production of microbial pigments is easy and can be scaled up for industrial production. Microorganisms (e.g., algae, fungi, bacteria) produce different pigments, which gives enormous scope for industries to develop a wide range of colours. These natural colourants have found applications in several industrial platforms, in particular the beverage industry. This chapter discusses some of the key applications of microbial pigments in beverages. © 2024 selection and editorial matter, Mohammed Kuddus, Poonam Singh, Raveendran Sindhu and Rachana Singh; individual chapters, the contributors.

BIOIB-02

**Development of Novel Food-Grade Pigments**

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**ISBN: 978-100383794-7;978-103239263-9, DOI: 10.1201/9781003353980-11, Pages 158-172, (2024)**

## Abstract

In the food and beverage sector, antioxidants are generally utilized as preservatives. However, the exponential growth in the world's population is expected to increase the market for antioxidants in other sectors, including the pharmaceutical and animal feed industries. Antioxidants help prevent cell damage by scavenging free radicals and reducing oxidative stress. Numerous bioactive substances with antioxidant properties are produced by microorganisms, and microbe-based antioxidants are biodegradable, nontoxic, and noncarcinogenic, in contrast with synthetic antioxidants. Microbes generate a vast range of secondary metabolites including carotenoids, flavins, melanins, quinines, monascin, and violacein that have a huge influence on society and are widely exploited in a variety of industrial applications: Pigments derived from microorganisms have medicinal, antibacterial, and cytotoxic properties; they are also suitable for usage as food additives, antioxidants, color enhancers, and functional food components. This review will summarize current research on the antioxidant effects of pigments derived from microorganisms. 

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## Publication Summary

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|---|---|---|
| Internationl Journals | 23 | (PHSIJ-01– PHSIJ-23) |
| Book Chapters | 02 | (PHSIB-01- PHSIB -02) |

## PHSIJ-01

### Synthesis, characterization and biological investigations of some new Oxadiazoles: In-vitro and In-Silico approach

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## Abstract

A series of new oxadiazole derivatives, namely 1-{2-substituted phenyl −5-[2-tifluoromethyl)-1H-indol-3-yl]-3-(2H)-ylethanone 1,3,4-oxadiazoles were synthesized and investigated in this research. Using AutoDockVina 4.2, the new compounds VIb and VIc were extensively investigated for their ADMET characteristics and in-silico drug receptor interactions with the target enzyme, GlcN-6-P synthase (PDB ID: 2FV5). The existence of an electron-withdrawing group and a lipophilic functional group substituted at the phenyl ring was observed to be more active than in other molecules. The new molecules drug ability was investigated using ADMET experiments performed by Swiss ADME software, and the newly synthesized compounds qualified for ADME characteristics and followed Lipinski's rule of five. FTIR, $^{1}$H NMR, $^{13}$CNMR, and mass spectrometry tools were used to characterize the prepared substances. The prepared substances were screened for antibacterial activity against gram-positive (Bacillus subtilis, Staphylococcus aureus) and gram-negative microbes (Pseudomonas aeruginosa and Escherichia coli) using cup plate and MIC techniques. These substances were also screened for antifungal activity against Aspergillus niger and Candida albicans, with Ampicillin and Amphotericin B serving as standard references. The compounds VIb and VIc have more antibacterial action than antifungal activity among the synthesized substances. Compounds VIa to VIf were examined for in vitro antioxidant activity and compounds VIb and VIc has displayed significant antioxidant potentials with $IC_{50}$ values 45.16 and 38.14 in DPPH assay. The compounds VIa–f were tested for anticancer activity using MDA-MB 361 cell lines using MTT assays, and the $IC_{50}$ values were recorded, out of which VIb and VIc displayed the lowest $IC_{50}$ values. In-silico drug receptor interactions with the target enzyme, phosphoinositide-3-kinase (PI3K), with PDB ID: 3MJW were predicted as supportive evidence for the anticancer properties of the synthesized scaffolds. © 2023 The Authors

## PHSIJ-02

### Influence of iontophoresis on delivery of NSAID-loaded deformable liposomal dispersions: in vitro and in vivo evaluation

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## Abstract

Aim: Negatively charged deformable liposomes (DL) of ketoprofen were formulated to enhance transdermal delivery of ketoprofen (KP) under the influence of iontophoresis for intraarticular delivery. Methods: Conventional and deformable KP liposomes were prepared using thin film hydration, characterized and intraarticular delivery of KP was evaluated using Sprague-Dawley rats. Results: Vesicles displayed entrapment efficiency (>71%); zeta potential <-25 mV; size between 152.4 ± 12.42 nm to 220.4 ± 6.22 nm, KP-DL were stable under iontophoresis. Conventional and deformable liposomes exhibited relatively higher iontophoretic flux values than passive flux; Iontophoretic delivery enhanced KP availability in the synovial fluid (1.34 ± 0.12 µg.h/ml) fourfold over passive delivery (0.329 ± 0.15 µg.h/ml). Conclusion: Iontophoretic mediated transport of deformable liposomes could improve transdermal delivery of ketoprofen into the synovial joints than conventional liposomes. Plain language summary The present work is testing the effect of current on the movement of a drug. The name of the drug is ketoprofen (KP). To prepare small-size particles of KP, a new preparation called as deformable liposomes is used. These liposomes were prepared using solvents to dissolve drugs and fats. Later the solvents were removed to form a thin film. Further to the thin film, a water-based solvent was added to form minute particle dispersed in water. The suspension was tested to find out the size, charge and amount of drug gone into it. More than 70% of KP was included and surface charge was negative and size was very less. Amount of KP entering inside the bone joints on the knee showed that four-times higher amount moved inside with the help of current than without the help of current (passive). So, with the help of current, higher amount of drug could be transported to decrease pain.

# PHSIJ-03

## Synthesis, Characterisation, Molecular Docking Studies and Biological Evaluation of Novel Benzothiazole Derivatives as EGFR Inhibitors for Anti-breast Cancer Agents

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**ISBN: 09759506 (ISSN), DOI: 10.25258/ijpqa.14.3.03, Volume-14, (2023)**

## Abstract

Novel (2-anilino-N-(4,6-dimethyl-1,3-Benzosulfonazol-2-yl) ethanamide derivatives were synthesized and characterized by spectroscopy methods. All the compounds assessed for in-vitro antimicrobial activities on three strains are S. aureus, S. epidermis and E. coli by using disc plate method (25 μg/mL). Compounds 5a-5j showed good to excellent antimicrobial activity for three different strains compared to standard ciprofloxacin. Further screened by in-vitro cytotoxic activity against MCF-7 cell lines. Some compounds were 5i, 5c, 5b,5d and 5i showed high cytotoxic activities of $IC_{50}$ values 73, 53,37,32 and 24 μg/mL, reference drug as Gefitinib against MCF-7 cell lines and MCF-12A. Further carried out docking studies using Schrodinger software to analyze the orientations, interactions and binding modes of these derivatives at the adenine-5-triphosphate binding site of EGFR (PDB ID: 2ITY), which indicated that the ligands show good interactions with active site residues in this structural benzothiazole class, and are considered lead compounds for further development as anti-breast cancer drugs. 

## PHSIJ-04

### Optimization of Parameters for The Design and Evaluation of Fenofibrate Loaded Floating Microspheres by Taguchi Method

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**ISBN:26306344 (ISSN), DOI:10.29228/jrp.298, Volume-27, Pages-130-144, (2023)**

## Abstract

Fenofibrate is an anti-hyperlipidemic agent with poor water solubility and poor bioavailability of 30%. The goal of this study was to develop and optimise floating microspheres of Fenofibrate utilising an emulsion solvent diffusion method in order to improve absorption and oral bioavailability of the medicine for a better approach in treating hyperlipidemic conditions using ethyl cellulose as a polymer. At the preliminary stage four formulations were prepared by changing the polymer ratio and keeping the stirring speed, stirring time and solvent composition constant. Based on the results obtained batch 2 was considered as an ideal batch. The data from this batch was used at the middle level of a Taguchi orthogonal array design to optimise the formulation, and the effect of independent variables such as A (Polymer concentration), B (Stirring speed), C (Stirring time), and D (Ethanol concentration) on dependent variables such as particle size, percentage yield, drug loading, buoyancy, and drug release was investigated. All the microspheres showed good buoyancy for 24 h in simulated gastric fluid and controlled release of drug for 12 hours. The optimized formulation was spherical in shape as confirmed by photographs from scanning electron microscopy. The in vitro release data were fitted into various kinetic models and the possible release mechanism was found to follow Korsmeyer-Peppas model. The results suggest that Fenofibrate floating microspheres provides modified drug release for treating hyperlipidemia and can be used successfully for development of sustain release formulation. 

## PHSIJ-05

### Development and validation of a stability-indicating ultra-high-performance liquid chromatography method for the estimation of ibrutinib and trace-level quantification of related substances using quality-by-design approach

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**ISBN: 02693879 (ISSN), DOI:10.1002/bmc.5798, (2023)**

## Abstract

A new ultra-high-performance liquid chromatography method was developed using quality-by-design principles for quantifying trace-level impurities of ibrutinib. The method utilized an ACQUITY UPLC BEH C18 column with a mobile phase consisting of equal parts of 0.02 M formic acid in water and 0.02 M formic acid in acetonitrile. The critical method parameters, including mobile phase pH, column temperature, and flow rate, were optimized using the design of experiments. Statistical analysis revealed the impact of these parameters on critical quality attributes. Perturbation and response surface plots illustrated the individual and interactive effects of the parameters. The optimal parameter levels were determined to be pH, 2.5; column temperature, 28°C; and flow rate, 0.55 mL/min. Confirmation experiments demonstrated the method's robustness, with the separation of impurities and unknown degradation products within a 5-min runtime. The optimized ultra-performance liquid chromatography method was validated according to ICH guidelines. The method exhibited linear response within the range of 0.025–100 µg/mL for ibrutinib and 0.0187–0.225 µg/mL for impurities (r2 > 0.9995), with limits of detection/limits of quantification of 0.01/0.025 and 0.015/0.0187 for ibrutinib and four impurities, respectively. Recoveries for the drug and impurities ranged from 92.69 to 102.7%, and precision was below 2% and 8% relative standard deviation for ibrutinib and impurities, respectively. © 2023 John Wiley & Sons, Ltd.

## PHSIJ-06

# Systematic optimization of reverse phase ultra-high-performance liquid chromatography method for quantification of nilotinib and its related substances in bulk drug and pharmaceutical formulation using quality by design approach

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## Abstract

A sensitive ultra-high-performance liquid chromatography (UHPLC) method was developed for the quantification of trace levels of nilotinib and its related substances (RSs) in the nilotinib capsule dosage form. Critical method parameters were optimized using the design of experiments, employing the ACQUITY UHPLC BEH Phenyl column (2.1 × 100 mm, 1.7 μm) at a constant flow rate of 0.6 mL/min. The isocratic mobile phase, consisting of aqueous and organic phases, achieved efficient chromatographic separation within 8 min at 261 nm. The mean retention time for nilotinib was 6.1339, and for RSs, it ranged from 2.10 to 6.91 min, with a resolution exceeding 2 for all peaks. The method demonstrated robustness, separating known impurities and degradation products. The linearity was assessed over a concentration range of 0.02–80 ppm for nilotinib and 0.015–0.12 ppm for impurities. The limit of detection and limit of quantitation (LOQ) for nilotinib were 0.01 and 0.02 μg/mL, respectively, and 0.01 and 0.015 μg/mL for individual impurities. Recovery studies at LOQ, 100%, and 150% of the specification limit yielded percent recoveries ranging from 92.27% to 102.45%. Precision results showed low relative standard deviations, below 2% for nilotinib and below 8% for impurities. This method is deemed suitable for pharmaceutical formulation quantification. 

PHSIJ-07

# Design, synthesis, in silico, and pharmacological evaluation of novel quinoline derivatives containing substituted piperazine moieties as potential anti-breast cancer agents

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## Abstract

Quinoline derivatives are important heterocyclic compounds with potential medicinal values, especially for treating cancers like breast cancer. However, drug resistance and potential toxicity can limit their effectiveness. New derivatives are needed to specifically target cancer cells, particularly in breast cancer, while minimizing harm to normal cells and side effects for better treatment outcomes. Thus, this study aims to design and synthesize novel quinoline derivatives incorporating substituted piperazine moieties to enhance their anticancer efficacy by inhibiting EGFR, a key therapeutic target for breast cancer. Therefore, in this study, structural elucidation of the synthesized compounds was confirmed by using various analytical techniques, including IR, MASS, and NMR spectral data. Subsequently, these analogs were analyzed for their binding affinity using the molecular docking study, while anticancer efficacy was evaluated against MCF-7 cell lines, followed by an in vivo study in a DMBA-induced rat model. Initially, docking studies of synthesized analogs (8a–i) at the ATP binding site of the EGFR showed better docking scores and MM/GBSA energy, indicating their increased binding affinity to the EGFR. Further, the in vitro evaluation of all compounds (8a–i) showed that the compounds effectively inhibit the EGFR-TK enzyme, with compound 8i showing the highest potency at 87.5%. Moreover, the anti-breast cancer efficacy of compound 8i is attributed to electron-donating groups, which enhance interactions with biological targets. Compound 8i exhibited promising anti-breast cancer activity and was confirmed in vitro and in vivo studies, warranting further investigation as a potential anticancer property. 

## PHSIJ-08

### Antioxidants: an approach for restricting oxidative stress induced neurodegeneration in Alzheimer's disease

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## Abstract

Alzheimer's disease (AD) is the leading cause of dementia, affecting millions of people worldwide. Oxidative stress contributes towards induction of neurodegeneration. It is one of the reasons behind initiation and progression of Alzheimer's disease. Understanding of oxidative balance and restoration of oxidative stress has demonstrated its effectiveness in the management of AD. Various natural and synthetic molecules have been found to be effective in different models of AD. Some clinical studies also support the use of antioxidants for prevention of neurodegeneration in AD. In this review we are summarizing the development of antioxidants to restrict oxidative stress induced neurodegeneration in AD. 

## PHSIJ-09

**An updated literature on BRAF inhibitors (2018–2023)**

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**ISBN: 13811991 (ISSN), DOI: 10.1007/s11030-023-10699-3, (2023)**

# Abstract

BRAF is the most common serine-threonine protein kinase and regulates signal transduction from RAS to MEK inside the cell. The BRAF is a highly active isoform of RAF kinase. BRAF has two domains such as regulatory and kinase domains. The BRAF inhibitors bind in the c-terminus of the kinase domain and inhibit the downstream pathways. The mutation occurs mainly in the A-loop of the kinase domain. The mutation occurs due to a conversion of valine to glutamate/lysine/arginine/aspartic acid at 600th position. Among the diverse mutations, BRAFV600E is the most common and responsible for numerous cancer such as melanoma, colorectal, ovarian, and thyroid cancer. Due to mutations in RAC1, loss of PTEN, NF1, CCND1, USP28-FBW7 complex, COT overexpression, and CCND1 amplification, the BRAF kinase enzyme developed resistance over the commercially available BRAF inhibitors. There is still unmute urgence for the development of BRAF inhibitors to overcome the persistent limitation such as resistance, mutation, and adverse effects of drugs. In the current study, we described the structure, activation, downstream signaling pathway, and mutation of BRAF. Our group also provided a detailed review of BRAF inhibitors from the last five years (2018–2023) highlighting the structure–activity relationship, mechanistic study, and molecular docking studies. We hope that the current analysis will be a useful resource for researchers and provide chemists a glimpse into the future as design and development of more effective and secure BRAF kinase inhibitors. Graphical abstract: The development of BRAF inhibitors to overcome the persistent limitation such as resistance, mutation, and adverse effects of drugs. In depth description about different heterocyclic scaffolds (quinoline, imidazole, pyridine, triazole, pyrrole etc.) as BRAF inhibitors from the last five years (2018–2023) highlighting the structure-activity relationship, mechanistic study, and molecular docking studies. [Figure not available: see fulltext.] 

## PHSIJ-10

### Computational investigation of quinazoline derivatives as Keap1 inhibitors for Alzheimer's disease

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**ISBN: 23529148 (ISSN), DOI: 10.1016/j.imu.2023.101334, Volume-41, (2023)**

## Abstract

The Keap1-Nrf2-ARE pathway is crucial in the antioxidant defense mechanism. The Keap1-Nrf2-ARE pathway has become an important target for the development of potent therapeutic agents for numerous diseases. Keap1-Nrf2 protein inhibitors are electrophilic species that covalently bind with the sulfhydryl group of a cysteine residue of Keap1, which results in modification in cysteine residue. In this in-silico research, we investigated the Keap1 inhibitory potential of 99 quinazoline derivatives by molecular docking investigation. The ligand molecules were extracted from the ZINC15 database in sdf format. The pdb format Keap1 protein with PDBID: 4ZY3 was downloaded from RCSB (https://www.rcsb.org/). Resveratrol was chosen as a standard drug molecule for molecular docking studies to compare the results of test ligands. The in-silico docking study was performed by using AutoDock Vina 1.5.7 software. Out of 99 quinazoline derivatives, 12 derivatives showed the best binding energy towards Keap1. Thus, the top 12 quinazoline derivatives were further r screened for their ADME profiling, and bioactivity assessment. The molecular docking study revealed that trifluoromethyl substituted quinazoline derivatives S91 and S44 had the best binding energy of −9.1 kcal/mol and −9.0 kcal/mol respectively (better than reference drug Resveratrol, $\Delta G = -8.1$ kcal/mol) at the KELCH binding pocket of Keap1. Compound S91 formed a conventional hydrogen bond with Val (418, 464,512), Ala (366, 466, 607), and Gly (419,511). All 12 derivatives were found to possess drug likeliness properties. For this result, it can be concluded that quinazoline derivatives can be developed as new potent Keap1-Nrf2 inhibitors. The in-vivo/in-vitro study is necessary to validate the in-silico results. © 2023 The Authors

## PHSIJ-11

### Development and Optimization of Novel Emulgel Loaded with Andrographolide-Rich Extract and Sesame Oil Using Quality by Design Approach: In Silico and In Vitro Cytotoxic Evaluation against A431 Cells

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**Abstract**

An epidermoid carcinoma is a form of non-melanoma skin cancer that originates from the outer layer of the skin's squamous cells. Previous studies have shown that andrographis extract and andrographolide inhibit the growth and proliferation of epidermoid carcinoma cells while also inducing cell cycle arrest and apoptosis. The objective of this study was to improve the anticancer efficacy of the andrographolide-rich extract by delivering it in the form of nanoemulgel. During the formulation of emulgels, sonication, and homogenization were employed, and a 22-factorial design was used to optimize the formulations through the quality by design (QbD) approach. The optimized formulation (AEE8) was subjected to preliminary evaluations along with particle size, drug release, and scanning electron microscopy (SEM) studies. The potential of the optimized emulgel against A431 cell lines was also investigated using MTT assay followed by flow cytometric analysis. The SEM results reveal that the optimized emulgel had a well-defined spherical shape, with a droplet size of 226 ± 1.8 nm, a negative surface charge of −30.1 ± 1.6 mV, and a PDI of 0.157. The cellular data indicate that AEE8 reduced the viability of the A431 cells with an IC50 of 16.56 µg/mL, as determined by MTT assay when compared to cells treated with the extract alone. Furthermore, the flow cytometric analysis of the optimized emulgel formulation demonstrated a marked G2/M phase arrest. This finding further supports the effectiveness of the gel in disrupting the cell cycle at the critical G2 and M phases, which are pivotal for cell division and proliferation. This disruption in cell cycle progression can impede the growth and spread of cancer cells, making the gel a promising candidate for anti-skin-cancer therapy. The safety of emulgels (AEE8) was validated through rigorous biocompatibility testing conducted on HDF (human dermal fibroblast) cell lines, ensuring their suitability for use. Considering the potential of the nanoemulgel, particularly AEE8, as demonstrated by its favorable properties and its ability to disrupt the cell cycle, it holds great promise as an innovative approach to treating skin cancer. 

## PHSIJ-12

### Design, Synthesis, In-silico Studies and Antiproliferative Evaluation of Novel Indazole Derivatives as Small Molecule Inhibitors of B-Raf

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**ISBN: 23656549 (ISSN), DOI: 10.1002/slct.202300291, Volume-8, (2023)**

## Abstract

B-Raf, a proto-oncogene that encodes the B-Raf protein in the Ras/Raf/Mek/Erk (MAPK) pathway, is important in directing cell development and differentiation, mutation of which results in various types of cancers. A series of novel indazole derivatives were synthesized employing scaffold-based approach and characterized by the spectral data. All the synthesized compounds were subjected to molecular docking to assess their binding affinity with the protein. The physicochemical and pharmacokinetic profile of the compounds revealed their compliance with Lipinski's rule. The antiproliferative capacity of the synthesized derivatives was assessed by screening them against the human melanoma cell lines Skmel-23 and A375, which express B-Raf in wild-type and mutant forms, respectively. Compounds with 2-chloro and 2-cyano-4-isoproxy substitutions elicited potent inhibition against melanoma cell lines with IC50 values of 40.11 and 13.37 μM against Skmel-23 and 16.89, 15.57 μM against A375 cells respectively. The compounds manifested greater potential than the standard doxorubicin. In order to detect changes in cell morphology and evaluate their apoptotic potential; these substances were subjected to morphological screening. Both cell lines were shown to be strongly inhibited by the 2-cyano-4-isoproxy substituted indazole derivative; making it a prospective therapeutic candidate for targeting both wild-type and mutant B-Raf forms. © 2023 Wiley-VCH GmbH.

