



# IEEE RASSE 2023

IEEE International Conference on  
Recent Advances in Systems Science and Engineering  
November 8-11, 2023 // Saintgits College of Engineering (Autonomous) // Kerala, India



## RASSE 2023 CONFERENCE PROGRAM

Please visit our website  
for more information!  
[2023.ieeerasse.org](https://2023.ieeerasse.org)

### SPONSORS AND ORGANIZERS



## Message from the Executive Chairman and Secretary

With immense pleasure, I welcome all the participants for the 3rd IEEE International Conference on Recent Advances in Systems Science and Engineering (RASSE 2023). I would like to convey my appreciation to the organizing committee for their unwavering dedication in making RASSE 2023 possible.

Saintgits College of Engineering has consistently served as a hub of opportunities for engineers and researchers alike. In the post-COVID world, the significance of systems science and engineering has grown immensely, as it now plays a pivotal role in integrating various fields to better serve society.

RASSE 2023 serves as a forum for sharing cutting-edge research results, innovative ideas, discussions on industrial practices, and the exploration of future research areas across the spectrum of systems science and engineering. This includes science, technology, methodologies, and applications of systems, integrated systems, cyber-physical systems, and system-of-systems, among others.

I have full confidence that the technical sessions, featuring eminent speakers from renowned organizations worldwide, will provide a unique opportunity to delve into uncharted territories and tackle the pressing challenges of our evolving industry.

I wish the conference a grand success.

Punnoose George  
Executive Chairman & Secretary  
Saintgits Group of Institutions



## Welcome Message from the General Co-Chair

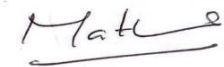
Following the second IEEE International Conference on Recent Advances in Systems Science and Engineering (RASSE) which was held in National Cheng Kung University, Tainan, Taiwan during November 7-10, 2022, the 3rd IEEE International Conference in this series (RASSE 2023) is being held at Saintgits College of Engineering (Autonomous), Kottayam, Kerala, India during November 8-11, 2023. This conference is sponsored by IEEE, IEEE Systems Council, and IEEE Kerala Section.

RASSE 2023 aims to bring together academicians, researchers and engineers to exchange state-of-the-art research and innovations, to discuss industrial practices, and to analyze technology trends and the future challenges in all aspects of systems science and engineering, on a single platform, for four days.

I am delighted that the conference has received an overwhelming response from India and abroad. Fifteen keynote talks will be delivered, and about a hundred research papers will be presented in the Technical, Tutorial, Special, Ph.D. Forum and Workshop sessions. A whole-day long Industry Forum on Nov. 10 will bring together industry leaders from India and abroad, working in frontier areas and on cutting-edge technologies, to deliver keynote talks, and engage in panel discussions on the theme "Generative AI/AGI, Exponentially Disruptive Technologies (EDT) Catalyzed by Industry 6.0/2030, Metaverse, Blockchain and Quantum Computing, among other aspects.

As one of the General Chairs, it was a pleasure to work with Dr. Andy Chen and his colleagues at IEEE Systems Council, and the entire organizing team from India and abroad.

As the host institute, we at Saintgits College of Engineering feel honored to welcome each one of the participants. I am sure that RASSE 2023 will enrich your knowledge, expose you to new disruptive technologies, and enable networking and collaborations. I hope that you will have a comfortable stay, and you will find some time to explore the natural beauty of Kerala, the "God's Own Country".



Dr. M D Mathew  
General Co-Chair, RASSE 2023



### **Dean (Research)**

Saintgits College of Engineering

### **Associate Provost**

Saintgits Group of Institutions

Pathamuttom P.O., Kottayam, India

dean.pg@saintgits.org

## Welcome Message from the General Co-Chair

Welcome to the IEEE International Conference on Recent Advances in Systems Science and Engineering (RASSE) 2023. This is the inaugural event for the new IEEE Systems Council flagship conferences in India. The planning of this event started in September of 2022. Our tremendously hard working and resilient the conference organizers have created a high-profile, leading-edge, interactive forum for researchers, engineers, practitioners, and educators to exchange state-of-the-art research results and innovations, to discuss industrial practice, and to define the future research topics in all aspects of systems science and engineering. This event will break many new grounds for the IEEE Systems Council. This is the first in-person Systems Council international conference in India. We are very pleased that we received support from all levels of government, and universities. And it's the first time we've dedicated a full day for the Industry Forum, which brings together over 20 industry leaders and experts around the globe to talk about different and exciting topics in all areas around the Exponentially Disruptive Technology (EDT).