## PHSIJ-13

# Synthesis and In-vivo Bioactivity Studies of Some New Hydrazide Schiff Bases and Mannich Bases of Indole Derivatives

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**ISBN: 09711627 (ISSN), DOI:10.59467/IJHC.2023.33.299, Pages-299-309, Volume-33, (2023)**

**Abstract**

The anti-inflammatory, analgesic, and antiulcer activities of eight new hydrazide Schiff bases and eight new Mannich bases of indole derivatives were investigated. 2-Methyl-1H-indole-3-carboxylate (III) on hydrazinolysis gave 2-methyl-1H-indole-3-carbohydrazide (IV), which on reaction with aldehydes gave corresponding hydrazide Schiff bases Va–Vh. The reaction of IV with formaldehyde, different aliphatic, aromatic, and heterocyclic amines afforded the Mannich bases of indole derivatives (VIa–VIe). The results of biological studies revealed that Schiff bases with 2,4-dichlorobenzaldehyde (Vh) and 2-chlorobenzaldehyde (Vb) were potent anti-inflammatory, analgesic, and antiulcer activities. Mannich bases (VIh and VIc) having -NO2 and -Cl groups in the paralocation of the heterocyclic nucleus displayed effective anti-inflammatory, analgesic, and antiulcer activities. © 2023 Connect Journals

## PHSIJ-14

### Polysorbate 80-coated albumin nanoparticles to deliver paclitaxel into the brain to treat glioma

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**ISBN: 20415990 (ISSN), DOI:10.4155/tde-2022-0056, Volume-14, Pages-193-206, (2023)**

## Abstract

Aim: To develop stable paclitaxel (PTX)-loaded bovine serum albumin (BSA) nanoparticles (BSA-NPs-PTX) as drug-delivery vehicles for delivering paclitaxel into the brain to treat glioma. Methods: This study used PTX-loaded BSA NPs coated with polysorbate 80 (Ps 80) to enhance PTX concentration in the brain. Results: The low IC50 indicated that the fabricated BSA-NPs-PTX and BSA-NPs-PTX-Ps 80 showed significantly enhanced cytotoxicity. The pharmacokinetic and biodistribution analysis of BSA-NPs-PTX and BSA-NPs-PTX 80 showed comparable pharmacokinetic profiles but were significantly different compared with free PTX. Conclusion: BSA-NPs-PTX-Ps 80 exhibited higher plasma concentration-time curves, as compared with BSA-NPs-PTX and PTX. BSA-NPs-PTX and BSA-NPs-PTX-Ps 80 showed significantly improved PTX distribution in the frontal cortex, posterior brain and cerebellum. © 2023 Newlands Press.

## PHSIJ-15

### Nanoparticle-based drug delivery across the blood-brain barrier for treating malignant brain glioma

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**ISBN: 23529520 (ISSN), DOI: 10.1016/j.onano.2023.100128, Volume-10, (2023)**

## Abstract

In spite of substantial progress made in the standard treatment and ancillary therapies that include concurrent chemotherapy, radiotherapy, and surgery, malignant brain tumors – especially high-grade glioma (HGG) and glioblastoma multiforme (GBM) – denote a gloomy prospect. Intrinsic factors associated with the protection of the GBM microenvironment and the challenges of delivering drug across the blood-brain barrier (BBB) primarily hinder the efficient treatment of GBM. Recent advances in nanomedicine have shown potential in overcoming some of these hindrances. The present review examines the merits and demerits of using nanoparticle (NP) drug delivery systems for enhancing the effectiveness of the targeted drug delivery for treating HGG. Recent advances in nanomedicine-based drug delivery strategies that focus on direct and dual-targeting drug deliveries for overcoming the challenges associated with malignant glioma are discussed. Finally, clinical translation of drug delivery strategies, unresolved concerns, and prospects for future development to facilitate the effective treatment of malignant glioma are presented. © 2023 The Authors

## PHSIJ-16

### Exploring the potential of Lindernia ciliata: isolation, characterization, and pharmacological evaluation of its anti-diabetic properties

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**ISBN:14786419 (ISSN), DOI: 10.1080/14786419.2023.2297253, (2023)**

## Abstract

We isolated two phytoconstituents using bioassay guided isolation for anti-diabetic property from the hydroalcoholic extract of Lindernia ciliata (Colsm.) Pennell (Family: Linderniaceae). We assessed the anti-diabetic potential using various assays, including the glucose absorption assay, glucose uptake in isolated rat abdominal muscle assay, insulin secretion by RIN-5F cells assay, α-amylase inhibition activity, and DPP-4 inhibition assay. The results from our study indicated that the ethanol and water fractions obtained from the hydroalcoholic extract significantly improved glucose uptake, demonstrating promising anti-diabetic properties. Further investigation led to the isolation of two distinct compounds, LCF-1 (IUPAC name: 2-(3,4-dihydroxyphenyl)-3,5,7-trihydroxy-4H-chromen-4-one) (LCF-1) and LCF-2 (IUPAC name: 3S,10R,13R,17R)-17-[(2R,5R)-5-ethyl-6-methylheptan-2-yl]-10,13-dimethyl-2,3,4,7,8,9,11,12,14,15,16,17-dodecahydro-1H-cyclopenta[a]phenanthren-3-ol). Consequently, our findings suggest that LCF-1 and LCF-2 are two phytoconstituent derived from the hydroalcoholic extract of L. ciliata, could serve as a potential source of anti-diabetic agents. This highlights its suitability for further development in the creation of herbal pharmaceuticals for diabetes treatment. 

## PHSIJ-17

### Evaluation of pharmacokinetic parameters of ubiquinol acetate, ubiquinone and ubiquinol in male Sprague-Dawley rats – A comparative study

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**ISBN: 00195499 (ISSN), DOI: 10.25259/IJPP_484_2022, Volume-67, Pages191-196,(2023)**

**Abstract**

Objectives: The objective of this study was to evaluate single-dose oral comparative pharmacokinetics studies of ubiquinol acetate (EnQ10), ubiquinone and ubiquinol in male Sprague-Dawley (SD) rats. Materials and Methods: Oral suspension formulations of ubiquinol acetate (EnQ10), ubiquinone, and ubiquinol at 300 mg/kg body weight (equivalent dose of ubiquinone) were prepared in 0.1% (v/v) Tween 80 and 15% (w/v) hydroxypropyl-β-cyclodextrin. Six animals per group for each compound were dosed with oral suspension formulations of EnQ10, ubiquinone, and ubiquinol. Blood samples were collected at time points of 1, 2, 4, 6, 8, 10, 24, 30, and 48 h and plasma samples were analysed using liquid chromatography with tandem mass spectrometry for the analyte's ubiquinone and ubiquinol. Results: In EnQ10 dosed animals, the plasma mean concentration maximum, Cmax (347.83 ng/mL) of ubiquinol was found to be 2.52 times higher versus ubiquinone dosed animals (137.90 ng/mL). Furthermore, in EnQ10 dosed animals, the observed plasma exposure (AUClast) (4808.94 h*ng/mL) for ubiquinol was found to be 3.96 times higher versus. Ubiquinone dosed animals (1214.42 h*ng/mL). One-way ANOVA (Analysis of Variance) was performed for the Cmax and AUClast of ubiquinol. There was a significant increase ($P < 0.05$) in the Cmax and AUClast of ubiquinol in animals dosed with EnQ10 compared to the animals dosed with ubiquinone. Conclusion: The findings from this study indicated that ubiquinol acetate (EnQ10) showed better oral bioavailability compared to ubiquinone (CoQ10) when administered orally (300 mg/kg body weight equivalent dose of ubiquinone) in the male in male SD Rats. ©2023 Published by Scientific Scholar on behalf of Indian Journal of Physiology and Pharmacology.

PHSIJ-18

## Mental Health and Stigmatization Linked to the COVID-19 Pandemic

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**ISBN: 26667967 (ISSN), DOI: 10.2174/0126667975250861231005103042, Pages-22-28, Volume-4, (2023)**

## Abstract

The COVID-19 pandemic has reached an entirely new level of severity. It has jolted the entire world and caused pervasive chaos. A significant portion of the psychological responses thus far have been reactions to events in other countries, worries about the future, and responses to con-finement. Initial and prominent responses to the pandemic in India have been appalling, with a sense of impending and palpable danger. Concerns based on facts coexist with those based on the abun-dance of information and misinformation disseminated by the media, particularly social media. Even with the stringent requirements for testing, many individuals still seek reassurance through testing. Despite the lack of general indications for their use, they stockpile pharmaceuticals out of dread of contracting the disease. In addition to recommendations regarding hand cleansing, there are uncer-tainties regarding whether to wear a mask, the type of mask to use, the distance to be maintained, and how to disinfect surfaces. There are legitimate concerns regarding employment losses and economic decline during and after the pandemic. Social isolation and social prejudice are not synonymous. Maintaining a distance of 1-2 meters is permissible for security purposes. In terms of status and op-portunities, everyone should be treated equally. The situation calls for a cheerful tone of speech. Using expressions such as "the end of the world" and "the plague" is discouraged. Contamination caused by rumors must be avoided. It is essential to promote early detection and prevention. Those who have been afflicted with COVID-19 must share their accounts of compassion and struggle. Be-fore COVID-19, only a minority of individuals with mental health issues were treated. According to studies, the pandemic has widened the mental health treatment divide, and outpatient mental health services have been particularly disrupted. 

## PHSIJ-19

### Neuroprotective effect of chia seed oil nanoemulsion against rotenone induced motor impairment and oxidative stress in mice model of Parkinson's disease

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**ISBN: 26624052 (ISSN), DOI: 10.1007/s13596-022-00648-0, Pages-1091-1108, volume-23, (2023)**

## Abstract

Chia seed oil (CSO) was reported to possess various pharmacological effects, however, its usefulness is restricted due to its inadequate solubility, bioavailability and stability. In the present work, efforts were put forward to develop chia seed oil nanoemulsion (CSO NE). The developed CSO NE was exposed to pharmacodynamic evaluation against Parkinson's disease (PD) induced by rotenone (RT) in the mice. Here, the animals were classified into 6 groups: (I) Vehicle control, (II) RT (1 mg/kg s.c.), (III) CSO (200 mg/kg p.o.) + RT, (IV) CSO (400 mg/kg p.o.) + RT, (V) CSO NE (200 mg/kg p.o.) + RT, (VI) CSO NE (400 mg/kg p.o.) + RT. Animals received the treatment 30 min before RT administration for 14 days. The outcomes of the motor/behavioural evaluations (rotarod test and locomotor activity), biochemical evaluations (estimation of malondialdehyde, nitrite, acetylcholine esterase, reduced glutathione, catalase and superoxide dismutase) and histopathological evaluation affirmed that the CSO NE treatment rendered a significant enhancement in the neuroprotective effects as compared to CSO administered alone. These results suggest that the oral bioavailability of CSO was escalated by its conversion to nanoform, thus imparting greater neuroprotection. The potential application of CSO NE was established in the management of PD. Graphical abstract: [Figure not available: see fulltext.]. 

**PHSIJ-20**

## Medicinal Chemistry Perspectives on Recent Advances in Src Kinase Inhibitors as a Potential Target for the Development of Anticancer Agents: Biological Profile, Selectivity, Structure-Activity Relationship

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**ISBN: 16121872 (ISSN), DOI: 10.1002/cbdv.202300515, Volume-20, (2023)**

## Abstract

The physiological Src proto-oncogene is a protein tyrosine kinase receptor that served as the essential signaling pathway in different types of cancer. Src kinase receptor is divided into different domains: a unique domain, an SH3 domain, an SH2 domain, a protein tyrosine kinase domain, and a regulatory tail, which runs from the N-terminus to the C-terminus. Src kinase inhibitors bind in the kinase domain and are activated by phosphorylation. The etiology of cancer involved various signaling pathways and Src signaling pathways are also involved in those clusters. Although the dysregulation of Src kinase resulted in cancer being discovered in the late 19th century it is still considered a cult pathway because it is not much explored by different medicinal chemists and oncologists. The Src kinase regulated through different kinase pathways (MAPK, PI3K/Akt/mTOR, JAK/STAT3, Hippo kinase, PEAK1, and Rho/ROCK pathways) and proceeded downstream signaling to conduct cell proliferation, angiogenesis, migration, invasion, and metastasis of cancer cells. There are numerous FDA-approved drugs flooded the market but still, there is a huge demand for the creation of novel anticancer drugs. As the existing drugs are accompanied by several adverse effects and drug resistance due to rapid mutation in proteins. In this review, we have elaborated about the structure and activation of Src kinase, as well as the development of Src kinase inhibitors. Our group also provided a comprehensive overview of Src inhibitors throughout the last two decades, including their biological activity, structure-activity relationship, and Src kinase selectivity. The Src binding pocket has been investigated in detail to better comprehend the interaction of Src inhibitors with amino acid residues. We have strengthened the literature with our contribution in terms of molecular docking and ADMET studies of top compounds. We hope that the current analysis will be a useful resource for researchers and provide glimpse of direction toward the design and development of more specific, selective, and potent Src kinase inhibitors. 

## PHSIJ-21

### Design and Development of Novel Glitazones for Activation of PGC-1α Signaling Via PPAR-γ Agonism: A Promising Therapeutic Approach against Parkinson's Disease

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**ISBN: 24701343 (ISSN), DOI: 10.1021/acsomega.2c07521, Volume-8, Pages: 6825-6837, (2023)**

## Abstract

Herein, we rationally designed and developed two novel glitazones (G1 and G2) to target peroxisome proliferator-activated receptor-gamma coactivator 1-alpha (PGC-1α) signaling through peroxisome proliferator-activated receptors (PPAR)-γ agonism as a therapeutic for Parkinson's disease (PD). The synthesized molecules were analyzed by mass spectrometry and NMR spectroscopy. The neuroprotective functionality of the synthesized molecules was assessed by a cell viability assay in lipopolysaccharide-intoxicated SHSY5Y neuroblastoma cell lines. The ability of these new glitazones to scavenge free radicals was further ascertained via a lipid peroxide assay, and pharmacokinetic properties were verified using in silico absorption, distribution, metabolism, excretion, and toxicity analyses. The molecular docking reports recognized the mode of interaction of the glitazones with PPAR-γ. The G1 and G2 exhibited a noticeable neuroprotective effect in lipopolysaccharide-intoxicated SHSY5Y neuroblastoma cells with the half-maximal inhibitory concentration value of 2.247 and 4.509 μM, respectively. Both test compounds prevented 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine-induced motor impairment in mice, as demonstrated by the beam walk test. Further, treating the diseased mice with G1 and G2 resulted in significant restoration of antioxidant enzymes glutathione and superoxide and reduced the intensity of lipid peroxidation inside the brain tissues. Histopathological analysis of the glitazones-treated mice brain revealed a reduced apoptotic region and a rise in the number of viable pyramidal neurons and oligodendrocytes. The study concluded that G1 and G2 showed promising results in treating PD by activating PGC-1α signaling in brain via PPAR-γ agonism. However, more extensive research is necessary for a better understanding of functional targets and signaling pathways. © 2023 The Authors. Published by American Chemical Society.

## PHSIJ-22

### Reactive oxygen species mediated apoptotic death of colon cancer cells: therapeutic potential of plant derived alkaloids

**Nelson, V.K., Nuli, M.V., Mastanaiah, J., Saleem T. S, M., Birudala, G., Jamous, Y.F., Alshargi, O., Kotha, K.K., Sudhan, H.H., Mani, R.R., Muthumanickam, A., Niranjan, D., Jain, N.K., Agrawal, A., Jadon, A.S., Mayasa, V., Jha, N.K., Kolesarova, A., Slama, P., Roychoudhury, S.**

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**16642392 (ISSN), DOI: 10.3389/fendo.2023.1201198, Volume-14, (2023)**

## Abstract

Colorectal cancer (CRC) is one of the most deaths causing diseases worldwide. Several risk factors including hormones like insulin and insulin like growth factors (e.g., IGF-1) have been considered responsible for growth and progression of colon cancer. Though there is a huge advancement in the available screening as well as treatment techniques for CRC. There is no significant decrease in the mortality of cancer patients. Moreover, the current treatment approaches for CRC are associated with serious challenges like drug resistance and cancer re-growth. Given the severity of the disease, there is an urgent need for novel therapeutic agents with ideal characteristics. Several pieces of evidence suggested that natural products, specifically medicinal plants, and derived phytochemicals may serve as potential sources for novel drug discovery for various diseases including cancer. On the other hand, cancer cells like colon cancer require a high basal level of reactive oxygen species (ROS) to maintain its own cellular functions. However, excess production of intracellular ROS leads to cancer cell death via disturbing cellular redox homeostasis. Therefore, medicinal plants and derived phytocompounds that can enhance the intracellular ROS and induce apoptotic cell death in cancer cells via modulating various molecular targets including IGF-1 could be potential therapeutic agents. Alkaloids form a major class of such phytoconstituents that can play a key role in cancer prevention. Moreover, several preclinical and clinical studies have also evidenced that these compounds show potent anti-colon cancer effects and exhibit negligible toxicity towards the normal cells. Hence, the present evidence-based study aimed to provide an update on various alkaloids that have been reported to induce ROS-mediated apoptosis in colon cancer cells via targeting various cellular components including hormones and growth factors, which play a role in metastasis, angiogenesis, proliferation, and invasion. This study also provides an individual account on each such alkaloid that underwent clinical trials either alone or in combination with other clinical drugs. In addition, various classes of phytochemicals that induce ROS-mediated cell death in different kinds of cancers including colon cancer are discussed. Copyright © 2023 Nelson, Nuli, Mastanaiah, Saleem T. S., Birudala, Jamous, Alshargi, Kotha, Sudhan, Mani, Muthumanickam, Niranjan, Jain, Agrawal, Jadon, Mayasa, Jha, Kolesarova, Slama and Roychoudhury.

## PHSIJ-23

### Mechanistic insights into the beneficial effects of curcumin on insulin resistance: Opportunities and challenges

**Balakumar, P., Venkatesan, K., Abdulla Khan, N., Raghavendra, N.M., Venugopal, V., Bharathi, D.R., Fuloria, N.K.**

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**ISBN: 13596446 (ISSN), DOI-10.1016/j.drudis.2023.103627**

## Abstract

The past couple of decades in particular have seen a rapid increase in the prevalence of type 2 diabetes mellitus (T2DM), a debilitating metabolic disorder characterised by insulin resistance. The insufficient efficacy of current management strategies for insulin resistance calls for additional therapeutic options. The preponderance of evidence suggests potential beneficial effects of curcumin on insulin resistance, while modern science provides a scientific basis for its potential applications against the disease. Curcumin combats insulin resistance by increasing the levels of circulating irisin and adiponectin, activating PPARγ, suppressing Notch1 signalling, and regulating SREBP target genes, among others. In this review, we bring together the diverse areas pertaining to our current understanding of the potential benefits of curcumin on insulin resistance, associated mechanistic insights, and new therapeutic possibilities. © 2023 Elsevier Ltd.

# BOOK CHAPTERS

## PHSIB-01

**A systematic review of astragalus membranaceus (fisch.) bge. (fabaceae)**

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**ISBN: 978-100061326-1;978-177491126-6, 17 July 2023, Pages 113-128**

## Abstract

Astragalus membranaceus is a member of Fabaceae family. Nearly 200 compounds were isolated from this plant which consists of polysaccharides, saponins and flavonoids; this include 142 kinds of cycloartane-type saponins and 19 kinds of oleanane-type saponins, 63 flavonoids comprising of isoflavones, isoflavans, pterocarpans, flavonols, flavones, and flavonones. Out of 14 polysaccharides isolated from A. membranaceus 13 of them have β-D-(1→3)-galactan moieties branched with β-D-(1→6)-galactooligosaccharide side chains. Astragalus-based treatments have demonstrated significant amelioration of the toxicity induced by other concurrently administered orthodox drugs such as immunosuppressants and cancer chemotherapeutics. In this chapter we summarize the bioactives and their pharmacological activities A. membranaceus. 