I would like to welcome Ministry of Electronics & Information Technology, APJ Abdul Kalam Technological University, and Kerala State Council for Science, Technology & Environment as sponsors for this conference. We have amazing lineup of keynote speakers who have taken their valuable time to share their invaluable thoughts and insights. I would also like to acknowledge the exceptional work of our conference team:

M D Mathew, General Conference Co-chair  
Shiyun Hu and Sudha T, Technical Program Co-chairs  
Sudha T and Usman Munawar, Treasurers  
Chintan Oza and Jubilant J Kizhakkethottam, Regional Organizing Committee Co-chairs  
Vinayakumar B and Antony Joseph, Publicity Co-chairs  
Binson V A, Publication chair  
Pradeep C. and Mahendran N, Workshop Co-chairs  
Bernard Fong and Anju Pratap, Special Session Co-chairs  
Harinarayanan Nampoothiri M G, Tutorial Chair  
Mithun Chittilappilly and Naveen John Punnoose, Industry Forum Co-chairs  
Arun Madhu and Ajith Ravindran, Ph.D. Forum Co-chairs

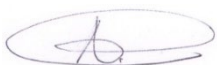
Another big thanks go to Alexis Wisdom from Conference Catalysts for providing administration and technical support around the clock throughout the entire period of planning this conference.

The IEEE RASSE 2023 Technical Program Committee has selected 85 excellent technical papers from 282 submissions to be included in the proceeding of this conference. These tracks include Machine Learning, Control Systems and Network, VLSI Embedded Systems, Signal Processing and Control Systems. Robotic and Control Systems, Computer Systems and Networks, and Energy and Power Electronic Systems. In addition, we're also including a PHD Forum and two tutorial sessions. This is an opportunity to transform your mindset and interact with academic and industry leaders from top-notch companies and many influencers from the region and around the globe. We hope that through common efforts devoted to solving real-life industry challenges, we might spark some new and fruitful collaborations.

I would like to close my remarks by thanking our conference host, Saintgits College of Engineering. I'd like to congratulate Saintgits College of Engineering being granted Autonomous status by the University Grants Commission (UGC), making the institution one among the first three Engineering Colleges in Kerala to achieve this coveted status. The status was conferred in recognition of the academic excellence, expert faculty, industry connect, placement records, extracurricular activities and state of the art infrastructure offered by the institution. Saintgits is the only unaided institution in Kerala with 7 NBA accredited programmes. Special thanks go to Dr. George Punnoose for his vision and unwavering support for this international conference.

If you are not already an IEEE member, I would encourage you to check out our website [ieee.org](http://ieee.org) to learn more about the value and benefits of joining our global community.

Most of all, I would like to thank you all for participating and contributing to this event. I sincerely hope you will enjoy the sharing today discussions, learning, and networking, and I hope to see you all again soon at one of our upcoming conferences as well.



Andy Chen  
General Co-Chair, RASSE 2023



## Message from the Chairperson, IEEE Kerala Section

Greetings from IEEE Kerala Section!!!

IEEE Kerala Section formed as a Subsection under the then India Section in 1975. Kerala Section became a full Section on 18 Nov 1983. As of 31 December 2022, Kerala Section is the largest among 344 Sections across the globe with 15, 402 members. As of now, Kerala Section is with 2 subsections, 16 technical Society Chapters, 4 Affinity Group Chapters, council on RFID Chapter, SIGHT Community group Chapter, 100+ active Student Branches and 350+ Student Branch Chapters and SB Affinity Group Chapters.

Kerala Section organized its first international conference on "Recent Advances in Computational Systems (RAICS 2011)" at Mascot Hotel, Trivandrum in July 2011. The first int'l conference technically supported by Kerala Section was the "IEEE PES Innovative Smart Grid Technologies Asia (ISGT Asia 2011)", organized by Power and Energy Society Kerala Chapter and held at The Quilon Beach Orchid, Kollam in December 2011.

At present we are having our own two international conferences, namely RAICS and SPICES (Signal Processing, Informatics, Communication and Energy Systems) held in alternate years. We have also organized Region 10's flagship int'l conference, "TENCON 2019" at Grand Hyatt Kochi in Oct 2019, organized IEEE India Council's flagship int'l conference, "INDICON 2022" at CUSAT Kochi in Nov 2022, IEEE Women in Engineering Affinity Group's "Women in Engineering International Leadership Summit "WIE ILS 2022" at Hotel Udaya Samudra Kovalam in July 2022, and so on.

This year we are supporting 14 IEEE international conferences. Ten conferences are already over.

The one at Saintgits College of Engineering (Autonomous), the flagship conference of IEEE Systems Council, IEEE International Conference on Recent Advances in Systems Science and Engineering (RASSE 2023) aims to create a high-profile, leading-edge, interactive forum for researchers, engineers, practitioners, and educators to exchange state-of-art research results and innovations, to discuss industrial practice, and to define the future research topics in all aspects of systems science and engineering.

As the Chairperson of IEEE Kerala Section, I congratulate the organizing committee, the program committee Chairs, the technical committee, and everyone involved in making this conference a reality.

I wish all the success to RASSE 2023 and to Saintgits College of Engineering.

Prof. Muhammed Kasim S  
Chair, IEEE Kerala Section  
Email: smkasim@ieee.org



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## About Saintgits College of Engineering

Saintgits College of Engineering is an autonomous premier educational institution. It is rated as one of the top three engineering colleges in the State of Kerala, India, in the self-financing sector (<https://saintgits.org/engineering-college/>). The college offers nine undergraduate engineering programs (B.Tech.), eight postgraduate engineering programs (M.Tech.), postgraduate program in Computer Applications (MCA), postgraduate program in Business Administration (MBA), and Ph.D. programs in all branches of Engineering, Business Administration, Mathematics, Physics and Chemistry. The college has about 3000 students and 350 faculty members. More than fifty percent of the faculty members are having Ph.D. degree/ pursuing Ph.D. research. Most of the undergraduate and postgraduate programs are accredited by the National Board of accreditation (NBA).

Founded by a group of pioneering educators, Saintgits College of Engineering seek to expose young minds to the world of technology and encourage all-round development of the mind. Our team of dedicated and caring faculty works with the student to reach academic excellence through a scientifically devised methodology. The high quality of our graduates, many of who have been university rank holders, and our distinctive results and placements are proof of the great distance we have travelled in 20 years. Saintgits College of Engineering has been granted Autonomous status by the University Grants Commission (UGC). The status was conferred in recognition of the academic excellence, expert faculty, industry connect, placement records, extracurricular activities and state of the art infrastructure offered by the institution.

The college follows research and innovation-driven teaching-learning processes along with soft and hard skilling. At Saintgits, the mission is to educate and train students for overall leadership in industry, research, and all other spheres of life with focus on the learning outcomes of the students.



## About RASSE 2023

The 3rd IEEE International Conference on Recent Advances in Systems Science and Engineering (RASSE 2023) will be held during November 8-11, 2023. The first conference in this series was held in 2021 in Shanghai, China. The second conference was held in 2022 in Tainan, Taiwan. RASSE 2023 will be organized and hosted by Saintgits College of Engineering (Autonomous), Kottayam, Kerala. The conference is sponsored by IEEE Systems Council, IEEE and IEEE Kerala Section. RASSE 2023 aims to create a high-profile, leading-edge, interactive forum for researchers, engineers, practitioners, and academicians to exchange state-of-the-art research and innovations, to discuss industrial practices, and to define the future research directions in all aspects of systems science and engineering.

RASSE 2023 is structured into several tracks – Technical Sessions, Industry Forum, Special Sessions, Workshops, Tutorials, and Ph.D. Forum. International experts in the above areas will be delivering Keynote and Invited talks. More than 200 delegates from India and countries around the world will be participating in the conference.