## PHSIB-02

**Biomolecules and pharmacology of alhagi maurorum medik (family: Fabaceae)**

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**ISBN: 978-100061326-1;978-177491126-6, 17 July 2023, Pages 101-111**

# Abstract

Local communities have identified the potential role of Alhagi maurorum for its numerous medicinal properties for the treatment of various ailments like diaphoretic, diuretic, purgative, treatment of piles, warts, migraine, and rheumatism etc. Many bioactives like tannins, alkaloids, saponins, flavonoids are present in the plant. The current chapter deals with the Phytochemical and Biological investigation of Alhagi maurorum. Bioactivities include hepatoprotective, wound healing, antireheumatic, antiviral, antibacterial, antifungal, antidepressant and analgesic activities. 

# SCHOOL OF HEALTH SCIENCES
# COLLEGE OF PHYSIOTHERAPY

## Publication Summary

| | | |
|---|---|---|
| International Journal | 06 | (PHTIJ-01 – PHTIJ-06) |

# COLLEGE OF PHYSIOTHERAPY
# SCHOOL OF ALLIED HEALTH SCIENCES
# INTERNATIONAL JOURNAL PUBLICATION

## PHTIJ-01

### Assessment of the diagnostic accuracy of Vibrasense compared to a biothesiometer and nerve conduction study for screening diabetic peripheral neuropathy

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**ISBN: 17571146 (ISSN), DOI: 10.1186/s13047-023-00667-3, Volume-16, (2023)**

## Abstract

Aims: Peripheral neuropathy is a common microvascular complication in diabetes and a risk factor for the development of diabetic foot ulcers and amputations. Vibrasense (Ayati Devices) is a handheld, battery-operated, rapid screening device for diabetic peripheral neuropathy (DPN) that works by quantifying vibration perception threshold (VPT). In this study, we compared Vibrasense against a biothesiometer and nerve conduction study for screening DPN. Methods: A total of 562 subjects with type 2 diabetes mellitus underwent neuropathy assessments including clinical examination, 10-g monofilament test, VPT evaluation with Vibrasense and a standard biothesiometer. Those with an average VPT ≥ 15 V with Vibrasense were noted to have DPN. A subset of these patients (N = 61) underwent nerve conduction study (NCS). Diagnostic accuracy of Vibrasense was compared against a standard biothesiometer and abnormal NCS. Results: Average VPTs measured with Vibrasense had a strong positive correlation with standard biothesiometer values (Spearman's correlation 0.891, $P < 0.001$). Vibrasense showed sensitivity and specificity of 87.89% and 86.81% compared to biothesiometer, and 82.14% and 78.79% compared to NCS, respectively. Conclusions: Vibrasense demonstrated good diagnostic accuracy for detecting peripheral neuropathy in type 2 diabetes and can be an effective screening device in routine clinical settings. Trial registration: Clinical trials registry of India (CTRI/2022/11/047002). Registered 3 November 2022. https://ctri.nic.in/Clinicaltrials/pmaindet2.php?trialid=76167. © 2023, The College of Podiatry and the Australasian Podiatry Council.

## PHTIJ-02

**Effect of lower body, core and upper body kinematic chain exercise protocol on throwing performance among university shot put athletes: A pilot study**

**Vinod Kumar, K.C., Altaim, T.A., Subramanian, S.S., Alkhob, S.A., Reddy, P., Anusha, M.B.S., Raj, N.B., Senthi, P. Gaowgzeh, R.A.M.**

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**ISBN: 16420136 (ISSN), DOI: 10.56984/8ZG143R1m, Pages-108-115, Volume:23, (2023)**

# Abstract

A coordinated sequence of movements is required to generate maximum power and velocity in shot put. Kinematic chains emphasize the interactions between various body segments during a movement. They suggest that force production and transfer are optimized by coordinating multiple joints and muscle groups. In previous research, the kinematic chain has been attributed to shot put performance. Few studies have examined the effects of a comprehensive kinematic chain exercise protocol on throwing performance among shot put athletes, particularly at universities. Pilot study investigating lower body, core, and upper body kinematic chain exercise protocol on university shot put athletes' throwing performance. A total of twenty-four young athletes specializing in shotput, with an average age of 19.87 years and a standard deviation of 1.31 years, were divided into two groups, namely the experimental group and the control group, using a random assignment method, the experimental group, consisting of 12 participants, underwent an 8-week kinematic chain training program alongside their regular training sessions. On the other hand, the control group, also consisting of 12 participants, only participated in their regular training sessions without any additional intervention. Pre- and post-training assessments were conducted to measure shotput throwing performance, preference for throwing style, and the participants' satisfaction with the exercise protocol, using a questionnaire. The athletes who took part in the kinematic chain program demonstrated a significicant improvement in throwing distance compared to the control group ($p = 0.01$). Additionally, the athletes in the experimental group reported higher levels of satisfaction with the exercise protocol ($p = 0.005$). These ficindings indicate that incorporating an 8-week Lower Body, Core and Upper Body kinematic chain exercise protocol into regular training sessions can lead to more pronounced improvements in sport-specificic throwing performance among young shotput athletes. 

## PHTIJ-03

### Bell Palsy Incidence in Patients with Post-COVID: A Retrospective Study

**Afza, T., Kumar, V.K.C., Subramanian, S.S., Pragassame, A., Sureshkumar, S., Eswaramoorthi, V., Kajamohideen, S.A., Jayaraman, M., Alkhob, S.A., Alfawaz, S.**

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c. Department of Physiotherapy, RMMCH, Annamalai University, Tamil Nadu, Chidambaram, India

## Abstract

Bell palsy is caused by impaired functioning of the 7th cranial nerve. A disparity in the stable state of the cytokine regulatory axis and a cytokine storm are observed to occur from the binding of the ACE2 to the COVID, and the subsequent functional alterations in the ACE2/AT2R suggest that COVID-19 may use direct or indirect processes to produce neurological symptoms. Increased cases of Bell palsy were reported during the CoV pandemic, so our study aimed to estimate the incidence rate of Bell palsy among COVID-19 patients in South Bangalore, India. Secondary data of patients with Bell palsy were obtained retrospectively from two multispecialty Hospitals in South Bangalore. COVID positive populations were collected between the period of March 2021 and February 2022, and many Bell palsy cases within 3 months of post-Covid period were included. Confirmatory calls were made for patients with Covid Positive who were not diagnosed to discover the occurrence of Bell palsy. A retrospective analysis of Bell palsy cases found 11 incidences between March 2021 and February 2022, when there were 1577 COVID patients in total. According to descriptive statistical analysis, the prevalence of Bell palsy increased by 0.7% during the COVID-19 pandemic. Bell palsy could be considered one of the neurological complications among COVID-19 patients, and appropriate preventative measures should be taken. 

## PHTIJ-04

### Video analysis of throwing techniques in Collegiate Shot-Put athletes: A visual exploration of throwing styles and performance factors

**Desha Anusha, M.K.B., Chananke Gowda, V.K.K., Subramanian, S.S., Imtiaz, Y., Pragassame, A., Subramanian, M.B., Raj, N.B., Afzal, S., Albadi, M., Mustafa Gaowgzeh, R.A.**

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**ISBN: 24554855 (ISSN), DOI: 10.52756/ijerr.2023.v32.006, Pages:89-96, Volume-32, (2023)**

## Abstract

The present study delves into the realm of collegiate shot-put athletes' throwing techniques, aiming to undertake a comprehensive comparative video analysis of various throwing styles. The primary objective is to visually explore these athletes' diverse throwing techniques and shed light on the critical performance factors associated with each style. By employing video analysis tools and techniques, this research intends to provide a detailed examination of the biomechanical nuances and body movements in different throwing methods. Through an extensive collection of video footage featuring collegiate shot-put athletes, the study will meticulously dissect and compare the variations in throwing techniques. The aim is to analyse the different types of throwing techniques used and the technique that produces the best result by collegiate shot-put athletes in and around Bangalore. 220 shot-put athletes of age group between 18-25 years, representing colleges from different Universities were approached to analyse their shot-put throwing technique with two high-definition cameras and analysed using Kinovea software. The mean rank for velocity was higher in the glide technique for both male and female athletes compared to the rotational technique. Male athletes with higher BMI used rotational technique in comparison to athletes with lower BMI, in female athletes with higher BMI used glide technique in comparison to athletes with lower BMI (p-0.0001.) Based on the results obtained from our study, the glide technique was the most prevalent technique used by collegiate athletes. The gliding technique showed better throwing distance than the rotational technique. The findings of this study hold the potential to offer valuable insights to coaches, athletes, and researchers in the field of shot-put training and sports biomechanics. The comparative video analysis approach provides a unique visual perspective that supplements the existing body of knowledge concerning shot put techniques. 

## PHTIJ-05

### Validation of the exercise protocol satisfaction questionnaire by content validation method

**Varathan, K., Vinod Kumar, K.C., Subramanian, S.S., Alfawaz, S.S., Alzahrani, G.A., Sriraghunath, S., Priya, H., Senthi, P., Eswaramoorthi, V., Gaowgzeh, R.A.**

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# Abstract

The Exercise Protocol Satisfaction Questionnaire is designed to ascertain whether patients are satisfied with the exercise protocol tailored for them without taking into account any generalized regimen. This questionnaire encompasses approximately 10 domains and contains 40 items. It has been presented to the expert panel. Subsequently, the content validation form was disseminated among the chosen expert panel from MPT ortho and MPT sports, which consisted of 50 academicians and 50 non-academicians. An overview of the questionnaire and general guidelines regarding the content validation form were provided to the selected expert panel. The statistical analysis report indicates that all items and questions within the questionnaire seem to be pertinent, with an I-CVI value exceeding 0.79. Scale Content Validation Index: The S-CVI/Ave value was determined by averaging the I-CVI values and is 0.89, denoting outstanding content validity. Cronbach's alpha reliability test: The Cronbach's alpha value stands at 0.907, signifying a high degree of internal consistency or reliability for the questions or items featured in the questionnaire. The research outcome infers that every item in the questionnaire is relevant to the questionnaire's construction. It achieves the objective it aims to measure and is recognized to possess a high item content validation index. Hence, it can be concluded that the Exercise Protocol Satisfaction Questionnaire has a commendable level of content validity and reliability. 

## PHTIJ-06

### N-doped graphene leaves on carbon nanotubes and $NiMn_2O_4$-graphene hybrid nanocomposites with ionogel film for flexible symmetric and asymmetric supercapacitors

**Mangishetti, S.R., Jang, D., Choi, J., Rajeshkhanna, G., Pittala, S., Kang, S.K., Ji, J., Kim, M., Jung, S.G., Ha, J., Kim, J., Maeng, J., Park, G.H., Bae, J., Kim, W.B.**

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**ISBN: 13858947 (ISSN), DOI: 10.1016/j.cej.2023.144863, Volume-472, (2023)**

## Abstract

The efficient fusion of the various components into hybrid nanostructures in a hierarchical three-dimensional fashion is found to be one of the significant strategies to obtain potential electrode materials for supercapacitors. In addressing this, two diverse kinds of 3D graphene-based hybrid nanomaterials are synthesized using facile and scalable approaches, and then their microstructural properties are studied. The developed 3D nitrogen doped-graphene leaves on bamboo shaped carbon nanotubes (N-glbNT-850) exhibit a high specific capacitance of 528 F/g at a 2 A/g current density. 3D blooming flower structured $NiMn_2O_4$-graphene electrode exhibit a high specific capacity and rate capability of 1632 C/g, and 88.1%, respectively. Further, a new ionogel electrolyte film is developed by incorporating a high concentration (96 wt%) of ionic liquid into a 4 wt% polymer host. A flexible symmetric supercapacitor fabricated by using this solid-state ionogel electrolyte film and a flexible asymmetric supercapacitor fashioned of N-glbNT//$NiMn_2O_4$-graphene could exhibit a wide working voltage range (3.4 V and 1.6 V, respectively), excellent energy density (96.3 and 156.8 Wh/kg, respectively), outstanding power density (3.39 and 2.34 kW/kg, respectively), and good rate performance with high cycle stability and remarkable flexibility. Thus, the development of inexpensive and efficient electrode materials based on graphene and effective solid-state ionogel electrolytes and the application of these technologies for efficient energy storage devices have all been made possible by the new and effective strategic process, which can be beneficial for commercial applications of energy storage, conversion, and environmental systems. 

# DR. CHANDRAMMA DAYANANDA SAGAR INSTITUTE OF MEDICAL EDUCATION & RESEARCH (CDSIMER)
# SCHOOL OF MEDICAL EDUCATION & RESEARCH
## Publication Summary

| | | |
|---|---|---|
| International Journals | 10 | (CDIJ-01 – CDIJ-10) |

## CDIJ-01

### Assessment of the diagnostic accuracy of Vibrasense compared to a biothesiometer and nerve conduction study for screening diabetic peripheral neuropathy

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**ISBN: 17571146 (ISSN), DOI: 10.1186/s13047-023-00667-3, Volume-16, (2023)**


## Abstract

Aims: Peripheral neuropathy is a common microvascular complication in diabetes and a risk factor for the development of diabetic foot ulcers and amputations. Vibrasense (Ayati Devices) is a handheld, battery-operated, rapid screening device for diabetic peripheral neuropathy (DPN) that works by quantifying vibration perception threshold (VPT). In this study, we compared Vibrasense against a biothesiometer and nerve conduction study for screening DPN. Methods: A total of 562 subjects with type 2 diabetes mellitus underwent neuropathy assessments including clinical examination, 10-g monofilament test, VPT evaluation with Vibrasense and a standard biothesiometer. Those with an average VPT ≥ 15 V with Vibrasense were noted to have DPN. A subset of these patients (N = 61) underwent nerve conduction study (NCS). Diagnostic accuracy of Vibrasense was compared against a standard biothesiometer and abnormal NCS. Results: Average VPTs measured with Vibrasense had a strong positive correlation with standard biothesiometer values (Spearman’s correlation 0.891, $P < 0.001$). Vibrasense showed sensitivity and specificity of 87.89% and 86.81% compared to biothesiometer, and 82.14% and 78.79% compared to NCS, respectively. Conclusions: Vibrasense demonstrated good diagnostic accuracy for detecting peripheral neuropathy in type 2 diabetes and can be an effective screening device in routine clinical settings. Trial registration: Clinical trials registry of India (CTRI/2022/11/047002). Registered 3 November 2022. https://ctri.nic.in/Clinicaltrials/pmaindet2.php?trialid=76167. © 2023, The College of Podiatry and the Australasian Podiatry Council.

## CDIJ-02

# Bailout Options for Intra-operative Implant and Instrumentation Related Incidents and Complications During Arthroscopic Knee Surgery—A Retrospective Study

**Krishnamurthy, S.L., Shah, R., Krishnan, R., Wasdev, A., Kaushik, Y.S., Nedumparampil, M.M., Amaravathi, R.S.**

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**ISBN: ISSN: 00195413, DOI: DOI: 10.1007/s43465-023-01086-z, olume 58, Issue 3, March 2024, Pages 289-297**

## Abstract

Background: Arthroscopic knee procedures are one amongst the common surgical interventions for problems in the knee. It is technically more demanding than an open procedure and is associated with several potential complications. During arthroscopy procedures, several technical challenges may arise, and even experienced surgeons may encounter new issues. However, careful attention to the surgical technique can help prevent or resolve them. Methodology: The study was conducted on all patients who underwent knee arthroscopy procedure during study period. We recorded details of the implants used and any unexpected situations related to them, as well as how they were managed. Instrumentation-related parameters such as screwdriver issues, radiofrequency ablator issues, scope damages, shaver complications, probe complications, and meniscus suture passing devices were also assessed. Results: In total, there were 12 (3.73%) implant and instrument-related incidents and complications, of which 5 (1.55%) were implant-related and 7 (2.17%) were instrument related. Among the instrumentation-related incidents and complications, two (0.62%) were screwdriver breakage incidents, two (0.62%) were radiofrequency ablator-related incidents, one was arthroscopic probe (0.31%) related incident, one (0.31%) was meniscus suture passing device related complication and one (0.31%) was arthroscope related incident. Conclusion: Surgeons must be ready to anticipate and effectively manage any technical difficulties that may arise during the procedure, maintaining composure in the face of unexpected challenges and guiding the team. In most cases, incidents can be addressed intra operatively and may not have long-term effects on patient outcomes. It is crucial to have multiple implant and instrument backup options available for successful surgery. © Indian Orthopaedics Association 2024.

## CDIJ-03

### Profile of poisoning cases in a tertiary care centre in rural South India

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**ISBN: 24118729 (ISSN), DOI: 10.17816/fm14217, Pages-383-390, Volume-9, (2023)**

## Abstract

BACKGROUND: Poisoning is the fourth most common cause of mortality in rural India. The commonest agents in India appear to be pesticides, sedatives, chemicals, alcohol, animal & plant toxins and household toxins. Our hospital receives an average of 20 to 25 poisoning cases every month. AIMS: To profile all cases of poisoning those are reported to casualty department at Dr. Chandramma Dayananda Sagar Institute of Medical Education and Research (CDSIMER); to study the types and frequency of poisoning cases admitted to the centre; to study the socio demographic associations of the poisoning cases. MATERIALS AND METHODS: Present study is a hospital record-based retrospective observational study of acute poisoning cases registered in the medicolegal register in the casualty of CDSIMER, which is a tertiary care centre situated in rural area near Harohalli, Ramanagara District, India. RESULTS: Males constituted 58% of the cases and 33.52% of the cases were in the age group of 21–30 years. 81.4% of the cases were able to reach hospital between 1 to 8 hours. 56% of the cases recovered and were discharged within 3 days. In 22 cases the duration of admission was more than 2 weeks as they went into complications. Organo phosphorus group of insecticide was the most common type of poison consumed constituting to 40.8% of the cases followed by Snake bite. Attempt to suicide (60.35%) was more common than accidental poisoning. CONCLUSION: Insecticides mainly Organophosphorus compound are the most common group of poisons which causes morbidity and mortality in rural Indian population especially in young adults between 21 to 40 years. Owing to the presence of forests in the region, Snake bite becomes the second largest type of poisoning. Suicide frequently prevails in the rural areas; financial problem is the leading cause for farmers to commit suicide. 

## CDIJ-04

### Post-mortem freshwater animal predation—a case report

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**ISBN: 2090536X (ISSN), DOI: 10.1186/s41935-023-00323-8, Volume-13, (2023)**

## Abstract

Background: Post-mortem animal predation affects human corpses in various ways. Lesions are a characteristic of the type of terrestrial or aquatic predators. These lesions can be misinterpreted and may be challenging for the forensic pathologist. Different species in freshwater cause different types of lesions depending on their feeding habits. There is a paucity in the literature about post-mortem lesions caused by freshwater animals. Case presentation: A 24-year-old man had accidentally drowned while fishing in the River Cauvery. His body was recovered after 3 days. Though the cause of death was drowning, post-mortem animal activity was observed during autopsy, and a live juvenile crab was also found along with the body. Distinct post-mortem lesions caused by decapods Oziotelphusa wagrakarowensis and small fishes Hypselobarbus dubius and Dawkinsia arulius are described. Conclusions: Aquatic predators and their activity on the corpse are different from that of terrestrial predators. Knowledge of the local fauna is required to correlate the lesions on the body to the predator. © 2023, The Author(s).

## CDIJ-05

### Sudden death in goldenhar syndrome

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**ISBN: 23495014 (ISSN), DOI: 10.4103/jfsm.jfsm_92_21, Volume-9, Pages-84-87, (2023)**

## Abstract

Goldenhar syndrome (GS) is a rare congenital disorder that is characterized by incomplete development of the ear, eye, nose, soft palate, lip, and jaw. It is also called oculo-auriculo-vertebral syndrome of Goldenhar, the name describes the common structural problems seen with the eyes, ears, and vertebrae. The outlook for children with GS varies but is generally very positive. Most children can expect to live a healthy life once treatments have been administered. However, certain congenital heart defects seen in this syndrome such as ventricular septal defect (VSD), persistence of arterial conduct, tetralogy of Fallot, and big vessel transposition can lead to sudden death during childhood. These defects are usually diagnosed during intrauterine life by means of fetal echography, leading to termination of such pregnancy or necessary corrective measures after the birth of such child. If such a child dies, it will be certified by the treating pediatrician. Thus, an autopsy pathologist rarely comes across such deaths. One such case of a 45-day-old female infant suffering from craniofacial deformity who became breathless, cyanotic, and died on the way to the hospital is being discussed here. The right ventricle showed double outlets, arising from it were the pulmonary artery and aorta. A small subaortic VSD was seen. Generalized hypoplasia of all internal viscera on the right side was observed. 

## CDIJ-06

### Clinical Masquerades in Physiognomy of Sebaceous Cysts Unveiled on Histopathological Examination: A Spectrum of Cases

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**ISBN: 09722068 (ISSN), DOI: 10.1007/s12262-022-03629-4, Volume-85, Page- 1044-1049, (2023)**

## Abstract

Sebaceous cysts are one among the most commonly encountered subcutaneous nodular lesions in clinical practice. They can form all over the body with face, neck and trunk being the favored sites. On clinical examination, they can mimic non-neoplastic and neoplastic lesions as presenting features are non-specific. Histopathological examination becomes mandatory for confirmation. We present a series of lesions suspected to be sebaceous cysts clinically but gave a discordant diagnosis on microscopic examination. This case series is presented with an intent to reaffirm the practice of submitting all clinical suspects of sebaceous cysts for histopathological examination post excision, as a different tissue diagnosis if any may have patient implications in terms of surgical procedures, treatment and follow-up. 