## Organizers

### General Co-Chair

Andy Chen

### General Co-Chair

M D Mathew

### Technical Program Co-Chair

Shiyan Hu

### Technical Program Co-Chair

Sudha T

### Industry Forum Co-Chair

Naveen John Punnoose

### Industry Forum Co-Chair

Mithun Chittilappilly

### Ph.D. Forum Co-Chair

Arun Madhu

### Ph.D. Forum Co-Chair

Ajith Ravindran

### Special Session Co-Chair

Anju Pratap

### Special Session Co-Chair

Bernard Fong

### Publications Chair

Binson V A

### Workshop Co-Chair

Pradeep C

### Workshop Co-Chair

Mahendran N

### Tutorial Chair

Harinarayanan Nampoorthiri M G

### Regional Organizing Co-Chair

Chintan Oza

### Regional Organizing Co-Chair

Jubilant J Kizhakkethottam

### Publicity Co-Chair

Vinayakumar B

### Publicity Co-Chair

Antony Joseph

### Treasurer

Usman Munawar

### Treasurer

Sudha T

### Conference Management

Conference Catalysts, LLC



## Conference Sponsors



## Host Institution



## National Sponsors



MINISTRY OF  
**ELECTRONICS &  
INFORMATION TECHNOLOGY**  
GOVERNMENT OF INDIA

## Centre for Engineering Research and Development (CERD)

Centre for Engineering Research and Development (CERD) was established in the campus of College of Engineering, Trivandrum, with the objective of augmentation of research activities in the state as well as to inculcate a research culture among the students and faculty of the department. The centre has been registered as a society under the charitable societies act. CERD is now functioning under APJ Abdul Kalam Technical University. Satellite centres are established in Engineering Colleges to facilitate the functioning of CERD. The Innovation centres are also established in Engineering Colleges to facilitate the development of innovative products. Regular interactions with innovators are being arranged on a regular basis to kindle the creative ability of the students.

Various schemes are implemented by the University to motivate, mentor and support researchers. Necessary financial assistance is being provided to carryout research and translate innovative ideas to prototypes. The Centre acts as a catalyst to create an environment conducive to research and helps to enhance the research culture in the institutions. Main schemes under CERD are Scheme for financial assistance to student project, Research Seed Money for young research faculty, Researcher of the Year award, financial assistance to attend seminars and conferences abroad.



Science for  
Humanity  
and Technology  
for Society

# Kerala State Council for Science, Technology and Environment



Sasthra Bhavan, Pattom P. O., Thiruvananthapuram-695004, Kerala State, India  
Tel: 0471-258200-09, Fax: 0471-2540085

email : mail.kscste@kerala.gov.in, Website : www.kscste.kerala.gov.in  
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Fostering Science,  
Technology and Innovation  
KSCSTE strives for a  
new Paradigm to link  
science with development



## Programmes and Schemes of KSCSTE

### FELLOWSHIPS AND SCHOLARSHIPS

KSCSTE – Emeritus Scientist Scheme  
Post Doctoral Fellowships  
KSCSTE Fellowships  
Fellowship for Science Writing and  
Communication  
Prathibha Scholarship for Students Opting  
Science Learning

### FINANCIAL SUPPORT

Grant For Research Projects In  
Emerging Areas of Science  
Activity in Specific Areas  
Student Projects  
Industry Linked Biotechnology Programme

### SCIENCE POPULARISATION

An Annual Mega Science Fest -  
Kerala Science Congress  
Annual Children's Science Congress  
Assistance For Seminars, Symposia  
and Workshops  
Digital Content Development on  
Science Innovation  
Technology Development and  
Patent Information  
Collaborative Projects in Technical  
and Environmental Areas  
Techfest, RIM, Greencorps & Ecoclubs

### PROMOTIONAL PROGRAMMES

Back to Lab Programme  
Sastraposhini and Sasthrabodhini  
Programmes  
Scheme for Promoting Young Talents in  
Science – SPYTIS  
Students Programme in Excellence in  
Experimental Design (SPEED)  
Nurturing Excellence in Science Teaching  
(NEST)

### AWARDS

Kerala Sasthra Puraskaram –A Prestigious  
Life Time Achievement Award For Eminent  
Scientists  
Science Literature Awards  
Dr. S. Vasudev Award For Best Research Project  
Kerala State Young Scientist Award Scheme

### RESEARCH & DEVELOPMENT CENTRES OF KSCSTE

Centre for Water Resources Development  
and Management (CWRDM), Kozhikode  
Jawaharlal Nehru Tropical Botanic Garden  
and Research Institute (JNTBGRI) Palode,  
Trivandrum  
Kerala Forest Research Institute (KFRI),  
Thrissur  
Kerala School of Mathematics (KSoM),  
Kozhikode  
National Transportation Planning  
and Research Centre (NATPAC),  
Thiruvananthapuram  
Srinivasa Ramanujan Institute for Basic  
Sciences (SRIBS), Kottayam  
Institute for Climate Change Studies (ICCS)  
Kottayam  
Malabar Botanical Garden and Institute for  
Plant Sciences (MBGIPS), Kozhikode

### GRANT-IN-AID INSTITUTIONS OF KSCSTE

Integrated Rural Technology Centre (IRTC),  
Palakkad  
Sophisticated Test and Instrumentation  
Centre (STIC), Kochi  
M S Swaminathan Research Foundation  
(MSSRF), Wayanad



**GOLDEN JUBILEE CELEBRATIONS OF  
SCIENCE AND TECHNOLOGY IN KERALA**

## Ministry of Electronics and Information Technology (MeitY)

The mission of MeitY is to promote e-Governance for empowering citizens, promoting the inclusive and sustainable growth of the Electronics, IT & ITeS industries, enhancing India's role in Internet Governance, adopting a multipronged approach that includes development of human resources, promoting R&D and innovation, enhancing efficiency through digital services and ensuring a secure cyber space. The objectives are to provide e-infrastructure for delivery of e-services, promotion of electronics hardware manufacturing and IT-ITeS industry, providing support for development of e-Skills and Knowledge network, and enhancing India's role in Global Platforms of Internet Governance.

### Major Functions of MeitY

1. Policy matters relating to information technology; Electronics; and Internet (all matters other than licensing of Internet Service Provider).
2. Promotion of internet, IT and IT enabled services.
3. Assistance to other departments in the promotion of E-Governance, E- Commerce, E- Medicine, E- Infrastructure, etc.
4. Promotion of Information Technology education and Information Technology-based education.
5. Matters relating to promotion and manufacturing of Semiconductor Devices in the country.
6. Initiative on bridging the Digital Divide: Matters relating to Digital India Corporation.
7. Promotion of Standardization, Testing and Quality in IT and standardization of procedure for IT application and Tasks.
8. Initiatives for development of Hardware/Software industry including knowledge—based enterprises, measures for promoting IT exports and competitiveness of the industry.



## Technical Program: Wednesday, 8 November

**10:00 - 12:00**

**Workshop: AI for Reduced Order Modelling in Complex Engineering Systems using MATLAB & Simulink**

Dr. Debanand Singdeo (MathWorks, India)

**Room: Hall 1- North Block**

**13:30 - 15:00**

**Tutorial 1: Reliability Design of Complex Systems - Modelling and Efficient Simulation**

Dr. Armin Zimmermann (Technische Universität Ilmenau, Germany)

**Room: Hall 1 – North Block**

**15:00 - 15:30**

**Coffee Break**

**15:15 – 16:45**

**Tutorial 2: Reinforcement Learning based Control System Design**

Dr. Sohom Chakrabarty (Indian Institute of Technology, Roorkee, India)

**Room: Hall 1- North Block**

## Technical Program: Thursday, 9 November

**08:00 - 09:30**

**Registration & Welcome Coffee**

**Room: Front Lobby – Administrative Block**

**09:30 - 11:00**

**Inaugural Session**

**Room: Main Venue - Mini Auditorium**

**09:30**

**Welcome Address**

Dr. Andy Chen (General Co-Chair, RASSE 2023, VP Conferences, IEEE Systems Council)

**09:40**

**Presidential Address**

Mr. Thomas T John (Director, Saintgits Group of Institutions)

**09:50**

**Inaugural Address**

Dr. Bindu R (Hon. Minister of Higher Education & Social Justice, Government of Kerala)

**10:10**

**Address by Guest of Honour**

Mr. Richard Chen (Director General, Taipei Economic and Cultural Centre in Chennai, Chennai)

**10:20**

**Address by Executive Chairman**

Er. Punnoose George (Saintgits Group of Institutions)

**10:30**

**Release of Conference Proceedings**

Prof. Muhammed Kasim S (Chairperson, IEEE Kerala Section)

**10:35**

**Presentation of Memento**

Dr. Sudha T (Principal, Saintgits College of Engineering)

**10:40**

**Signing of MoU between Taipei Economic and Cultural Centre in India, and Saintgits Group of Institutions**

Mr. Peters Chen (Director, Taipei Economic and Cultural Centre in India, New Delhi) & Er. Punnoose George

**10:45**

**Vote of Thanks**

Dr. M D Mathew (General Co-Chair, RASSE 2023, Dean – PG & Research, Saintgits College of Engineering)

**10:55**

**National Anthem**

**11:00 - 11:15**

**Coffee Break**

**11:15 - 12:30**

**Keynote Presentations**

**Room: Main Venue - Mini Auditorium**

**Keynote Talk 1: Smart Observer for Working Conditions in Distant Water Fisheries**

Pao-Ann Hsuing (Chief Information Officer, Director of Taiwan-India Joint Research Centre on AI, and Professor, National Chung Cheng University, Taiwan)