## CDIJ-07

### A Tale of 5Ms: Massive Uterine Leiomyoma Mimicking Ovarian Malignancy along with Multiple Fibroids displaying Multiple Degenerations

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**ISBN: 18585051 (ISSN), DOI: 10.18502/sjms.v18i1.12870, Volume-18, Page-104-110, (2023)**

## Abstract

Background: Leiomyomas are by far the commonest uterine neoplasms in the female reproductive age group. Giant leiomyomas are quite scarce and when longstanding tend to undergo various degenerations owing to decreased blood supply which on imaging may simulate malignancy owing to compromised blood supply and may simulate malignancy on imaging. Case Presentation: We present a case of a 48-year-old post-menopausal multiparous woman complaining of intermittent lower abdominal pain for a month. Suspected as an ovarian tumor clinically and on ultrasound, this was seconded by raised serum CA125 levels. Histopathological examination gave a definitive diagnosis of a giant uterine leiomyoma along with multiple fibroids exhibiting multiple degenerations. Conclusion: Degenerated leiomyomas can masquerade malignancy and hence should be one of the first differentials in women of reproductive age group presenting with complex abdominopelvic masses. © Aakanksha Koul et al.

## CDIJ-08

**First-Year medical students' perspective on early clinical exposure in the era of competency-based medical education: Unraveling by thematic analysis**

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**ISBN: 25898302 (ISSN), DOI: 10.4103/mjdrdypu.mjdrdypu_997_21, Volume-16, Page- 322-328, (2023)**

## Abstract

Introduction: Implementation of Competency-Based Medical Education (CBME) as an outcome-based teaching methodology has brought changes in the curriculum worldwide in terms of teaching and learning. As students are the prime stakeholders in medical education, their feedback is crucial in designing the curriculum framework. We present thematic analysis of medical students' feedback on Early Clinical Exposure (ECE), which has given an in-depth insight into their perceptions. Materials and Methods: A prospective study was conducted post early clinical exposure session for the first-year MBBS students under the CBME curriculum from April to October 2021 in a teaching medical institute. Feedback was collected in text transcripts by two open-ended questions about effectiveness and suggestions for improvement. Qualitative data analysis of thematic type was performed. Results: Post-familiarization of data codes were generated for each of the two questions. Codes with similar meanings were grouped into four themes for each question. Analysis of students' transcripts revealed perspectives on knowledge, doctor-patient relationship, clarity in understanding concepts as themes for effectiveness, the need for case-based learning in the hospital environment, time management, and innovative teaching methods as themes for improvement. Conclusion: Students perceived the teaching methodology of early clinical exposure positively and recognized the need to integrate basic science with clinical expertise and professional identity at an early stage in medical school. The study results have brought out implications for improving teaching sessions in terms of technology use, content, and creating a conducive environment for the learners. 

CDIJ-09

# Eosin Nigrosin staining technique in assessment of sperm vitality in medical laboratories – A snippet from our experience on implementing the staining, interpretation and quality control procedures

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**ISBN: 23942746 (ISSN), DOI: 10.18231/j.ijogr.2023.048, Volume-10, Pages-227-229, (2023)**

## Abstract

Eosin Nigrosin staining for assessment of sperm vitality is an essential component of basic semen analysis as it helps differentiate between dead and immotile sperms, and has clinical implications in terms of patient treatment and follow up. This staining technique involves minimal use of reagents and simple procedural steps. Standardization of the same is pertinent to warrant accurate and reproducible results in medical laboratories, even those not specialized in infertility care. We wish to share our hands on experience through various stages in implementing this staining technique from challenges faced to putting quality control processes in place as reference for peers. 

**CDIJ-10**

# Study of Victims of Alleged Sexual Assault

**Hugar, B.S., Hosahally, J.S., Girish Chandra, Y.P., Shivarama, P.**

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**ISBN: 24118729 (ISSN), DOI: 10.17816/fm6708, Volume-9, Pages- 117-124, (2023)**

## Abstract

BACKGROUND: Sexual assault has been a major concern to our society. It is one of the most underreported offences to the law enforcement agencies. Such offences are multi-faceted and certain details of the offence may be hard to be unearthed even after a thorough investigation. AIMS: To study factors associated with reporting of sexual assault cases and to correlate findings with the alleged history. MATERIALS AND METHODS: The study was conducted in the Department of Forensic Medicine, M.S. Ramaiah Medical College Bangalore from January 2018 and December 2020. All victims of alleged sexual assault brought for medical examination to the Department of Forensic Medicine were interviewed through a detailed questionnaire after taking consent. Relevant information was sought from the victim and the consent from victims. Descriptive statistics for qualitative type of data were summarized using frequency and percentage. RESULTS: 82 victims those who had come to or brought by the parents or guardian or police with alleged history of sexual assault were subjected for medical examination. All of them were females except two juveniles. Majority of the victims (n=71, 86.5%) were less than 18 years of age and were considered as juvenile / minors under Indian law. Either the victims or their parents reported to the police in most of the cases (n=76, 92.7%). In 53.65% of the cases the alleged assaults were reported to the police after three days of alleged recent sexual assault. The purpose of reporting to the police was because of honour or pride of the parents / guardian in 59.75% of the cases. It was observed that only in four cases there were positive findings of recent penetrative sexual assault in the form of fresh hymeneal tears or presence of spermatozoa in the swabs taken during genital examination. CONCLUSION: Majority of the victims of alleged sexual assault were minors. Only 12% of them reported to the law enforcement directly without anybody persuading. More than 50% of victims presented to the hospital after 3 days of the alleged sexual assault. In most of minor victims the sexual intercourse was consented, but it was invalid since the girl below 18 years cannot consent for sexual intercourse. Majority of adult victims had consented for sexual intercourse on promise of marriage. In view of these, no physical injuries were seen on victims and positive evidence of sexual assault was detected only in 5% of cases. 

# DEPARTMENT OF MANAGEMENT STUDIES (MBA)
# SCHOOL OF COMMERCE & MANAGEMENT (MBA)

## Publication Summary

| | | |
|---|---|---|
| **International Journal** | **04** | **(MGSIJ-01)<br>(MGSIJ-04)** |
| **Book Chapters** | **01** | **(MGSBC-01)** |

## MGSIJ-01

**Growth of green investments through fintech innovations**

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ISBN: 9798369300107 (ISBN); 9798369300084 (ISBN), DOI: 10.4018/979-8-3693-0008-4.ch003, Pages-37-55, (2023)

# Abstract

In order to maintain a development that is harmonious with the environment while simultaneously maximizing profits, adopting green, sustainable, and responsible investments has become a goal for every company. This has resulted in numerous new trends in technology, financial management, and how businesses want to position themselves in the market through green investments. Fintech, with its digital transformation, ease of doing business, transparency, and expanded reach, plays an important role in this scenario. Fintech is developed as an alternative to traditional financial institutions and plays a critical role in long-term green investment. The aim of this study is to investigate the significance of green investment and its growth with Fintech innovations. The findings show that Fintech innovation increases the sustainability of financial businesses by encouraging green investment as well as green economic growth by raising the level of green finance development, which is crucial for most nations. 

## MGSIJ-02

**An efficient management education in developing women entrepreneurial aspirations**

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**ISBN: 09756809 (ISSN), DOI: 10.1007/s13198-022-01847-3, (2022)**

# Abstract

In the latest era, opportunity recognition is a critical factor of entrepreneurship and plays an important role in business management. It helps to analyze the market trends and decreases the risk in failure of business organizations. Women entrepreneurship development is an essential part of human resource development. Entrepreneurship amongst women has been a recent concern. Women have become aware of their existence their rights and their work situation. This paper addresses the effects of entrepreneurship education on entrepreneurial opportunity recognition. It is evident from the study that the women entrepreneurs have high scope of being successful in their entrepreneurship journey, provided they have been guided and given relevant and required management education opportunities. It's been significant from this research work that the future of the women entrepreneurs is bright, hence there is a need to work on their Management education. 

## MGSIJ-03

### Harmonic-to-noise ratio as speech biomarker for fatigue: K-nearest neighbour machine learning algorithm

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**ISBN: 03771237 (ISSN), DOI-10.1016/j.mjafi.2022.12.001, (2023)**

## Abstract

Background: Vital information about a person's physical and emotional health can be perceived in their voice. After sleep loss, altered voice quality is noticed. The circadian rhythm controls the sleep cycle, and when it is askew, it results in fatigue, which is manifested in speech. Using MATLAB statistical techniques and the k-nearest neighbour (KNN) machine learning algorithm, this study assessed the efficacy of the harmonic-to-noise ratio (HNR) as a speech biomarker in differentiating fatigued and normal voice after sleep deprivation of one night. Methods: After one night of sleep deprivation, acoustic samples for sustained vowel/a/and visual reaction time were recorded from n = 32 healthy young Indian male volunteers (20–40 yrs). One-way ANOVA established significant changes in voice characteristics with progressive sleep deprivation. The effectiveness of speech HNR as a biomarker for the detection of healthy and fatigued voice was researched, using the KNN classifier in a machine learning algorithm. Results: The HNR voice feature was taken from an acoustic sample for three times: baseline (Time 1), 3 AM (Time 2), and 7 AM (Time 3) towards an incremental one-night sleep loss. At 3AM, the HNR changed significantly $p<0.05$. Utilizing an iterative signal extrapolation approach, the KNN classifier divided the submitted voice signal sample into normal and fatigued categories. Conclusion: The findings imply that the HNR can be used to link fatigue from sleep deprivation with vocal alterations by classifying voice samples in a KNN classifier. Along with the multimodal diagnostic features, this method may also offer an additional acoustic biomarker for the diagnosis of fatigue post sleep loss. © 2023

## MGSIJ-04

# Investment Performance and Tracking Efficiency of Indian Equity Exchange Traded Funds

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**13872834 (ISSN), DOI: 10.1007/s10690-022-09379-3, Volume-30, Pages- 165-188, (2023)**

## Abstract

Exchange Traded Funds (ETF's) are one of the beloved passively managed funds that offer both retail and institutional investors an access to highly profitable and wide- range of diversifiable financial assets. The study aims to assess the ability of Indian equity ETF's in replicating the performance of their benchmark indices using a sample of 27 equity ETF's traded on the National Stock Exchange of India during the pre-pandemic period from 01/01/2015 to 31/12/2019. Evaluation of the performance of sample ETF's through risk-return analysis, risk-adjusted performance measures, tracking error analysis and multi-factor regression have revealed that the majority of the sample ETF's outperformed their tracking indices but with notable tracking errors during the study period. Further, the study also indicates that the returns of the sample ETF's have a significant and positive relationship with the returns of the index but are inversely related to risk and management fees. The results of this study will have major implications for investors in evaluating the performance of ETF's and fund managers as well in taking suitable measures to reduce tracking errors that will help in successful replication of the benchmark along with undertaking initiatives that will enable the ETF's to become price efficient. 

# Books & Book Chapters

## MGSBC-01

### Internet of Things and Its Relevance to Digital Marketing

**Sanyal, S., Kalimuthu, M., Arumugam, T., Aruna, R., Balaji, J., Savarimuthu, A., Chavadi, C., Thangam, D., Manoharan, S., Patil, S.**

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**9781799892687 (ISBN); 9781799892663 (ISBN), DOI: 10.4018/978-1-7998-9266-3.ch007, Pages-138-154, (2023)**

## Abstract

The internet of things characterizes a unified structure of internet-supported objects that can gather and send data through a wireless network with no intervention of humans. By this structure, the present business world is experiencing remarkable changes due to the irresistible potential derivable from the internet of things. This technology is already bringing significant changes across the industries, of which the digital marketing sector has the maximum benefits. This technology collects various data from the consumers through different forms of digital marketing platforms such as social media marketing, online marketing, electronic mail marketing, pay-per-click advertising. With these types of data, marketers can generate some meaningful insights, develop interactions with customers, communicate with sellers and customers, and can also forecast the behavior and lifestyle of the customers. With this backdrop, the chapter has made an attempt to explain the relevance of the internet of things in digital marketing. 

# DEPARTMENT OF COMMERCE AND MANAGEMENT
# SCHOOL OF COMMERCE & MANAGEMENT (UG)

## Publication Summary

| | | |
|---|---|---|
| **International Journals** | **01** | **(CAMIJ-01)** |
| **International Conference** | **01** | **(CAMIC-01)** |

**DEPARTMENT OF MANAGEMENT STUDIES (UG)**
**SCHOOL OF COMMERCE AND MANAGEMENT**
**INTERNATIONAL JOURNAL PUBLICATIONS**

**CAMIJ-01**

**Effect of irrigation on farm efficiency in tribal villages of Eastern India**

**Kalli, R., Jena, P.R., Timilsina, R.R., Rahut, D.B., Sonobe, T.**

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c. Asian Development Bank Institute (ADBI), Kasumigaseki, Chiyoda-ku, Tokyo 100-6008, Tokyo, Japan

## Abstract
Irrigation is an important adaptation strategy to cope with climate change which reduces vulnerability to water stress and improves crop productivity to feed millions. There is evidence of crop yield stagnation in many developing countries, and irrigation efficiency is claimed to increase crop productivity. Therefore, this paper uses data envelopment analysis to evaluate the farmer's productivity through technical efficiency (TE), i.e., the relationship between resource inputs and outputs of 513 paddy farmers in Eastern India. The results show that the farms are, on average operating at 14% TE, leaving a considerable scope to improve up to 86% to reach the optimal level. A significant difference is observed between irrigated and rain-fed paddy farmers, such that10% of the irrigated farms achieved efficiency scores over 40% and only 2% of rain-fed farms achieved the same. The tobit and beta fit regression models are estimated to find out the factors that influence the TE. Both surface water and groundwater sources of irrigation are used as predictors, along with other socio-demographic factors. Access to surface water irrigation is identified to be a significant determinant of farm efficiency, however, surface water irrigation, such as canal irrigation, is accessible only to farmers living on plain land. Farmers living on highlands need to explore other sources of irrigation practices, such as drip and sprinkler, that can increase TE and farm productivity. Therefore, this paper calls for government intervention to provide extensive training and facilities for these micro-irrigation practices. © 2023 The Authors.

## INTERNATIONAL CONFERENCE PUBLICATIONS

## CAMIC-01

### An Automatic IP Falsifying Attacks Detection Using Hop Count Filtering and Round-Trip Time

**Saikumar, K., AL-Hameed, M.R., Hamood, S.A., Saleh, S.A.H., Rashed, A.N.Z., Venkat, V.V.**

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## Abstract

This kind of DoS attack depends on numerous compromised hosts in the network to assault the victim, which results in a significant decrease in the victim's performance. In most DDoS attack tools, IP spoofing technique is used, which makes it impossible to filter out erroneous packets from a large volume of gathered data. Existing research addresses issues such as longer processing times and a lower detection rate for suspicious packets. In this research, we present the Distributed Probability based Hop Count Filtering utilising RTT (DPHCF-RTT) approach to alleviate the above-mentioned constraints by increasing the detection rate of invalid packets and lowering calculation time. As a result, network congestion and the depletion of host resources are no longer issues. Useful information may be gained from Round Trip Time (RTT) in order to enhance an algorithm that depends on Hop Count alone for efficiency. With a maximum of four hops and a minimal computation time, the proposed approach DPHCF-RTT has proved to have a 99 percent detection rate of malicious packets. 

# PATENTS

## Summary

| | | |
|---|---|---|
| **Patents** | **67** | **(DSUIP-01 – DSUIP-67)** |

| ID | Author(s) | Title of the Patent | Publication Details |
|---|---|---|---|
| DSUP -01 | Suryanarayana G K | An Efficient Heat Transfer Device | Intellectual Property India, Application Number: 202241045979; Application Type: Ordinary; Date of Publication: 07/10/2022 |
| DSUP -02 | Dr. G Venkata karthik kumar Reddy<br>Dr. Prabitha P.<br>Dr. A. Muthukumar<br>Ms. Shailaja P Desai<br>Ms. Ashwini Suresh Patil<br>Mr. Soumitra Tiwari<br>Mr. Guruprasad V Sutar<br>Mr. Vinod Kumar Singh<br>Dr. Sachin Tyagi<br>Mr. Debyan Bhattacharjee<br>Dr. Prashant Tiwari<br>Ms. Rasmita Jena | The effect of gravity and centrifugal force on plant development and fruit production | Intellectual Property India, Application Number: 202241049325; Application Type: Ordinary; Date of Publication: 09/09/2022 |
| DSUP -03 | Amit budhori<br>Dr. Prashant tiwari<br>Smita jain<br>Vandana narvariya<br>Akhilesh pratap<br>Dr. Suresh janadri<br>Disha dutta<br>Dr. neeta rai<br>Dr. bincy raj<br>Ankur kumar kandpal<br>Mr. Alok kumar<br>Vikas bhatt | Machine learning based approach to analyse the pros and cons of liposomes in immunomodulation. | Government of Canada, Application Number: 202211049928; Application Type: Ordinary; Date of Publication: 09.09.2022 |
| DSUP -04 | Gaurav S. Mude<br>Dr. Prashant Tiwari<br>Ankita Dubey<br>Mr. Braesh Patel<br>Hricha Joshi<br>Dr. Shweta Shrivastava<br>Ms. Surabhi<br>Dipiksha<br>Rajni Karakoti<br>Amit Budhori<br>Vikas Bhatt<br>Dr. Neeta Rai | Implementing techniques of artificial intelligence for estimating the ziprasidone hydrochloride monohydrate in capsules by reverse phase HPLC. | Government of Canada, Application Number: 202221046665; Application Type: Ordinary; Date of Publication: 30.09.2022 |

| | | | |
|---|---|---|---|
| DSUP -05 | Dr. Prashant Tiwari<br>Akhilesh Pratap<br>Vikrant Chilate<br>Raj Kumar Tiwari<br>Lawanya Lata Pandey<br>Dr. Sushil Sueshrao Burle<br>Khushi Chouksey<br>Amit Budhori<br>Dr. Suresh Janadri<br>Amit R. Jaiswal<br>Dr. Rajni Kant Panik<br>Rahil Khan Attaullah Khan | Deep learning-based technique to analyse the impact of liposomal formulations in | Government of Canada, Application Number: 202241047508; Application Type: Ordinary; Date of Publication: 02.09.2022 |
| DSUP -06 | Dr. Prashant Tiwari<br>Dr. Juhi Dubey<br>Mrs. Shweta Singh<br>Urvashi Sharma<br>Dr. Anamika Saxena<br>Baljeet Kaur<br>Dr. Aditya Parashar<br>Dr. Nansri Saha<br>Dr. M. Gnana Ruba Priya<br>Anchal Verma<br>Dr Sailesh Narayan<br>Ganesh Prasad Patel | Artificial intelligence based hydrophobic drug delivery through liposomal formulation for treating cancer | Government of Canada, Application Number: 202221051177; Application Type: Ordinary; Date of Publication: 28.10.2022 |
| DSUP -07 | Dr.M. Gnana Ruba Priya,<br>Dr. Bincy Raj | Design, Microwave Synthesis and Biological Evaluation of 4-(2,6-Dimethyl Phenyl)-4(3H) Quinazolinone | Government of Canada, Application Number: 202241059887; Application Type: Ordinary; Date of Publication: 28.10.2022 |
| DSUP -08 | Mrs. Shweta Singh<br>Dr. Pradeep Golani<br>Sanjay Nagdev<br>Bhushan Rajesh Gudalwar<br>Prabhat Kumar<br>Rekha S<br>Dilend Patle<br>Dr. Juhi Dubey<br>Nagendra Bhuwane<br>Dr. Ashok Mahajan<br>Dr.Arun Kumar Patel<br>Anurag Singh | Systematic approach for estimation of lamotrigine in bulk and pharmaceutical formulations through development and validation of hplc method | Government of Canada, Application Number: 202211052583; Application Type: Ordinary; Date of Publication: 07.10.2022 |
| DSUP -09 | Dr. Santosh Kumar Verma<br>Mrs. Shilpa Murthy<br>Dr. Arun Kumar Kashyap<br>Mrs. Shilpi Shukla<br>Mr. Rajeev Kumar Mishra<br>Mr. Tapas Panigrahi<br>Ms. Sonal Gautam<br>Mrs Rekha S<br>Mr. Rohit Singh<br>Dr. Sonal Dubey<br>Dr. Rameshwari Verma | Synthesis of Substituted Five-Membered Heterocyclic Compounds (Pyrazole, Triazole, And Imidazole) As Potent Inhibitors of Mycobacterium Tuberculosis | Government of Canada, Application Number: 202241060573; Application Type: Ordinary; Date of Publication: 28.10.2022 |