**Keynote Talk 2: Challenges in Translating Research from Lab to Land (products/solutions)**



Ramesh Loganathan (Professor Co-Innovation/Outreach, Indian Institute of Information Technology Hyderabad, India)

**Keynote Talk 3: Importance of Engineering Research and Innovation in Advancing Sustainability**

Chithirai Pon Selvan (Director – Research, Head of Faculty, Head of School – Science and Engineering, Curtin University, Dubai)

**12:30 - 13:00**

**Lunch**

**Room: Abdul Kalam Block Seminar Hall**

**13:00 - 13:25**

**Keynote Talk 4: Investigation on the Control Techniques for Grid-tied Solar PV System**

Chiti Babu (Indian Institute of Information Technology, Design and Manufacturing (IIITDM), Kancheepuram, India)

**Room: Main Venue - Mini Auditorium**

**13:25 - 13:50**

**Keynote Talk 5: Development of Deep-Learning Based Systems Used in Radiotherapy and Smart Agriculture Fields**

Wei-Min Liu (National Chung Cheng University (CCU), Taiwan)

**Room: Main Venue - Mini Auditorium**

**13:50 - 14:15**

**Keynote Talk 6: Optimization/Systems Engineering**

Vinay Ramanath (Principal Expert R&D at Siemens Technology, Siemens, India)

**Room: Main Venue - Mini Auditorium**

**14:30 - 16:00**

**Session 1: Machine Learning I**

**Research Track 1**

**Session Chairs: Devshree Kumar (CSIR-NAL, India) & Sobhana N (Rajiv Gandhi Institute of Technology, India)**

**Room: Hall 2 - North Block**

**14:30**

**Fake Profile Detection in Online Social Networks Using Machine Learning Models**

Jyothis Joseph (Rajiv Gandhi Institute of Technology, Kottayam, India)

A new era of networking has emerged due to the easy access of social networks. Social networking websites have drawn a lot of attention from people all around the world as a result of the extensive use of the internet. People can share a lot of information using online social networks. Some of the widely used social networks are Twitter, Facebook, Google+, Instagram, Pinterest and LinkedIn. We can join and share personal information free of cost through these websites. Although social network has many uses, it may harm people due to the possibility of happening various malicious activities in social networks. The majority of social network users are ignorant of the security threats that OSNs pose. There are several issues with modern online social networks, such as fraudulent profiles and online impersonation. False profiles spread inaccurate information about a certain individual or make fraudulent attempts with bad intentions. Fake profiles can be identified using machine learning techniques. Various machine learning models, such as Support Vector Machine, Decision Tree, Neural Networks, Random Forest, Naive Bayes, Logistic Regression, and K-nearest Neighbor can be employed for the detection of fake profiles. This paper summarizes the various machine learning techniques used for the identification of fake profiles along with a comparison based on evaluation metrics.

**14:45**

**Classification of Skin Lesions Using Deep Learning Models With Transfer Learning Techniques**

Paparao Mekala (National Institute of Technology Puducherry, India)

B Surendiran (National Institute of Technology Puducherry, India)

G Vishnu (NIT Puducherry, India)

G. Jaideep Sai (NIT Puducherry, India)

P Subash (NIT Puducherry, India)

One of the most powerful strategies for improving skin cancer patient's chances of survival is finding the disease at its earliest possible stage for diagnosis. It is an essential step to find out the type of cancer in order to ensure efficient treatment machine learning and deep learning have seen explosive growth in the past few years, particularly for the detection and categorization of even the deadliest diseases such as cancer. The use of deep convolutional neural networks (DCNN) has also increased significantly due to their revolutionary impact on computer vision and medical image processing. In this work, we are using three different

Deep learning models for skin lesions classification. The main goal of this work is to classify skin lesions in RGB images using deep learning methods such as Densely connected Convolutional Neural Networks, Residual Neural Networks, and Convolutional Neural Networks. The existing methods are costly and time-consuming. This has been a problem for many patients who are in need of critical medical attention. But, due to the emergence of deep learning techniques, this problem could be overcome at a better cost than naive methods. This project aims to Classify an image using Neural networks. Image pre-processing is done on an image. After implementing three different deep learning models to classify the skin lesions from the images, we select the most accurate model and use it moving forward. The model classifies the skin lesion type from the test case images and will come to know which type of skin cancer the patient is suffering from. These kinds of use cases are closely related to the training data. Generalizability can be achieved by carefully picking the right data, collecting more of such data, and using it for training.

**15:00**

#### **Butterfly Classification Using CNN**

Ramesh naidu Balaka (Aditya Institute of Technology and Management, India)

Naresh Tangudu (Aditya Institute of Technology and Management Tekkali, India)

The most significant creature in the ecology is the butterfly. The relationship between plants and butterflies is essential for supporting many ecosystem processes. They are occasionally referred to as flying flowers or blooms of many hues. Butterflies play a significant role in pollination. The population of this lovely species is in decline as a result of numerous human actions, including the use of pesticides on plants, habitat degradation, and a lack of understanding of the importance of butterflies to the ecosystem. This study continues an exploration into classifying butterflies using image processing and deep learning techniques. The outward morphological characteristics (structure) and genital characteristics of butterflies can be used to classify them. There are many different kinds of butterflies, and research into the species categorization of butterflies is very important for practical tasks like environmental preservation and pest management for farms and forests. However, because there are so many different varieties and designs, it is necessary to divide them according to type to make recognition easier. Several machine learning techniques, such as classical machine learning, deep learning, and transfer learning, are used to achieve the best response by training and testing on a butterfly dataset. This programme can identify a butterfly's category by capturing a real-time picture of it or choosing an image from a gallery.

**15:15**

#### **Analysis of Sentiments in Low Resource Languages: Challenges and Solutions**

Girija V R (Saintgits College of Engineering, Kottayam, India)

Sudha T (Saintgits College of Engineering (Autonomous), Kottayam, Kerala, India)

Riboy Cheriyan (SAINTGITS College of Engineering, India)

Sentiment analysis, which enables the automatic identification and classification of sentiments and emotions conveyed in textual data, has become a significant topic of research in Natural Language Processing (NLP). While sentiment analysis for high-resource languages has made significant advancements, low-resource languages have received relatively little attention. This study attempts to investigate the challenges and potential solutions associated with sentiment analysis in low-resource languages. This paper also suggests some cutting-edge strategies to increase sentiment analysis's precision and applicability in less-resource languages. In this paper, we reviewed various approaches and methodologies proposed to address the challenges posed by low-resource languages. These include transfer learning techniques, cross-lingual sentiment analysis, data augmentation, and unsupervised learning methods. We included the importance of domain adaptation in sentiment analysis for low-resource languages, as language characteristics and sentiments can vary significantly across domains. We also explored the role of multilingual embeddings and cross-lingual resources in improving sentiment analysis performance. The fusion of linguistic expertise and advanced methodologies paves the way for a deeper understanding of low-resource language sentiments. To increase its effectiveness, more research and investigations are required. A more in-depth understanding of sentiments expressed in low-resource languages is made possible by the integration of linguistic expertise and cutting-edge techniques.

**15:30**

#### **Estimation of Learners' Levels of Adaptability in Online Education Using Imbalanced Dataset**

Manjima Sree (Mahatma Gandhi University Kerala, India)

Jobel John James (Mahatma Gandhi University Kerala, India)

Alphy Shaji (Mahatma Gandhi University Kerala, India)

Ambily Merlin Kuruvilla (Mahatma Gandhi University, Kerala, India)

The COVID-19 epidemic has had a huge impact on education, causing a quick move to online learning environments. Students had to adjust to a virtual learning environment as a result of this move, which brought new obstacles for them. The study looks at how adaptable students are in online learning and how it affects their academic performance and general learning process. This study



aims to assess students' levels of adaptation to online learning settings and to pinpoint the factors that either support or hinder students' ability to adapt to this new learning environment. According to preliminary data, with respect to personal circumstances, students' adaptation in online learning differs greatly. The dataset used for the study is students\_adaptability\_level\_online\_education.csv is taken from Kaggle Machine Learning repository. The dataset is equalised using the Synthetic Minority Oversampling Technique (SMOTE), as it comprises an unbalanced set of values. In order to equalize the distribution of data, the values for the minority class are increased at random. Dataset has been employed to predict the degree of student adaptability to online education through a number of machine learning algorithms, including Random Forest (RF), Support Vector Machine (SVM), K-Nearest Neighbours (KNN) and xgb.XGBClassifier(). The Random Forest classifier had the greatest accuracy (92%), compared to those that were employed. The demand for customised and adaptable learning experiences grows as online education continues to transform the traditional learning environment. This study addresses the idea of student adaptivity in the education with an emphasis on how it may significantly enhance learning results for students from a variety of backgrounds and learning styles.