| | | | |
|---|---|---|---|
| | Dr. Kadalipura P. Rakesh | | |
| DSUP -10 | Peta Sudhakar<br>Shanaz Banu<br>Dr A V Badri Nath<br>Dr. Uttam Prasad Panigrahy<br>M. Shyamala<br>Swarupa Arvapalli<br>Dr. C. Madhusudhana Chetty<br>Dr. Akash Marathakam<br>Dr. Vakkalagadda Ravi Kumar | Ethanolic extract of Argyreia nervosa with Anticonvulsant and Anxiolytic activity | Government of Canada, Application Number: 202241062745; Application Type: Ordinary; Date of Publication: 18.11.2022 |
| DSUP -11 | Rakesh Das, V. Murugan | Air Condition autoregulating jacket for transdermal drug delivery system through cold diffusion | Government of Canada, Application Number: 202241049103; Application Type: Ordinary; Date of Publication: 07.10.2022 |
| DSUP -12 | Mr. M. Chithambarathanu<br>Dr. R. Swaminathan<br>Dr. S. Meenakshi<br>Mr. Kallakuri N V P S Brahma Ramesh<br>Mr. Amara S A L G Gopala Gupta<br>Mr. B P N Madhu Kumar<br>Dr. S. Yazhinian | An Artificial Intelligence Based Data Management for IOT devices using Blockchain Technique and work | Government of Canada, Application Number: 202241061041; Application Type: Ordinary; Date of Publication: 04.11.2022 |
| DSUP -13 | Mr.M. Chithambarathanu<br>Dr.R. Ranjana<br>Anjali Surendran<br>Dr. A. Syed Musthafa<br>Dr.N. Kalyana Sundaram<br>Dr. Ashok Kumar<br>Dr. C. R. Rene Robin | A Deep Learning Based System for Anomaly Detection in Machine Learning Data and Method thereof | Government of Canada, Application Number: 202241065526; Application Type: Ordinary; Date of Publication: 25.11.2022 |
| DSUP -14 | Dr. SHAHINA PARVEEN<br>Prof. Suparna Hiresave Suresha<br>Prof. Baskar Venugopalan<br>Prof. Ramandeep Kaur<br>Prof. Swetha Patil | A System and Method for enabling Business Application, SAAS performance, SMB Segments | Government of Canada, Application Number: 202241076744; Application Type: Ordinary; Date of Publication: 06.01.2023 |
| DSUP -15 | Dr. SHAHINA PARVEEN<br>Prof. Ramandeep Kaur<br>Prof. Swetha Patil<br>Prof. Suparna Hiresave Suresha<br>Prof. Baskar Venugopalan | A System and Method for Enabling Freemium Services to Free Services | Government of Canada, Application Number: 202241076745; Application Type: Ordinary; Date of Publication: 06.01.2023 |

| | | | |
|---|---|---|---|
| DSUP -16 | Manjula D | Novel Pharmaceutical Formulations Comprising Nilotinib for bone marrow Therapy | Government of Canada, Application Number: 202241072701; Application Type: Ordinary; Date of Publication: 30.12.2022 |
| DSUP -17 | Ravinder Singh Kuntal | A Novel Hardware Prototype for crowd Monitoring System and A Method Thereof | Government of Canada, Application Number: 2022/12546; Application Type: Ordinary; Date of Publication: 21.10.2022 |
| DSUP -18 | Ravinder Singh Kuntal | A Method for calculating the lowest cost Feed Ratio for Pregnant Dairy Cows | Government of Canada, Application Number: 2022/13757; Application Type: Ordinary; Date of Publication:23.11.2022 |
| DSUP -19 | Savitha Hiremath<br>Shwetha G S | Blockchain based method to detect and rectify insider attack in hydroponics | Government of Canada, Application Number: 202321015422; Application Type: Ordinary; Date of Publication: 26.05.2023 |
| DSUP -20 | Mr. Hemant Sudarshan<br>Mr.M. Chithambarathanu<br>Mr.V. Jagan Raja<br>Mrs. D. Saisanthiya<br>Dr. M. Venkatesh<br>Mr.K. Sathish<br>Dr. J K Periasamy | A System for providing security using a plurality of factors for IOT Gadgets | Government of Canada, Application Number: 202341040746; Application Type: Ordinary; Date of Publication: 30.06.2023 |
| DSUP -21 | Mr.M. Chithambarathanu<br>Dr. Shahina Parveen<br>Ms. Sowmya N<br>Mr. Adabala P V D L Kumar<br>Mr. Panthani Ramesh<br>Dr. Joshuva Arockia Dhanraj<br>Dr. M. S. Jeyalakshmi | A System for Detecting and Classification of Machine Anomalies Using Convolutional Neural Network and Method Thereof | Government of Canada, Application Number: 202241068192; Application Type: Ordinary; Date of Publication: 23.12.2022 |
| DSUP -22 | J. Josephine Leno Jenita, Manjula D, Wilson B, K.B. Premakumari, Shanaz Banu, Seema S Rathore, Teja Choudhary, Pasupathy, V Murugan | Pharmaceutical formulations comprising capecitabine for colon-specific target | Government of Canada, Application Number: 202241062045; Application Type: Ordinary; Date of Publication: 11.11.2022 |
| DSUP -23 | Nithya Rajamanickam, Prashant Tiwari, Bincy Raj, Jincy Thomas, Soosamma John | Phramaceutical Copmosition comprising extract of cassytha filiformis for treatment of Neurogenerative diseases | Government of Canada, Application Number: 202241073193; Application Type: Ordinary; Date of Publication: 30.12.2022 |

| | | | |
|---|---|---|---|
| DSUP -24 | M. Gnana Ruba Priya, Dileep Kumar, Satisha D, C Geetha Priya, P K Anamika, S E Maida Engel | Design insilico studies, synthesis and biological evaluation of benzimidazole and schiff bases of benzothiazole derivatives as EGFR inhibitors: Targeting Breast cancer | Government of Canada, Application Number: 202241076982; Application Type: Ordinary; Date of Publication: 06.01.2023 |
| DSUP -25 | Barnaboss Wilson, Nivedhitha Shenoy, Geetha KM, Manjula D, J Josephine Leno Jenita, Kalpnan Divekar | Hydrogel formulation containing oxiconazole encapsulated nanosponge for antifungal activity | Government of Canada, Application Number: 202341002641; Application Type: Ordinary; Date of Publication: 20.01.2023 |
| DSUP -26 | Geeth KM, Christina Thakuri, Wilson Barnaboss, Kalpana Divekar | Nanoemulsion containing sesame seed oil for cardioprotection | Government of Canada, Application Number: 202341002115; Application Type: Ordinary; Date of Publication: 20.01.2023 |
| DSUP -27 | Dr. Kalpana Divekar | Synthesis of novel Isaxozole derivatives for treatment of Alzeimers disease | Government of Canada, Application Number: 202341004570; Application Type: Ordinary; Date of Publication: 17.02.2023 |
| DSUP -28 | Dr. Premakumari KB, Chitra P, | Quantitative Analysis of N-Nitroso Morpholine Mycophenolate Mofetil in Drug and Drug Product using Liquid Chromatography Mass Spectrometry. | Government of Canada, Application Number: 202341007970; Application Type: Ordinary; Date of Publication: 24.02.2023 |
| DSUP -29 | Geetha KM, Anitha KN | Isolation of 2-(1,3-diphenyl-1H-pyrazol-5-yl) acetic acid from Nigella sativa extract for Soluble Epoxide Hydrolases (sEH) Inhibition | Government of Canada, Application Number: 202341015376; Application Type: Ordinary; Date of Publication: 17.03.2023 |
| DSUP -30 | Mr. Rajendra Herur Vishnumurthy<br>Dr. M Gnana Ruba Priya<br>Dr. Prashant Tiwari<br>Dr. Dileep Kumar | Microencapsulation of celecoxib to enhance solubility profile for the management of alzheimer's disease like pathology | Government of Canada, Application Number: 202341012953; Application Type: Ordinary; Date of Publication: 17.03.2023 |
| DSUP -31 | Alharbi, Hanan Fahad, SA Arputhanatham, Shyam Sundar, IN Bhupathyraaj, Mullaicharam, IN Mohan, Musthafa, Mohammed Essa Mohammed, P Sivakami Sundari, Rajarajan, Uma Maheshwari, Sella Peruma Sathya, Semapagapandiyan Yoga, Vella Pandian Chitra | A System for developing antimicrobial Quercetin dihydrate nail lacquer for the treatment of paronychia | Government of Canada, Application Number: 202023100057; Application Type: Ordinary; Date of Publication: 03.07.2023 |

| | | | |
|---|---|---|---|
| DSUP -32 | Dr. Sriram Nagarajan, Dr. Kavitha Rajesh, Dr. Kotha Kranthi Kumar, Dr. Ashok Kumar Janakiraman, Dr. Sheik Nasar Ismail, Dr. Reddy Nazemoon. | Machine for development and production of solid pharmaceutical products | Government of Canada, Application Number: 379887-001; Application Type: Ordinary; Date of Publication: 22.02.2023 |
| DSUP -33 | Dr Ancha Kishore Babu, Dr Kotaiah silaka battini, Dr. Sunil Kumar Kadiri, Dr.cheepurupalli prasad, Dr Kommu Pradeep, Dr. M Akiful Haque | Viscosity measurement apparatus | Government of Canada, Application Number: 6265692; Application Type: Ordinary; Date of Publication: 03.09.2023 |
| DSUP -34 | Dr A M Mahaboob Basha<br>Dr.S. Amirdha Vasani<br>Dr.S. Baranidharan<br>Dr. Raja Narayanan<br>Dr.G. Chandrakala<br>Dr.S. Roohi Kursheed Khan<br>Mr.B.S. Rajath<br>Aditi Soni | The mediating effect of investors awareness and perceived risk in relationship between facilitating factors of crytocurrency investments and investment decision- market growth using strutural equation modeling algorithm | Government of Canada, Application Number: 202241060504; Application Type: Ordinary; Date of Publication: 28.10.2022 |
| DSUP -35 | Dr A M Mahaboob Basha<br>Dr.S. Baranidharan<br>Mr. Rajath B.S<br>Mr.G. Abhilash<br>Dr.V. Geetha<br>Mr. L.S. Vinaysagar<br>Dr.G. Chandrakala<br>Dr.S. Amirdha Vasani | The intermediary role of governance to strengthen the ruprr value in between the antecedents of rupee value enhancement factors and impact on Gross Domestic Product (GDP) of India | Government of Canada, Application Number: 202241073734; Application Type: Ordinary; Date of Publication: 30.12.2022 |
| DSUP -36 | Dr A M Mahaboob Basha<br>Dr.S. Baranidharan<br>Dr. Raja Narayanan<br>Dr. Rajath B.S<br>Mr.G. Abhilash<br>Mr.R. Harsha<br>Mr.J.V. Santhosh<br>Mr.L. S Vinay Sagar<br>Ms. Ramapriya H D<br>Dr. Geetha V | The Systematic Investment Plan (SIP) Model on mutual Fund Investments | Government of Canada, Application Number: 202341026651; Application Type: Ordinary; Date of Publication: 05.05.2023 |
| DSUP -37 | Dr. N. Balachandran<br>Dr. Veena Prasad Vemuri<br>Dr. Akhil Goyal<br>Dr. Jyoti Mishra<br>Dr. Swapna<br>Mr. Suraj Kumar<br>Mr. Venkatasubbaiah Bellapu | Analysis of customers review for purchased products impacts the growth of E-Commerce Business | Government of Canada, Application Number: 202341025403; Application Type: Ordinary; Date of Publication: 05.05.2023 |
| DSUP -38 | Dr. Jyoti Mishra<br>Dr. Preeti Kulshrestha<br>Mrs. Nagasudha R.<br>Dr. Sibu C. Chithran<br>Mrs. Monalisa Pattanayak<br>Dr. Samrat Srivastava<br>Mr. Sameer Yadav<br>Mr. J. Logeshwaran | Analysis of current Consumer Protection Act in e-commerce policy, India | Government of Canada, Application Number: 202341038281; Application Type: Ordinary; Date of Publication: 30.06.2023 |

| | | | |
|---|---|---|---|
| | Sujitha Nandipati<br>Dr. M.V.K. Srinivasa Rao<br>Dr. Sheetal Macchindra Randhir<br>Dr. V. Kannan | | |
| DSUP -39 | Dr. Vinod Kumar K C | Internet of m-health Things M-IoT based smart sensing wheelchair to assist in Healthcare | Government of Canada, Application Number: 202341027260; Application Type: Ordinary; Date of Publication: 05.05.2023 |
| DSUP -40 | Dr Radhika Chintamani | A Novel Spatial Maneuvering Electronic Device | Government of Canada, Application Number: 202341001640; Application Type: Ordinary; Date of Publication: 13.01.2023 |
| DSUP -41 | Dr. Prakruti P Acharya, Dr. Sunil S More, Dr. V Krishnamurthy | Method of Fabricating A Protein - Polysaccharide Scaffold | Government of Canada, Application Number: 202341017601; Application Type: Ordinary; Date of Publication: 26.05.2023 |
| DSUP -42 | Ravinder Singh Kuntal | A Real Coded Genetic Algorithm Based System for Feed Formulation | Government of Canada, Application Number: 2023/02599; Application Type: International; Date of Publication: 31.05.2023 |
| DSUP -43 | Mrs. Priya Satish<br>Dr. Anita Chaturvedi<br>Dr. Kokila Ramesh<br>Dr. Vishal Patil<br>Dr. Ravinder Singh Kuntal | A Non-Linear Mathematical System and Method for Monitoring Health Issues and Providing Customized Solution | Government of Canada, Application Number: 202341005600; Application Type: Ordinary; Date of Publication: 24.02.2023 |
| DSUP -44 | Ravinder Singh Kuntal | A true genetic algorithm-based system for formulating the most cost-effective feed ration for pregnant dairy cows | Government of Canada, Application Number: 2020221047456; Application Type: International; Date of Publication: 06.09.2022 |
| DSUP -45 | Dr. Vishal Patil<br>Dr. Ravinder Singh Kuntal<br>Dr. Radha Gupta<br>Dr. Anita Chaturvedi<br>Dr. Kokila Ramesh<br>Mrs. Priya Satish<br>Dr. Bhagyashri R Doddamani<br>Mr. Vishwanatha S<br>Mr. Veeresh Malagi | A System and Method for Estimating Nutritional Requirements for Dairy Cattle and Buffalo | Government of Canada, Application Number: 202241000251; Application Type: Ordinary; Date of Publication: 24.02.2023 |

| | | | |
|---|---|---|---|
| | Mr. K J Ghanashyam<br>Mr. Suresha R<br>Mr. Vishwas Patil | | |
| DSUP<br><br>-46 | Dr. SHAHINA PARVEEN<br>Keerthi A Reddy<br>Shreyas B U | A System and Method for Enabling Logistics Tracker | Government of Canada, Application Number: 202241068773; Application Type: Ordinary; Date of Publication: 09.12.2022 |
| DSUP<br><br>-47 | Dr. SHAHINA PARVEEN<br>Sohan R Vernekar<br>Sai Skandha Saravanan | A System and Method for Enabling Senior World | Government of Canada, Application Number: 202241068774; Application Type: Ordinary; Date of Publication: 09.12.2022 |
| DSUP<br><br>-48 | Dr. SHAHINA PARVEEN<br>Adnan Mohamed Syed<br>Shashikala M S | A System and Method for Enabling SAAS Analysis Tool for Big Data | Government of Canada, Application Number: 202241068432; Application Type: Ordinary; Date of Publication: 09.12.2022 |
| DSUP<br><br>-49 | Dr. SHAHINA PARVEEN<br>Prajjwal mishra<br>Abhas agnihotri | A System and Method for Enabling MOMIX Platform | Government of Canada, Application Number: 202241068431; Application Type: Ordinary; Date of Publication: 09.12.2022 |
| DSUP<br><br>-50 | Dr. SHAHINA PARVEEN<br>Tharun Ganesh Naidu<br>Deepak Boppana Giri<br>Mucharla Nikhil Guptha | A System and Method for Enabling Arthritis Information Platform | Government of Canada, Application Number: 202241068433; Application Type: Ordinary; Date of Publication: 09.12.2022 |
| DSUP<br><br>-51 | Dr. Shahina Parveen | A System and Method for Enabling Upskilling Platform | Government of Canada, Application Number: 202241068048; Application Type: Ordinary; Date of Publication: 02.12.2022 |
| DSUP<br><br>-52 | Dr. Shahina Parveen<br>R Punith Raj<br>Nihal Prasad N. B | A System and Method for Enabling Agri Commerce | Government of Canada, Application Number: 202241068049; Application Type: Ordinary; Date of Publication: 02.12.2022 |

| | | | |
|---|---|---|---|
| DSUP -53 | Dr. Shahina Parveen | A System and Method for Enabling Memory Triggering AR/VR | Government of Canada, Application Number: 202241068028; Application Type: Ordinary; Date of Publication: 02.12.2022 |
| DSUP -54 | Dr. Shahina Parveen | A System and Method for Enabling Hassel Free Senior Assistance | Government of Canada, Application Number: 202241068030; Application Type: Ordinary; Date of Publication: 02.12.2022 |
| DSUP -55 | Dr. Shahina Parveen | A System and Method for Enabling Funding Community for Farmers | Government of Canada, Application Number: 202241068034; Application Type: Ordinary; Date of Publication: 02.12.2022 |
| DSUP -56 | Dr Pramod Kumar Naik, Dr. Sindhu. P. Menon, Dr Basavaraj N Hiremath, Prof Baskar Venugopalan, Dr. Kiran B. Malagi, Arun Khannur, Dr Ravinder Singh Kuntal, Mr Naveen Kulkarni, Mr Pratham V Kamat, Mr Gangesh Gunjan, Mr Yogesh Sirvi, Nachiketh U Ujjainimath | A Novel Hardware prototype for crowd monitoring system and a method thereof | Government of Canada, Application Number: 2022/12546/G06K; Application Type: International; Date of Publication: 23.04.2022 |
| DSUP -57 | DR. B. BALAKUMAR, Dr. Kiran B. Malagi | Automatic Google Scholar Citation Fetching using Python | Government of Canada, Application Number: SW-16364/2023; Application Type: International; Date of Publication: 02.06.2023 |
| DSUP -58 | Amit Raikar<br>Amit Raikar<br>SHARANABASAPPA TADKAL | Prevention of Traffic Signal Violation and Pedestrian Safety Using Retractable Electric Bollard | Government of Canada, Application Number: 202341020218; Application Type: Ordinary; Date of Publication: 07.04.2023 |
| DSUP -59 | Dr. Sindhu P Menon, Dr. Tina Babu, Dr. Rekha Nair, Prof. Pavithra K | The Novelty resides in the shape and configuration of the "CANCER DETECTOR | Government of Canada, Application Number: 367707-001; Application Type: Ordinary; Date of Publication: 30.03.2023 |

| | | | |
|---|---|---|---|
| DSUP -60 | Dr. Revathi V, Dr Ramakrishnan R | Glove Type Dishwashing Brush | Government of Canada, Application Number: 333086-001; Application Type: Ordinary; Date of Publication: 02.12.2022 |
| DSUP -61 | Mr. Sharath M N<br>Dr. Rajesh T M<br>Dr. Mallanagouda Patil | An efficient Optimal Metaheuristics based Pixel Selection for Video Steganography usingHomomorphic Encryption approach | Government of Canada, Application Number: 202241077262; Application Type: Ordinary; Date of Publication: 06.01.2023 |
| DSUP -62 | Mr. Sharath M N Dr. Rajesh T M | Device for Identifying Object at Security Gate | Government of Canada, Application Number: 380418-001; Application Type: Ordinary; Date of Publication: 18.05.2023 |
| DSUP -63 | "Kalakuntla Nishanth Rao & Dr. Vaibhav Meshram" | Ultra Wideband Tightly Coupled Array Antenna Optimization with Resistive FSS to Improve Antenna Bandwidth | Government of Canada, Application Number: 202341002430; Application Type: Ordinary; Date of Publication: 26.05.2023 |
| DSUP -64 | Dr. Geetha K M,<br>Malathi S V &<br>Dr. Wilson B | Neuroprotective Potential of Nano Emulsion Containing Cod Liver Oil | Government of Canada, Application Number: 202341007999; Application Type: Ordinary; Date of Publication: 26.05.2023 |
| DSUP -65 | Dr. Rajesh T M & Dr. Shaila S G | System and Method of Classifying Egg-Carrying Fish | Government of Canada, Application Number: 202341013038; Application Type: Ordinary; Date of Publication: 30.06.2023 |
| DSUP -66 | Rajesh T M, Praveen Kulkarni & Shaila S G | Classifier Device, System, and Method | Government of Canada, Application Number: 202341013040; Application Type: Ordinary; Date of Publication: 30.06.2023 |
| DSUP -67 | Rajesh T M, Sharath M N, Shaila S G, Tina Babu | System and Method for Data Hiding in Video Communication Using Steganography | Government of Canada, Application Number: 202341021786; Application Type: Ordinary; Date of Publication: 26.05.2023 |

# Ph. D THESIS

## Summary

| | | |
|---|---|---|
| **Thesis Abstracts** | **18** | **(DSUT-01 – DSUT-18)** |

DSUT-01


# Anitha K.N.
# (HSC16PFPH01)

**Department of Pharmacology**
**College of Pharmaceutical Sciences**
**School of Health Sciences**

Under the Supervision of

Dr. Geetha K.M


**Title: Evaluation of selected medicinal plants Having soluble epoxide hydrolase (seh) Inhibition for anti- ulcer, anti-inflammatoryAnd analgesic activities in rodents**


## Abstract

**Aim**: The study was aimed to evaluate some Indian medicinal plants for sEH inhibition activity and in vivo pharmacological screening of selected plants.

**Methodology**: The dried plant materials of fifty plants were grounded into a coarse powder and extracted with methanol and ethyl acetate by cold maceration. The plant extracts were evaluated for sEH inhibition activity usinga fluorescent reporting system. Ten methanolic extracts and twenty ethyl acetate extracts were potentially effective in suppressing sEH activity with IC50 values of less than 10 µg/ml. Methanolic extracts of three plants (Celastrus paniculatus, Nigella sativa and Wrightia tinctoria) exhibited significant sEH inhibiton activities when compared to ethyl acetate extracts of all other plants screened. Hence methanolic extracts of Celastrus paniculatus seeds (CPME) and Nigella sativa seeds (NSME) which showed potent sEH inhibition were selected from the thirty extracts for phytochemical screening. Further, pharmacological evaluation for anti-inflammatory in LPS-induced paw oedema in rats, anti-ulcer activities in ethanoland indomethacin-induced ulcers in rats and effect on diabetic neuropathic pain in STZinduced diabetic neuropathy in rats were studied. Based on the in vivo results, NSME was foundto be significantly more potent compared to other extracts and was selected for bioactivity guided isolation of the active phytoconstituents. The isolated compounds were evaluated for in vitro sEH inhibitory activities and studiedfor molecular docking to find out the possible target and to understand the binding mode analysis against x-ray crystal structure of sEH enzyme.

**Results**: Fifty plant species were investigated for their sEH enzyme inhibitory potential against the human sEH enzyme using a fluorescent reporting system. The highest potency was observed with methanolic extract of Piper longum fruit (IC50 = 1.108 µg/ml) but the ethyl acetate extracts of the same was found to exhibit poor sEH inhibitory activity (IC50 >50 µg/ml). In case of ethyl acetate extract, Bergamia koengii leaves showed highest sEH enzyme inhibitory activity with IC50 value of 2.384 µg/ml. Although thirty plant extracts studied showed very good sEH inhibitory activities, CPME and NSME showed optimum sEH inhibitory action. Both CPME and NSME exhibited anti-inflammatory, antiulcer and analgesic activity in diabetic neuropathic pain in rats and the results were statistically significant. Two phytoconstituents, PE-01 and PE-02 were isolated from NSME and showed very good in vitro sEH inhibitory activities. PE- 01 and PE-02 have shown significant drug-like characteristics. The results demonstrate that PE-01 and PE-02 were potent, safe and novel sEH inhibitors. Compound PE-02 was found to be almost equipotent to the standard 1-(1-propanoylpiperidin-4-yl)-3- [4- (trifluoromethoxy) phenyl] urea (TPPU) against sEH.

**Conclusion**: In conclusion, the study report suggests that various natural products used in the

traditional medicinal system have many promising sEH inhibitors. Two phytoconstituents PE1 and PE2 isolated from Nigella sativa methanolic extract, were potent, safe and novel sEH inhibitors. Compound PE- 02 was found to be almost equipotent to TPPU against sEH.
**Keywords**: Nigella sativa, Celastrus paniculatus, stomach ulcer, nociceptive bioassays, Randall Selittotest, linoleic acid, she inhibition, 5hydroxyeicosatetranoicacid, 1-(1-propanoylpiperidin-4-yl)-3-[4-(trifluoromethoxy) phenyl] urea (TPPU).

**DSUT-02**

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Under the Supervision of

Dr. V. MURUGAN

**Title: Phytochemical and Pharmacological Screening of Few Species of Tephrosia Genus for Their Antioxidant and Antihyperlipidemic Activities**

**Abstract**

Background: Polyphenols and flavonoids have a significant role in conquer hyperlipidemia, which is one of the major risk factors causing cardiovascular diseases. Several previous studies showed the effect on lipid parameters are due to the presence of polyphenols like flavonoids, triterpenoid, sterol, retinoid and triterpene in various plants. The whole plant of Tephrosia tinctoria and Tephrosia villasa extracts were assessed for their antihyperlipidemic and antioxidant activities.

**Methods:** The whole plant of Tephrosia tinctoria and Tephrosia villosa extracts were extracted by successive extraction with petroleum ether, chloroform, ethanol and water. The extracts were assessed for qualitative and quantitative phytochemical evaluation by standard procedures. The chloroform and ethanolic extracts were selected for further isolation and characterization of phytoconstituents and pharmacological evaluation. Triton-WR-1339 induced and high cholesterol-diet (HCD) induced hyperlipidemic rats were used to evaluate the antihyperlipidemic effects of chloroform and ethanolic extracts of both plants. Hyperlipidemia was induced in rats by single intraperitoneal administration of Triton-WR-1339 200 mg/kg b.w in acute model and by feeding cholesterol 400 mg/kg b.w along with normal diet in chronic model rats. Parameters such as serum lipid profile was assessed to demonstrate the antihyperlipidemic effect of extracts. SOD, catalase, GSH and LPO assays were used to measure the antioxidant capacity of the phenolic constituents present in extracts. Histopathology of rat liver and aorta were evaluated. The expected mechanism of action of various phytoconstituents from both the plants were investigated by in-silico method like molecular docking, Drug likeliness studies and ADME/T studies.

**Results:** The chloroform and ethanolic extracts of Tephrosia tinctoria and Tephrosia villosa were found to have maximum phenolic and Flavonoid content. One of the major active phytoconstituents, Dehydrodeguelin and Tephrosin were isolated from XVII chloroform extract of Tephrosia tinctoria and Tephrosia villosa respectively and subjected for characterisation by HPLC, FT-IR, 1H NMR &13C NMR and LC-MS spectroscopy Both the chloroform and ethanolic extracts of Tephrosia tinctoria and Tephrosia villosa were effective in lowering the levels of total cholesterol (TC), triglycerides (TG), low-density lipoprotein-cholesterol (LDL-C) levels with consequent increase in the levels of high-density lipoprotein-cholesterol (HDL-C) in acute and chronic

hyperlipidemic models. Furthermore, the extracts were effective in increasing the levels of SOD, CAT and GSH, and decreasing the LPO levels which were confirmed by histopathological observations. The effect of the extracts was comparable with that of the standard simvastatin. The in-silico investigation also confirms that the majority of the compounds showed good affinity to the active sites of HMG CoA reductase (HMGR), lipoprotein lipase (LPL) and lecithin cholesterol acyl transferase (LCAT) enzymes and also they are nontoxic, drugable in nature. Hence, this study suggests that Tephrosia tinctoria and Tephrosia villosa can be used for the treatment of hyperlipidemia.
**Conclusion**: This study concludes that few of the polyphenolic and flavonoids from Tephrosia villosa and Tephrosia tinctoria can be considered as antihyperlipidemic agent in treating hyperlipidemia.
**Keywords**: Polyphenols, Flavonoids, Atherosclerosis, Antioxidant activity, Triton WR-1339, Lipid profile, Simvastatin.

DSUT-03


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**Title: Assessment of Neuroprotective activity of Hydrocotyle sibthorpioides against chemically induced cognitive impairment and oxidative stress**


## Abstract

Hydrocotyle sibthorpioides (Family: Araliaceae) is a medicinal plant and is being a part of the traditional cuisine of Assam. The plant is traditionally used as a brain tonic by the people of Assam. Hence, the aim of this project was to evaluate the neuroprotective property of H. sibthorpioides. Therefore, we collected and extracted the whole plant in a Soxhlet apparatus using petroleum ether, chloroform, methanol and water. The extracts were evaluated for its acute oral toxicity as per OECD guidelines 425. The result suggested that the LD50 of all the extracts were >2000 mg/kg. We later evaluated the neuroprotective activity of the extracts of H. sibthorpioides using $AlCl_3$. The result suggested that the chloroform and methanolic extract showed a significant increase in Aluminium (Al) level, acetylcholinesterase (AChE) level and protein expressions of amyloid precursor proteins (APP), β and γ secretase, and β-amyloid (Aβ1-42) in the cortex and hippocampus comparing to the control. Moreover, there was a significant reduction in locomotor activity, muscle coordination and cognition and memory. On the other hand, animals treated with chloroform and methanolic extracts of H. sibthorpiodes given at 200 and 100 mg/kg body weight orally with $AlCl_3$ altered the behavioural impairment caused by Al and Al concentration, activity of AChE, synthesis molecules of Aβ generation. The report of histological studies in hippocampus and cortex supported the neuroprotective role of chloroform and Methanolic extract of H. sibthorpioides, which conserved a normal histoarchitecture pattern of cortex and hippocampus. Finally, it can be concluded that Chloroform and Methanolic extract of H sibthorpioides can alter memory loss induced by aluminum toxicity by enhancing AChE activity and by its involvement in amyloidogenic pathway. We also evaluated for its neuroprotective effect against monosodium glutamate (MSG) induced excito neurotoxicity in rats. The animals were subjected to high doses of MSG (2g/kg body weight) along with the test dose during the experimental period (1 week). The test chemicals were the petroleum ether, chloroform, methanol and aqueous extracts of H. sibthorpioides. 0.05 mg/kg of Dizocilpine hydrogen maleate, an NMDA antagonist was used as a standard drug. After the experimental period the animal groups were tested for its cognitive behaviour using Morri's water maze and elevated plus maze, ambulatory behaviour and muscle coordination. On the 9th day the animals were sacrificed and evaluated for its biochemical parameters. The biochemical parameters evaluated were Antioxidants biomarkers, GABA,

glutamate, and the level of Proinflammatory cytokines. The results suggested that chloroform and Methanolic extracts of H. sibthorpioides significantly enhance the cognitive behaviour of rats compared to the control. Biochemical analysis suggested that there was a high level of Antioxidants and lower levels of Glutamate and proinflammatory cytokines in the cortex and hippocampus region of the brain. Therefore, we can conclude that chloroform and Methanolic extracts of H. sibthorpioides can significantly prevent the Monosodium glutamate induced excito-neurotoxicity by enhancing the level of antioxidants in the brain, decreasing the level of proinflammatory cytokines and glutamate. Later, we performed a bioassay guided isolation two get two phytoconstituents. The phytoconstituents, HS-1 and HS-2 was identified using 1H-NMR, 13C-NMR, IR and mass spectroscopy spectral data. The identified compounds were then subjected to docking studies against the targeted proteins of Alzheimer's using Autodock software. The targeted proteins were Acetyl cholinesterase, butyrylcholinesterase, beta-secretase-1, Tau protein kinase. The docking studies showed better binding energy with different targets of alzheimer's suggesting that HS-1 and HS-2 are responsible for the neuroprotective action of H. sibthorpioides.
**Keywords:** Hydrocotyle sibthorpioides Lam; Araliaceae; Neuroprotection;

**DSUT-04**

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Under the Supervision of

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**Title: Synthesis and Characterization of Nanostructured Metal Vanadates and Their Application as Cathode Materials for Lithium Ion Battery**

## Abstract

Calcium oxalate monohydrate (COM), the major crystalline composition of most kidney stones (urolithiasis), induces inflammatory infiltration and injures in renal tubular cells. However, the mechanism of COM-induced toxic effects in renal tubular cells remain ambiguous. The present study aimed to investigate the anti-urolithiatic potential of banana phytosterol - beta-sitosterol (BST) and stigmasterol (STI) which were previously isolated from our laboratory. The study involves the development of in vitro (HK-2 cell line) and in vivo (Drosophila) model. Further, human proximal tubular epithelial cells (HK-2) on nucleation, aggregation, and growth of the CaOx crystals, as well as its protective potency was tested on oxalate-induced cell injury of HK-2 renal epithelial cells. HK-2 cells were incubated with different concentrations of oxalate, and the effect of oxalate on the growth of the cells was assessed by MTT, apoptosis and ROS inhibition assays. Our data revealed that BST is effective in COM crystal dissolution and acts as cytoprotective agent. In addition, to understand the mode of action, tight junction proteins (Human claudins 14, 16 and 19) were molecular docked with calcium oxalate and BST. Molecular simulation studies were conducted at 20ns. our data also suggest that BST's effects on claudins result in a tighter epithelial barrier, which may reduce the reabsorption of sodium, calcium and water, thereby preventing the formation of a kidney stone. As a part of in vivo studies drosophila claudins a class of transmembrane protein in the family of tight junction (TJ) proteins. Further, the study was focused on the identification of lead compounds for Drosophila claudin like proteins Sinuous, KuneKune and Megatrachea adopting the structure-based drug design method. Autodock 4.2 software used as a molecular docking tool for the initial docking. Then, ligands compounds Beta-Sitosterol (BST) drug molecule and Potassium-Magnesium Citrate (STD) i.e., standard drug were subjected for molecular docking for finding binding energy in the active site of Drosophila claudins. Molecular dynamics simulations were carried out for 100 ns using GROMOS 54A7 force field package. The study draws inference that Beta-Sitosterol (BST) as potential inhibitors for human and drosophila claudins. In summary, our study strategy established novel leads against claudins biomarkers in humans and drosophila which draws attention towards novelty. To conclude, the results of the study strongly recommend Beta-Sitosterol (BST) as potent anti-urolithiatic agent which paves ways for newer drug development and design.

DSUT-05

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**Title: Assessment of anti-atherosclerotic activity from plant juices of ayurvedic reputes in cell lines and mice model**

## Abstract

Atherosclerosis is caused by high plasma concentrations of low-density lipoprotein (LDL), resulting in the development of lipid-laden plaques on the arterial walls, leading to blockage and heart attack. Macrophages take up oxidised low-density lipoproteins, which results in the formation of foam cells, which are critical in the initiation of atherosclerosis. Till today contemporary drugs used for the treatment and prevention are statins, nevertheless, some of these have serious side effects. Medicinal plants have wide range of phytochemicals used for treatment and are rich in as yet unexplored novel natural products. Ayurveda and Siddha recommend a list of medicines which also serve as food in our daily lives, thus called nutraceuticals. A wide range of medicinal plants have phytochemicals used for treatment modules in Ayurveda and are rich in natural products. Different samples and combination were selected for the isolation of phytochemicals, namely tannins, phenolics, and carotenoids from C. limon, T. ammi, Honey, T. ammi with C. limon, T. ammi with honey, C. limon with honey, respectively. These phytochemicals (tannin, phenolics, carotenoids) were isolated using two solvents, i.e., methanol and water extraction. Antioxidant assays such as DPPH, superoxide, and nitric oxide activity were performed to determine the free radical scavenging activity of which, tannin methanol extract from T. ammi, C. limon T. ammi, T. ammi honey and C. limon honey was shown to have the lowest IC50 value at $P < 0.05$. Further antibacterial activity was checked for methanolic extract of different phytochemicals by minimal inhibitory concentration. Furthermore, to isolate LDL, human blood was collected, and plasma was separated. The plasma was then subjected to ultra-centrifugation to isolate LDL. In LDL oxidation inhibition assay in different phytochemical extracts was shown to have highest inhibition percentage in tannin methanolic extract of T. ammi, C. limon T. ammi, T. ammi honey and C. limon honey with significance at $P < 0.001$. This active phytochemical was then studied to determine the cytotoxicity range and subjected to antiproliferative having increased inhibition from (T. ammi honey mixture at $P < 0.001$), foam cell inhibition (T. ammi honey, C. limon honey mixture at $P < 0.05$), nitric oxide inhibition (C. limon with T. ammi with IC50 value of $7.39 \pm 0.13$ µg/mL with a significant difference at $P < 0.001$), and anti-apoptotic assays (T. ammi honey mixture IC50 value of $7.19 \pm 0.16$ µg/mL with a significant difference at $P < 0.001$) induced with oxidised LDL in RAW 264.7 macrophages and THP-1 cells showed to have prominent inhibitory property. The active phytochemical was characterized by HPLC and GCMS to determine the compounds present. The highly

active sample was tested on Swiss Albino mice to determine the lipid profile. Significant LDL oxidation inhibition and antioxidant activity were observed in tannins methanolic extracts from T. ammi, T. ammi with C. limon, T. ammi with honey, and C. limon with honey mixture, which were subjected to anti-atherosclerotic properties in cell lines and characterized. Prominent antibacterial activity was observed against 5 different pathogenic bacteria except for Streptococcus mutans. However, in anti-atherosclerosis assays, significant inhibition was seen by C. limon with T. ammi mixture, and T. ammi honey mixture. The highest activity with the lowest IC50 value was found to be in C. limon with T. ammi mixture which revealed the potential for antiproliferation, prevention of foam cell formation, nitric oxide inhibition, and antiapoptotic activity. Hence, it was further studied in Swiss albino mice, which exhibited reduced LDL concentration in extract treated mice when compared to control and fat diet fed mice. Thus, active phytochemical act as antilipidemic and anti-atherogenic properties. Hence, contemplating the side effects of presently available treatment, isolated active phytochemicals play an important role in alleviating atherosclerosis. The present study provides the actions of isolated active phytochemicals on cell lines as the major therapies for atherosclerosis. **Keywords**: Natural products, phytochemicals, tannins, foam cell inhibition, antiproliferation, antiapoptosis, anti-atherosclerosis**.**

DSUT-06

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Under the Supervision of

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**Title: Invitro & Invivo assessment of fabricated Protein Polysaccharide scaffold for enhanced Bone regeneration**

## Abstract

Treatments for osseous deficiencies in the future show significant potential when using scaffoldbased bone tissue engineering. Understanding the composition and structure of native bone tissue is necessary for successful materials design for bone-tissue engineering, as is making the right choice of biomimetic natural or tunable synthetic materials. The extracellular matrix (ECM) of native tissue should be imitated as closely as feasible in the optimal scaffolds for tissue engineering. The purpose of this study was to prepare a scaffold with ECM components comprising collagen type 1, hydroxyapatite (HAp), hyaluronic acid (HYA), and chondroitin sulphate (CS) by utilizing 1-ethyl-3- (3-dimethylamino propyl) carbodiimide/N-hydroxy succinimide (EDC-NHS) as a crosslinker. The objective of this study was to evaluate and comprehend the impact of each ECM component and its function in bone-tissue engineering. Waste from fresh water and marine Hypophthalmichthys molitrix (Silver carp- SC) and Rhizoprionodon acutus (Milk shark-SH) respectively was used to extract type 1 collagen and nano-hydroxyapatite. However, Hypophthalmichthys molitrix was considered due to highest yield of collagen comparatively and availability of bones for nanohydroxyapatite synthesis. Utilizing an acid soluble extraction technique, collagen type 1 was isolated and characterised using FTIR, XRD, CD, TGA, and SEM. Proliferation efficiency was estimated using MTT assay on L929 fibroblast cell lines. Also, since collagen type 1 isolated from silver carp waste was shown to have typical properties and less cytotoxicity, it was employed to construct scaffolds. Silver carp bones were used to extract HAp by following thermal calcination (TC) and alkaline hydrolysis (AH) to standardize the protocol. A comparative analysis was conducted and characterized by FTIR, XRD, and SEM-EDX; HAp synthesized from alkaline hydrolysis exhibited a Ca/P ration of 1.65, close to natural hydroxyapatite in nano range with no toxic behavior. Hence AH-HAp was considered for scaffold fabrication. By using the freeze-drying method, extracted collagen type 1and the synthesised nano-hydroxyapatite, the scaffold was created. Hyaluronic acid and chondroitin sulphate were added as bioactive polysaccharides. The scaffold was tested for mechanical screening, density evaluation, and porosity measurements in order to evaluate its properties as a biomaterial for tissue engineering. Invitro studies of scaffolds were conducted on MG63 osteoblast cell lines to examine the toxicity, mineralization, and proliferation properties by performing MTT, Alkaline phosphatase, and Alamar blue assays. A 7-day biocompatibility and proliferation assessment of scaffold was conducted on Mg-63 cell lines at a highest concentration which resulted in nearly 100% viability at all days. Thus, our objective of creating scaffold that could stimulate cells to regenerate and mimic natural activity was confirmed from the preliminary invitro results. The developed scaffold was then inserted into the subcutaneous layer of Wistar rats, and histopathological examinations were used to track and record the scaffold's acceptance characteristics. The calcium deposition in the implanted sites and the biocompatibility confirmed the fabricated scaffold to have good properties as an implant material. As the resulting biomaterial is known to exhibit biocompatibility and promote angiogenesis, the unique protein-polysaccharide scaffold does find use in tissue engineering.

**Key words:** Collagen type 1, Fish waste, Invitro and Invivo studies, Nano-hydroxyapatite, Polysaccharides, Scaffold.

DSUT-07

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Under the Supervision of

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**Title: Power Aware Asynchronous Strategies for GALS Systems**

## Abstract

The proposed research focuses on determining the types of template-based designs suitable for full custom asynchronous circuit design optimization parameters like metastability, timing violations, delay and area overhead to speed up the conventional iterative method of simulations by creating standard cell library. Research implementation starts with analytical method of full custom transistor level designing of gates. The designing of gates are done by using various methods like null convention logic, QDI, template based, etc. Using cadence virtuoso tool using spectre simulator for low power and high-performance operation. Asynchronous controllers design are done using petri nets and other graphical methods to carryout channel and handshaking synthesis. Usually, the design specifications allow considerable freedom to the circuit designer on issues concerning the choice of a specific circuit topology, individual placement of the devices, the locations of input and output pins, and the overall aspect ratio (width-to-height ratio) of the final design. The actual implementation of the asynchronous circuit starts at the schematic level. The top- level circuit or design is hierarchically decomposed until the design consists of a netlist of leaf cells. The design of System-on Chip (SoC) using synchronous circuits involves complex clock distribution which poses a challenge for designers to integrate at large scale. Therefore, Globally Asynchronous Locally Synchronous (GALS) architecture containing asynchronous port controllers encapsulated in self-timed wrapper is being adopted. These port controllers communicate through Asynchronous Finite State Machines (AFSMs) which is defined by Signal Transition Graph (STG) implemented by C element. The GALS architecture is implemented for point-to-point interface which can also be modified for multipoint interface. This methodology uses two-phase handshake protocol to communicate between two Locally Synchronous (LS) modules as it has lesser signal transitions, which in turn reduces latency. Globally Asynchronous Locally Synchronous (GALS) Systems combine the benefits of synchronous and asynchronous systems. Modules can be designed like modules in a globally synchronous design, using the same tools and methodologies. These port controllers communicate through Asynchronous Finite State Machines defined by Signal Transition Graphs are implemented adopting the C element. This GALS architecture implemented for the point-to-point interface can also be modified for the multipoint interface. The proposed methodology uses a two-phase handshake protocol to communicate between two Locally Synchronous modules as it has fewer signal transitions, which, in turn, reduces latency.

**KEYWORDS**: Asynchronous wrapper; Globally asynchronous locally synchronous (GALS); Handshake protocol; Muller C element; Port controller; Signal transition graphs (STG); Synthesis logic; OpenRAM, single node upset, memory compilers, 12T SRAM, energy efficient memory, Scalable CMOS.

DSUT-08

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**Title: Preliminary phytochemical studies and Screening of syzygium cerasoideum for Antidiabetic, antihyperlipidemic and antioxidant activities**

## Abstract

**AIM:** Syzygium cerasoideum is used in the treatment of diabetes mellitus. The present study investigates the role of isolated constituent held responsible for its antidiabetic activity with the help of methanol (MESC) and chloroform (CESC) extracts.

**Method:** Phytochemical screening and antioxidant activity of the extracts were done. Hyperlipidemic and diabetic animal models were used to prove its hypolipidemic and antidiabetic activity which were supported by protein docking study and histopathological findings.

**Results:** Preliminary phytochemical tests revealed the presence of flavonoids, glycosides, phenolic compounds in the extracts. Highest antioxidant activity was exhibited by methanolic and chloroform extract and Kaempferol was quantified by HPTLC. In triton induced hyperlipidemic model, CESC (200 mg/kg b.w) and pitavastatin demonstrated a significant hypolipidemic activity but in cholesterol induced hyperlipidemic model both CESC and MESC at low doses showed a significant hypolipidemic activity. MESC (400mg/kg) showed blood glucose lowering effect at 30 min during the oral glucose tolerance test. In high fat eating C57BL/6J mice, antiobesity effect was demonstrated by MESC. In spite of showing hypoglycemic effect in normoglycemic rodents the extracts did not exhibit hypoglycemic episodes during the treatment period. Both CESC and MESC showed significant blood lowering effect in STZ induced diabetic animal model. Mearnsetin, the isolated compound is believed to be a potent flavonoid. The molecule interactions were studied with proteins using Auto dock tool. The docking score by using Auto dock has shown -8.1 kcal/mol for mearnsetin with Human pancreatic alpha-amylase (PDB ID: 1HNY) the molecule had formed conventional hydrogen bonding with ARG421, GLY403, ASP402, ARG252, THR6 of amino acid residues and pi cation interactions with ARG252. -9.9 kcal/mol for mearnsetin with Human dipeptidyl peptidase IV (PDB ID: xvii 2P8S) the molecule had formed conventional hydrogen bonding with ARG125, TYR547 of amino acid residues, the hydroxyl atoms had undergone unfavorable donor-donor & Acceptor- acceptor interactions with SER630, TYR585, GLU206, ARG669 of amino acid residues respectively and Pi-Pi cations are stacked with PHE357 of amino acid residue.

**Conclusion:** Our results clearly demonstrated significant beneficial effects of Syzygium cerasoideum in protecting pancreas from high fat diet and Streptozotocin deleterious effects. However, these studies suggest that the Syzygium cerasoideum extracts might be designed to develop new Antidiabetic formulations.

DSUT-09

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Under the Supervision of

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**Title: Studies on sampling based multi-Viewpoints visual techniques for Efficient big data clustering**

## Abstract

Data clustering is one of the prominent unsupervised techniques to discover the partitions (or clusters) with the similarity analysis of data objects. It evolves the data clustering process in two steps: finding cluster tendency and deriving the data clusters. Top data clustering techniques like k-means, single pass k-means, and mini-batch-k-means are enabled effective data clusters with the knowledge of cluster tendency. Extracting the information related to several clusters is known as the clustering tendency. There are chances of poor data clustering results for incorrect cluster tendency values. Pre-cluster tendency assessment methods are surveyed to find the cluster tendency value. It found that visual techniques such as Visual Assessment of (cluster) Tendency (VAT) and Improved VAT (iVAT) are greatly used for the assessment of cluster tendency 'k'. Technologies such as social media, mobile computing, and the realization of the Internet of Things (IoT) generate an exorbitant amount of data every day, which faces the Big Data clusters assessment problem. Euclidean and Cosine have widely used distance metrics for measuring the similarity features between data objects in visual approaches. The cosine similarity measure is wildly successful for the estimation of clusters in most of the datasets. It uses an origin as a single viewpoint during measuring similarity features. Measuring the similarity features between two data objects using multi-viewpoints is more accurate; however, the current visual approaches cannot use the multi-viewpoints. Thus, the proposed framework contributes to the work towards developing visual approaches using multi-viewpoints. Social media datasets and other structured web-based datasets are in Big Data form, and the size of those datasets is comparatively immense compared to a large set of synthetic datasets concerning 5V properties of Big Data. For the big data, the multi-viewpoints-based clusters assessment approach faces scalability issues concerning the time and memory parameters. Thus, it is also proposed to develop the sampling-based multiviewpoints clusters assessment approaches for addressing time scalability problems. For highdimensional big data, state-of-the-art visual approaches demand high computational time due to the problem of the curse of dimensionality problem. With this fact, the Linear Subspace Learning (LSL) based visual approaches are developed in the part of the proposed work to handle the curse of dimensionality problem effectively. **Keywords:** Clustering tendency, Big data clustering, Similarity Computation Measures, Linear Subspace Learning, Sampling Strategy.

**DSUT-10**


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Under the Supervision of

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**Title: An energy efficient clustering and Routing using gso and aco in Wireless sensor networks**


## Abstract

In our day to day life, Wireless Sensor Network (WSN) plays a very important role, as the networks are widely used in different fields including the manufacturing and industrial automation, monitoring areas, military monitoring, underwater detection, the agricultural field, forecasting of weather, medical arena, defense field, networks of traffic control, and various other commercial uses as well. One of the most efficient techniques used for implementing the routing algorithms in WSNs is clustering, which maximizes the network lifetime and its scalability. The CH (Cluster Head) acts a vital role in the clustered WSN during the process of data transmission. So far, several research works have already existed based on cluster-based routing. Still, there exist problems of choosing the optimal cluster head to make the routing more efficient. Two major contributions have been made in this research work. In the 1 st contribution, a new hybrid algorithm known as the ACI-GSO approach (ACO integrated GSO) is proposed that hybridizes the concept of "ACO (Ant Colony Optimization) and GSO (Glowworm Swarm Optimization)" algorithms. Moreover, the Cluster Head node is chosen through the proposed ACI-GSO model in which the fitness functions are produced by multiple objectives such as energy, delay, and distance. At the final stage, the comparison is made between the performances of composed work with the existing schemes to certain measures. In contribution 2, a novel cluster-based routing approach was introduced by choosing the optimal CH. Furthermore, an algorithm called "GU-WOA" (Grey Wolf Updated Whale Optimization Algorithm) is executed in this work. A novel multi-objective function is defined in terms of various constrictions like security, delay, distance, and energy. At last, the performance of security-aware clustering with the GU-WOA model is validated and assessed over other customary models concerning standardized network energy, throughput, and thriving node analysis, correspondingly.

DSUT-11

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Under the Supervision of

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**Title: Detection of pathogens using 2-dimensional Photonic crystal biosensor**

## Abstract

Advancement in the electronics devices has brought optimistic impact in various sensing and communication technology. Fibre optic technology has changed the scenario of communication field and has influenced highly towards the sensing platform. Optical devices have become suitable replacement for electronic devices due to its efficiency and speed of operation. Photonic crystal technology is derived from optical sensor family, it is best candidate for rapid detection and it is label free, hence does not require any modification in the bio-sample. Photonic crystals are capable of manipulating the light, it can forbid propagation of certain frequency of light and it is key element for sensor design. Sensing mechanism of photonic crystal sensor mainly depends on the refractive index. In this thesis, we have proposed different photonic crystal sensors to detect various pathogens. Two-dimensional silicon based photonic crystal waveguide with point defect is designed for diagnosis of cervical cancer in females by using infected cervical bio-sample inside the slab column. Finite difference time domain analysis is carried on the structure and transmission plot is examined to detect the infected cells. Bent waveguide is proposed with holes inside the silicon material to detect different stages of malaria. Silicon dioxide ($SiO2$) material is used as base for sensing layer, at the top of its silicon slab with holes of radius 150nm is placed and it acts as sensing layer. Holes radius to holes spacing ratio (r/a) is kept at 0.28 to achieve noticeable sensitivity. Propagation of electromagnetic wave inside the sensor is characterized by the bio-sample inside the cavity, based on the refractive index of the blood sample corresponding wavelength shift can be observed in the output spectrum. Finally, we have modelled a multi-application PC straight waveguide biosensor capable of detecting Anemia, HIV and cholesterol using blood sample. Incident light has wavelength of 1500 – 1925nm, lattice constant to array hole radius (a/r) is kept at 3.23 and other parameters of sensor are fine tuned to achieve X compatibility in detection. Signature analysis for the diseases is carried using cross leaf angle in the polar plot.

**Keywords**- PC- Photonic crystal, RI- Refractive index, FDTD- Finite difference time domain, PCW- Photonic crystal waveguide, PBG- Photonic bandgap

Sharath M.N.
(ENG18PPCS06)
**Dept. of Computer Science and Engineering**

Under the Supervision of

Dr. Rajesh T M & Dr. Mallanagouda Patil

**Title: A robust model for securing the data in video Communication**

## Abstract

Recent improvements in internet and information technology have made it feasible to rapidly distribute multimedia content. Despite these technical advancements, personal data and information security remain vulnerable. In the contemporary Internet era, the ability to secure private information is crucial, and digital steganography offers this capability. Digital video has received the most attention from experts of all digital media due to its strong capacity to mask crucial information. Steganography, a method of concealing information, incorporates the cover's hidden message without altering it. Additionally, the embedding event can only be detected by the recipient. Security is perhaps the most crucial feature of top-notch steganography. The recent development of video steganography techniques has aided in preventing the theft of private information. However, these strategies have a number of issues, including distinctiveness, embedding ability, and durability. Several approaches have been proposed to address the shortcomings, including Optimal Metaheuristic-Based Pixel Selection with Homomorphic Encryption Technique for Video Steganography (OMPSHEVS), Modified Knight Tour Algorithm, and Encryption with Bacterial Foraging Optimization Algorithm-Based Pixel Selection Scheme for Video Steganography Technique, and Combination of Knight Tour and 7th Bit Model. The overall framework is carried out for different cover videos. The video quality at various bit rates is measured using PSNR in order to assess the steganography technique's performance. PSNRs are frequently employed in steganography algorithms to assess video quality. Firstly, in the OMPS-HEVS approach, frame conversion is performed at the initial stage and applied to wavelet decomposition, from which pixel selection takes place. Stego video is made using an embedding approach, and a secret message is obtained using an extraction technique. A PSNR value of 84 dB is obtained, which contributes to enhanced security. Secondly, a unique video steganographic technology makes use of a novel methodology that incorporates enhanced knight tour algorithms and a color shift analysis approach in additive color mode to guarantee security, robustness, and high concealment. It is more secure because the RGB color mode pixel shift is undetectable to an attacker. From the improved Knight Tour approach, a PSNR value of 84.86 dB is achieved. Thirdly, the secret message is effectively disguised in the cover video using a recommended EBFOA-PSVS approach, which also uses an optimal BFOA pixel selection. In order to achieve the maximum PSNR, the best pixels are then selected using BFOA. Finally, the encrypted hidden image is found in the cover video. This work achieves a PSNR value nearing 60 dB. Finally, a combined approach utilizing the knight tour and 7-bit model achieves a higher PSNR value of 85 dB, which is

better in contrast to other approaches examined. A comprehensive evaluation is performed on the proposed approach, and it is concluded that by utilizing the combined strategy of the knight tour and 7-bit model, improved security and PSNR value are achieved. Also OMPS-HEVS approach achieves PSNR value 85.34dB and MSE 0.00019 with SSIM 99.84%.
**Keywords**: Steganography, OMPS-HEVS, Knight Tour Algorithm, Homomorphic Encryption technique, EBFOA-PSVS, Color shift analysis, Discrete Wavelet Transform, Glow worm Swarm Optimization, Jaya Optimization Algorithm, Optimal Homomorphic Encryption.

Uma Vinod Kumar
(ENG17PPBS13)
**Dept. of Mathematics**

Under the Supervision of

Dr. Deepika. T

**Title: Surface Gravity Wave Interaction with Composite Porous Structures**

## Abstract

The objective of this study is to evaluate the hydrodynamic performance of a dual breakwater system comprising of a submerged rectangular porous structure and a thin floating flexible porous plate, in water of finite depth. Initially, an eigenfunction matching method is developed for the problem of oblique wave scattering by the floating plate. The effectiveness of the plate as a wave attenuator and its relative merits in comparison with rigid and impermeable plates is investigated. In the second part of the study, a detailed investigation of the hydroelastic response of a plate with a submerged structure directly beneath it, is carried out. The dispersion relation for this dual system is derived and the nature of the roots is analyzed using contour plots. Apart from scattering coefficients, wave loads on the submerged structure and the plate, plate deflection, etc. are also computed and analyzed to understand the effect of each of the components of the system on the other. The essential features of scattering by the coupled system are compared with those of its components, viz., plate and submerged structure. Finally, the floating plate is kept at a finite distance from the submerged structure to study the impact of the presence of the submerged structure and the distance between the two barriers on scattering by non-porous as well as porous flexible plates. The solution of the boundary value problems for the velocity potentials involves solving the modified Helmholtz equation by separation of variables and matching the vertical eigenfunctions across the domain interfaces. This method necessitates locating the roots of the complex dispersion relations that occur in fluid regions containing porous structures. The orthogonality of vertical eigenfunctions in the open water region is used to arrive at a system of linear equations, and Matlab codes are developed to solve this system numerically to obtain the hydrodynamic scattering coefficients, wave forces and plate deflection. The numerical schemes are validated by comparing with established results in the literature and the energy identity is derived. The results indicate that a porous flexible plate is more effective than an impermeable or rigid one in attenuating wave energy, with its enhanced ability to reduce both reflection and transmission, and withstand wave forces. When a submerged porous structure is present directly below a porous plate, there is only a marginal increase in its efficiency. On the other hand, addition of a thin plate cover to an existing low crested rubble mound can vastly improve its performance. A gap between the submerged structure and impermeable plate induces oscillation in scattering coefficients. The presence of the submerged porous structure would decrease wave loads on VLFS which are modelled as impermeable elastic plates, but reduces the efficiency of a thin floating porous breakwater.

**Keywords**: Scattering coefficients, eigenfunctions, dispersion relation, wave forces, energy dissipation, oblique waves

Trupti Shripad Tagare
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**Dept. of Electronics & Communication Engineering**

Under the Supervision of

Dr. Rajashree Narendra

**Title: Energy efficient duty cycle based futuristic Clustering technique for longer network Lifetime of wireless sensor network**

## Abstract
In the recent times, Wireless Sensor Networks (WSNs) and its applications have shown an exponential uptrend. It has also made substantial impact on several aspects of our lives and the society. Some of its major applications extend from biodiversity monitoring to automation in industries, transportation, heath surveillance systems, etc. WSNs enable the transmission of necessary data and aid in accurate remote monitoring of inaccessible geographical locations. These networks primarily aim to design and develop techniques for achieving optimum usage of network energy in order increase their lifetime. In this research work, existing energy-efficient clustering-based protocols namely, Direct communication technique, Low Energy Adaptive Clustering Hierarchy (LEACH) technique, Distance-based technique, Distance and energy based, Energy Aware Multi-Hop Multi-Path Hierarchical (EAMMH) technique, Enhanced Distributed Energy Efficient Clustering (EDEEC) technique, Stable Election Protocol (SEP), Power-Efficient Gathering in Sensor Information Systems (PEGASIS) and Mobile Sink Improved Energy-Efficient PEGASISbased Routing Protocol (MIEEPB) are implemented and comparative observations are established. Further, the research study formulates a Futuristic Clustering Technique (FCT) for achieving energy efficient network. In this study, an area with random sensor nodes is considered. Each node is energized to an initial value of E0 (Joules). Also, each sensor node is solar panel enabled. The clustering technique implemented is hierarchical-based wherein a Cluster Head (CH) is selected for each cluster. CH is responsible for collecting sensed data from other nodes in the cluster, aggregating the data and transmitting it to the Base Station (BS). Thus, the energy requirement of CH is higher than normal nodes. This concept is explored in the FCT to provide additional energy only to CHs only if its residual energy is below 5% of E0 (Joules). Parameters of network namely: consumption of energy, lifetime, and transmission of data packets are evaluated. Simulation outcome of the FCT shows improved energy efficiency and network lifetime. The technique delays the death of first node and thus enhances the network's stability. The lifetime of the FCT is assessed with Multi-Level Hybrid EnergyEfficient Distributed (MLHEED) techniques, LEACH, and its variants. Lifetime of network is improved by 13.35% compared to MLHEED-6 protocol. The energy consumption is reduced by 7.15%, 12.10%, and 14.97% compared to level 4, 5 and 6 of MLHEED protocol respectively. In FCT, all nodes are dead at 3459th round with the first node dead at 473rd round. The overall network energy consumption is 31.2892 Joules. Around 39.03% more data packets are transmitted to BS using FCT as compared to MLHEED-6 protocol. Next, the study concentrates on the illustration of the data aggregation process which reduces the quantity of data packets to be transmitted to BS. Although this aggregation might lead to loss of actual data, it helps in reducing energy

requirement during transmission. Realizing energy efficient networks is of prime importance and hence is considered appropriate in WSN. Adding confidentiality to aggregated data helps in sending the data more securely. Spread Spectrum Modulation (SSM) is a widely used technique to provide confidentiality in communication systems. In this study, a method of averaging the sensed values is adopted for data aggregation and SSM technique using Frequency Hop Spread Spectrum Modulation (FHSSM) on Binary Phase Shift Keying (BPSK) modulated wave is implemented to provide confidentiality to the accumulated data that needs to be carried from CH node to BS. Modulated and demodulated signals, spread and de-spread sequences, Bit Error Rate (BER) of BPSK/FHSSM over Rayleigh flat fading channel and Power Spectral Density (PSD) of frequency hopped signal are visualized using plots. The results show that the BER value decreases from 10^-1 to 10^-4 with increase in Signal to Noise Ratio (SNR) from 0 to 25 dB. After appending confidentiality to the aggregated data, the results show that the maximum power consumption in the network is 7.518 mW at 5MHz frequency. Thus, the proposed work promises efficient energy consumption, longer network lifetimes with reinforced confidentiality. Duty cycle plays an important role to reduce the energy requirement in WSN. A Duty Cycle Based Futuristic Clustering Technique (DCBFCT) is implemented using the nearest neighbour approach, which selectively puts the nodes into sleep and awake modes. This reduces the network's overall energy consumption and thereby increases its lifetime. Based on distance, the optimum values for node duty cycle are obtained. The results show a further reduction in terms of energy consumption from 31.2892 Joules (as in FCT) to 27.5265 Joules on implementation of DCBFCT. In this approach, the death of first node is recorded at 758th round whereas the same technique when implemented using FCT has its first node dead at 473rd round. With DCBFCT approach there are still 9 alive nodes at the end of 5000 rounds while all nodes would die at 3459th round when implemented without the duty cycle approach. The entire work is carried out on MATLAB/Simulink tool. Here, different scenarios are considered for simulation like varying the number of nodes, rounds, and area considered for monitoring. The results are tabulated to estimate the performance of the a etwork. A simulation is run with all the concepts designed depicting normal nodes, CH, data transmissions and BS. The results show that the proposed technique helps in achieving energy efficiency and a longer network lifetime. In future, the study can be extended to investigate the impact of duty cycle to reduce data packet collisions. DCBFCT can be implemented in hardware to realise a real-time Internet of Things (IOT).

**Keywords**: Wireless sensor network, clustering, cluster head, number of rounds, heterogeneity, energy efficiency, lifetime, data aggregation, spread spectrum modulation, frequency hopping, Rayleigh flat fading, power spectral density, Fast Fourier transform, bit error rate, duty cycle.

**DSUT-15**


Sunil Kumar C

(ENG18PPEC03)

**Dept. of Electronics and Communication Engineering**

Under the Supervision of

Dr. Puttamadappa C

&

Dr. Chandrashekar Y L


**Title: Design, Simulation and Analysis of Advanced micro-grid controller with Inverter for Power Quality Improvement in Solar PV Systems**

## Abstract


Power quality (PQ) is the main restriction in contemporary power networks due to the rising integration of grid-connected photovoltaic (PV) systems. In the first study, a three-phase gridconnected PV system with a reactive and active power controller is used to raise the PQ of the Seagull Optimization Algorithm (SOA). The Fly back converter using Bacterial Foraging Optimization Algorithm (BFOA) to track the maximum power from the PV panels and the recommended SOA optimized controller for the grid-integrated three-phase inverter are the two main controllers in this proposed system. A three-phase Modular Multilevel Inverter (MMLI) is being used to integrate PV into the grid. The MMLI controls the active and reactive power using a SOA-optimized controller and grid voltage. The new aspect of the suggested system is how it increases PQ while using the BFOA and SOA optimization algorithms to provide the most power possible and enhances active power from non-linear PV. In order to improve PQ, the suggested control approach must reduce power entering the inverter by controlling the instantaneous active and reactive powers. The suggested SOA controller feeds the grid with the most power possible from the BFOA-optimized PV array. Moreover, it might lessen the compensation for harmonic and reactive power. PQ mitigation techniques are described in the literature however they do not improve performance under critical load levels. The SOA-based Z Source Inverter (ZSI) is used in the second study to empower actual power by balancing the need for reactive power in the grid-connected PV system. The SOA algorithm helps to totally alleviate the PQ concerns by allowing control of the ZSI. The primary goal of the proposed technique is to empower actual power in a gridconnected PV system and correct reactive power transfer. The grid-connected PV system manages the voltage and current through the ZSI using the predicted technique. The suggested system is set up and duplicated on the MATLAB/Simulink platform, and its results are compared and evaluated using earlier developed techniques.



**Keywords**: Bacterial Foraging Optimization Algorithm (BFOA), Seagull Optimization Algorithm (SOA), Z – Source inverter (ZSI), Sliding mode controller (SMC) and Power Quality (PQ)

RANJITH B
(ENG19PPEC10)
**Dept. of Electronics and Communication Engineering**

Under the Supervision of

Dr. Saara K &
Dr. Preeta Sharan

**Title: Design and development of mems based Optical sensor for biomedical Applications**

## Abstract

variety of integrated optical distributed Bragg reflector (DBR) structures are being investigated in an effort to find novel bio-sensing technologies that could be applied to multipurpose integrated silicon photonics in bio-medical applications. Within the purview of this thesis, work has been done on everything from simple ideas to unique device designs, as well as on the optimization of the theoretical model, spectral characterization and analysis of these devices for their suitability to sense various biological and physiological parameters of the human body. The goal of the proposed work is theoretical design and analysis of one-dimensional photonic crystal sensor for biomedical applications. Transfer/Characteristic Matrix Method (TMM/CMM) is used to theoretically model, design and analyze the proposed one-dimensional DBR structure. TMM results can be validated with practically fabricated DBR structure with good accuracy. The proposed DBR structure can be validated for its accuracy by fabricating the device. The proposed DBR structures can be fabricated using Chemical Vapour Deposition (CVD), sol-gel, or electron beam lithographic techniques. Initially, a micro-fluidic device has been designed and analysed to separate the different blood components. The most widely used dielectrophoresis (DEP) approach for manipulating particles is described in this work. Since it is one of the most widely used methods for particle separation, it can be used to separate the two main blood components RBCs and platelets. The size, shape, and other structural characteristics of the blood cells can be used by doctors to make a number of serious diagnoses. Lab-on-a-chip (LOC) devices are the most popular concepts in chemical and biological management for the quickest and most accurate analysis of chemical or biological components. An FEM tool is used for designing and to analyse the proposed structure. Next, by altering the electrode's width and height allows us to examine the impact of its physical dimensions on the separation voltage. To determine the distribution of the electric field inside the channel, the potential distribution within the micro-fluidic channel is also investigated. By examining the findings, the optimal design for the segregation of blood components with the minimum amount of applied voltage is chosen. Due to cell viability, one of the parameters taken into account while constructing microfluidic channels is the minimum voltage needed for particle segregation. In order to select the optimal LOC for biomedical applications, an optimized micro-fluidic device structure is chosen. S econdly, a DBR structure is proposed as a bio-sensor to sense the presence of malignant cells in the test sample. First, in order to detect the presence of oral cancerous cells in the analyte, a DBR sensor Fabry Perot Micro-cavity is designed and examined. The sensing capabilities of the proposed structure with a central micro-cavity and three pairs of high and low refractive index layers on either side of the defect are examined. For the measurement of sensor performance, five normal (INOK) cells and oral cancerous (YD-10B) cells are taken into account. It is then analysed

to determine how variations in the geometric length of the central defect layer and the quantity of DBR layers affect the resonant wavelength, sensitivity, and Q factor. A very high sensitivity of 3630nm/RIU is achieved for the proposed design. Next, a DBR structure with central cavity is proposed for the detection of Plasmodium falciparum which causes malaria disease. Early malaria detection is crucial in medical applications. In the host RBC cells, P. falciparum progresses through a variety of erythrocytic phases. It is crucial to identify these infected RBC stages using the proper diagnostic methods. Proposed structure is useful for the early detection of these infected cells. A high sensitivity and Q factor of 4,500nm/RIU and 8,333 was achieved for the proposed design. Thirdly, a sensitive temperature sensor is proposed using DBR structure to monitor and measure cryogenic temperature and high temperature over wide range. First, a DBR temperature sensor was designed and analysed to measure cryogenic temperature between 0 and 120K. Gallium arsenide (GaAs) was used to measure the change on temperature. Since the dielectric constant of GaAs depends on temperature, it can be utilized to monitor and measure temperature changes. We attained a Q factor of 3,534 and a high sensitivity of 1.525 nm/K. The suggested sensor is appropriate for use in the applications that require precise low temperature measurement. Next, to monitor temperature across a wide range, a highly sensitive temperature sensor is presented using multi-layer Bragg Reflector (BR) structure. Temperature affects the parameters of many semiconductor materials, including germanium. In order to model and design the suggested sensor, we took the RI dependency of germanium material with temperature into consideration. To find the resonant mode for an incident electromagnetic wave, a cavity layer is added to the multilayer structure's core. The sensor can measure temperatures over wide range between 100K and 550K. The obtained sensor's RI sensitivity, Q-factor, and temperature sensitivity are 2,323nm/RIU, 11,5000, and 1.18 nm/K. Fourthly, a sensitive optical pressure sensor was investigated and proposed using DBR s tructure to measure low pressure as well as high pressure. First, a one-dimensional silicon photonic crystal DBR is used as a highly sensitive low pressure sensor to monitor the applied hydrostatic pressure. The top of the structure is made by a 1D flexible silicon layer. With the applied boundary pressure, this sensing layer bends in downward direction. When 1D PC is stressed, its effective refractive index is changed, which causes the resonant mode wavelength to propagate through the structure at a different wavelength. The resonant mode was observed to shift towards a higher wavelength region as the applied pressure was changed from 10kPa to 20kPa and from 0MPa to 10MPa. To achieve the best possible outcomes, the defect cavity length and number of DBR layers are fine tuned. According to the results of the simulation, the suggested sensor has a very high sensitivity of 350nm/GPa, a Q-factor of 40,104, with transmission of 99.99%. Finally, an FBG based pressure sensor was developed using single mode fiber (SMF) to monitor and measure the radial artery pulse pressure experimentally. The design and experimental testing of an optical sensor based on Fiber Bragg Gratings along with 3D device fabricated was used to measure the radial artery pulses. One of the diagnostic tool for clinical evaluation and disease diagnosis is a Pulse Waveform Analysis (PWA). Clinical research has looked into high fidelity radial artery pulse waveforms for calculating central aortic pressure, which has been shown to be a predictor of cardiovascular illnesses. The proposed sensor is used for the purpose of measuring the radial artery pulse waveform across major pulse position point. The suggested optical sensing system can measure the pulse signal with good accuracy. The main characteristic parameters of the pulse can then be retrieved from the processed signal for their use in clinical applications. The findings show that combining optical technologies for physiological monitoring and FBG sensor for radial artery pulse waveform in clinical applications are highly feasible.

**Keywords**: Photonic Crystal, Distributed Bragg Reflector, Characteristic Matrix Method, Cancerous Cells, Temperature, Pressure, Radial Artery Pulse.

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(ENG17PPBS14)

**Dept. of Mathematics**

Under the Supervision of

Dr. Anuradha Bhattacharjee

**Title: Mathematical Modelling of Cardiovascular System**

## Abstract

This study is motivated by a desire to understand blood flow through stenosed and aneurysmic arterial segments of varying cross-sections, particularly through coronary and aortal arterial segments. Several mathematical models considering the Newtonian and non-Newtonian models for blood are presented and their predictions in a variety of circumstances are investigated. This process is repeated for the seven different scenarios under study which vary in complexity and realism. The structures considered for each of the cases varied from rigid wall models to elastic wall models including two-layer configurations for the arterial walls. Initially, the need for mathematical models to analyze the blood flow in a diseased artery is discussed and a brief recap of the available research in this field is presented. This is followed by a short note on the formation of atherosclerotic plaque and aneurysms is revealed. The details of the FEM solver, the steps involved in preparing the solver, the methods to reduce the error, and the flow of the process are discussed. As blood behaves as both Newtonian and non-Newtonian, depending on the flow conditions, the study considers both the properties of blood according to the convenience of the topic under study. The different non-Newtonian models studied are the Carreau model, Bingham model, Herschel Bulkley model, Casson model, and the power law model. The best-suited non-Newtonian model for blood is investigated and the results obtained using the Carreau model are more promising than the other models. Arteries carry several chemical components in the matrix of blood. The chemical species include oxygen molecules, LDL molecules, the Aspirin molecules depending on the nutrition intake as well as the pathological conditions. The transport patterns of these chemical species are discussed by considering blood to be a Newtonian fluid. The relative concentration profiles of LDL and oxygen molecules are investigated and an inverse interrelation is discovered. In recent times around the world, the most discussed and worried topic is the causes and effects of coronavirus. One of the prominent alterations made to the blood by the virus is the increase in its viscosity. The hyperviscosity of blood in atherosclerotic and aneurysmic patients is investigated by assuming the Newtonian behavior of blood. The study suggested that the hyper-viscous effects further worsen the condition of stenosis and aneurysm leading to accelerated progression of the plaque and sac. The rapid progression of plaque and sac approach a threshold condition subsequently leading to the rupture and hence the thrombosis. The results obtained on solving the mathematical models using the FEM solver are used to draw conclusions and drawbacks of the assumptions made in the current study. The clinical significance of the study is mentioned with the recommendations for future study.

**Keywords:** Atherosclerosis; Aneurysm; FEM solver; Low-density lipoprotein; Hyperviscosity; Wall shear stress; Von Mises stress.

Mukti Chaturvedi
(ENG18PPEC08)

**Dept of Electronics and Communication Engineering, School of Engineering**

Under the Supervision of

Dr. Arungalai Vendan S

**Title: Experimental & simulation studies of magnetically impelled arc butt Welding of mild steel tubes**

## Abstract

Magnetically Impelled Arc Butt (MIAB) welding is a unique process which involves complex interactions of an electric arc with applied and induced magnetic fields. This process involves the application of concepts from various interdisciplinary areas such as physics, magnetism, electrical, mechanical, metallurgical and arc sciences. It has the features of shorter weld cycle, weld reproducibility, lesser input energy requirement and minimal loss of material. In comparison to other solid-state welding processes, MIAB welding has the advantage of cost-efficient welds with better control and reliability. In the MIAB welding technique, magnetic flux density and current interact to create Lorentz force that impels the arc along the faying surfaces. The impelled arc leads to the heating of the parts being welded. The result is a swift welding process that offers considerable cost savings for a range of joint configurations. The application of MIAB welding had largely been confined to small wall thickness and for low pressure applications. It is suitable for joining ferrous tubes in customisable applications. Though, presently not in full use, applications of MIAB can be extended to boilers, heat exchangers, furnace piping in petrochemical industry and other safety critical high-pressure machinery parts. Control methods are being researched for efficient heating for the MIAB welding of thick-walled tubes and solid parts. MIAB welding is a relatively less explored technique of material joining and the literature available is inadequate to some extent. Considering the numerous advantages of MIAB welding, this study is undertaken to extend the process to mild steel tubes AISI 1018 and add more interdisciplinary insights to the existing literature. The outcome of this research study will encourage industries to adopt this process for manufacturing on a regular basis. This will eventually increase productivity and quality while minimising the utilised power and the incurred cost. Various aspects of the design of the MIAB welding are realized with simulation studies that encompass mechanical, electromagnetic and the electrical system using MATLABSimulink software. In order to determine the optimal parameter, set, the input parameters to the simulation models are varied and the components properties are also modified with different hydraulic, magnetic and electrical systems. This also includes varying the welding current and arc voltage. Observations through variations of these factors and components, helped to bridge the gap of inadequate information about the process control and dynamics. MIAB welding trials are performed on MS tubes of outer diameter 27mm and with thickness between 2-3mm. The machine parameters and components are designed to suit the requirements of tube welding of these geometries. This study then presents the results of the mechanical and metallurgical tests carried out on the welded samples. Destructive tests such as Tensile test, Bend test (root and face), Hardness, Charpy Impact and Petal test are conducted and the results are discussed in detail. Metallurgical characterisation is performed that involved macro and micro structural investigations

and SEM study for fracture analysis. Testing and characterisation results revealed good weld strength and metallurgical integrity. Non-destructive testing such as Liquid Penetrant test, Magnetic pulse testing and Radiography Test are also carried out on the welded tube samples. These tests helped in the detailed analysis and also aided arriving at the optimum weld parameters for efficient welds. X-ray diffraction analysis is also carried out to analyse the particle size, particle shape, the chemical composition, and the strain at the base and the weld sections. Besides, machine learning algorithms are used for classification, establishing parametric interdependency and optimisation of parameters and for predictive analysis. Machine learning algorithms named logistic regression and linear regression have been used to arrive at the regression equation to establish the relation between reinforcement height and HAZ and the process parameters. The last segment of this study provides a techno-economical evaluation of MIAB process with the conventional solid-state welding processes - Flash Butt Welding and Induction Pressure welding. For the comparative analysis, the total electrical energy input per weld, the overall cost per weld and weld cycle duration are considered. The future scope of study may include use of shielding gas during the MIAB welding process and assessment of its impact on the welded joints. This welding process can be implemented for the welding of dissimilar metals and non-ferromagnetic materials. The initial tube gap setting determines the arc length during the initiation of the arc. During this study, only a small range of gap setting lengths were analysed and was observed to be a factor of importance. Hence, for future work different gap settings with a greater range can be tried while welding mild steels using MIAB welding process. Hence, through this research, the feasibility of MIAB welding for mild steel tube welding for automobile applications is established. Introduction of new science for automotive welding which is a pivotal strive amongst rivals and the possibility of inclusion in all academic/research curriculum are the predominant advantages from this research outcome.
**Keywords:** Welding, MS1018, Electromagnetism, Material Joining, Arc, Thermodynamics

# Funded Research Projects

| SL. NO | Project Title | Funding Agency | Principal Investigators | Project Duration (Months) | Total (Estim atedin lakhs) | Department |
|---|---|---|---|---|---|---|
| 1 | Design and Development of low cost (rGO)/Si doped tungsten trioxide (WO3) based Gas sensor for human breath analysis applications | Indian council of Medical Research (ICMR) | Dr. K. Vijaya Kumar | 36.00 | 26.4 | SOE-PHYSICS |
| 2 | Digital Twin-Smart Tool Holder | CMTI | Dr. Suresh Nagesh | 12.00 | 8.00 | SOE-MECHANICAL |
| 3 | Automated Weld Detection System | CMTI | Dr. Suresh Nagesh | 12.00 | 8.00 | SOE-MECHANICAL |
| 4 | Smart heat treatment system | CMTI | Dr. Suresh Nagesh | 12.00 | 8.00 | SOE-MECHANICAL |
| 5 | Graphene Oxide (GO) and reduced graphene oxide (rGO) based nanomaterials for photothermal supercapacitor applications | SERB | Dr. Yogesh Kalegowda | 36.00 | 30.00 | SOE-PHYSICS |
| 6 | Magnetoelectric Spin orbit (MESO) logic for the energy-efficient, beyond CMOS computing applications | SERB | Dr. Suresh Pittala | 36.00 | 50.00 | SOE-PHYSICS |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | DST-IIT Kanpur Integrated Clean Energy Material Acceleration Platform on Materials | DST | Dr. Rupam Bhaduri | 36.00 | 30.35 | SOE-ECE |
| | **Total Funding: INR 160.75 Lakhs** | | | | | |

# Consultancies & Trainings

| Sl. No. | Name of the Faculty | Consultancy Awarded Agency | Type of work |
|---|---|---|---|
| 1. | Dr. Suresh Nagesh | QP India as a Chief Technical Consultant | QuantumPoint Pvt Ltd |
| 2. | Prof. Susweta Das | Coordinate and participate with VASLR to develop skill-building courses and curricula suitable for UG and PG students. | Global Village SEZ |
| 3. | DSU | CORPORATE TRAINING PROGRAMME ON 'AUTOCAD' held from 2nd to 13th August 2021 | BUHLER INDIA, ATTIBELE, KARNATAKA-562107 |
| 4. | DSU | CORPORATE TRAINING PROGRAMME ON 'AUTOCAD' held from 4th to 19th April 2022 | BUHLER INDIA, ATTIBELE, KARNATAKA-562107 |
| 5. | DSU | OJT Programme held on 4th May to 17th june 2022 | Strides Pharma |
| 6. | DSU | CORPORATE TRAINING PROGRAMME ON 'AUTOCAD' held from 22nd Sep to 1st Oct 2022 | BUHLER INDIA, ATTIBELE, KARNATAKA-562107 |
| 7. | 1. Dr. Shaila S G<br>2. Dr. V Revathi<br>3. Dr. Basavaraj N Hiremath<br>4. Dr Kiran Malagi<br>5. Dr. Jayita Saha<br>6. Dr. Komala | Academic Teaching for MTech students of Central University of Andhra Pradesh, Anantapuramu, Andhra Pradesh (17.12.2021) | Central University of Andhra Pradesh, Anantapuramu, Andhra Pradesh |

## Summary of Publications, Sponsored Projects & Consultancies 2022-2023

| Schools | School of Engineering | School of Basic& Applied Sciences | School of Health Sciences | School of Medical Education & Research (CDSIMER) | School of Commerce& Management Studies | School of Arts, Design & Humanities | TOTAL |
|---|---|---|---|---|---|---|---|
| International Journal Publications | 127 | 27 | 29 | 10 | 05 | 0 | **198** |
| National Journal Publications | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| International Conferences | 67 | 02 | 0 | 0 | 01 | 0 | **70** |
| National Conferences | 02 | 0 | 0 | 0 | 0 | 0 | **02** |
| Book Chapter(s) | 16 | 02 | 02 | 0 | 0 | 0 | **20** |
| Total | 212 | 31 | 31 | 10 | 06 | 0 | **290** |
| Patents | 67 | | | | | | |
| Sponsored Projects | **07**<br>**ICMR: 01**<br>**DST: 01**<br>**SERB: 02**<br>**CMTI: 03** | | | | | | **07** |
| Consultancies<br>Trainings | 02<br>04 | 01 | | | | | **07** |