**15:45**

#### **Risk Prediction of Crime Data Using Combined ARIMA & LSTM**

Amirthavalli R (Velammal Engineering College & Anna University Chennai, India)

Thanga Ramya S (R M K Engineering College, India)

R Seetharaman (Anna University, India)

Rajeswari A (Velammal Engineering College, India)

Urbanization creates a lot of social problems. One of these problems inherent in all cities of the world is crime. Police databases accumulate a large amount of data that could be analyzed in order to reduce crime rates. The analysis of criminal activity and prediction of number of crimes remains one of the most interesting problems for researchers. For a developing country like India, it is not new that people hear of crimes happening quite often. With the rapid urbanization of cities, we have to constantly be aware of our surroundings. Criminality is a negative phenomenon, which occurs worldwide in both developed and underdeveloped countries. The criminal activities can severely strike the economy as well as affect the quality of life and well-being of residents, thus leading towards social and societal issues. The crimes and criminal acts can incur costs to both the public and private sectors. Public safety is a considerable factor for secure environments when people travel or move to new places. In order to avoid the unfortunate, this work try to observe crime rates by the hybrid prediction method. We proposed a hybrid model based on deep learning methods that integrates an autoregressive integrated moving average (ARIMA) model and a long short-term memory (LSTM) model to improve the accuracy of crime rate prediction. Our analysis provides a comprehensive guide to crime rate analysis of model parameters with regard to performance in prediction of crime rate by accuracy calculation from comparing supervise classification machine learning algorithms.

**14:30 - 16:00**

#### **Session 2: Computer Systems and Networks I**

##### **Research Track 2**

**Session Chairs: Ren-Song Ko (National Chung Cheng University, Taiwan) & Madhu K p (Rajiv Gandhi Institute of Technology, Pampady, India)**

**Room: Hall 1 - North Block**

**14:30**

#### **A Data Flow-Based Approach for Classification and Risk Estimation of Android Apps**

Md. Meraj Uddin (Indian Institute of Information Technology and Management Kerala, India)

Roopak Surendran (Digital University of Kerala, India)

Gokul Gopakumar Rema (Kerala University of Digital Sciences, Innovation and Technology, India)

Tony Thomas (Kerala University of Digital Sciences, Innovation and Technology, India)

The growing prevalence of Android applications (apps) has sparked concerns over the security of users' personal information. Of particular concern is the potential leakage of sensitive data, such as GPS locations, user contacts, and IMEI codes, to unauthorized entities. Existing security mechanisms primarily focus on binary classification, distinguishing between malicious and benign files, but fail to address the risks associated with potentially harmful benign apps that unintentionally leak information to third-party users. To bridge this gap, we propose a novel framework that combines static taint analysis and machine learning techniques to classify and identify risks in Android apps. The machine learning model is trained on a dataset comprising data flow-based features from 16,000 malware and benign apps. We evaluate its capability to estimate risks associated with unknown apps using a separate test dataset containing 4,000 apps. The classification accuracy of our mechanism is 94% among them 87% of malware apps are identified as high-risk and over 1% of the benign apps are also identified as high-risk in the tested dataset. This research represents a significant step forward in enhancing app security and data privacy, catering to the evolving landscape of mobile app threats and ensuring a safer experience for Android users.

14:45

**On Impact of Semantically Similar Apps in Android Malware Datasets**

Roopak Surendran (Digital University of Kerala, India)

Md. Meraj Uddin (Indian Institute of Information Technology and Management Kerala, India)

Malware authors often reuse program segments from other applications (apps) to perform similar kind of malicious activities, such as information stealing and sending SMS to premium rate numbers. Consequently, multiple semantically similar malware samples may exist within a malware family or dataset. The presence of such apps, unbeknownst to many researchers, may inadvertently influence the evaluation of their Machine Learning (ML) models. In this paper, we investigate the impact of semantically similar apps on the performance measures of ML-based Android malware detectors. Through experiments on the Drebin dataset, we assessed the performance of distinct ML models based on opcode, permission, and API call features of both malware and goodware applications, with and without semantically similar apps. Our findings show that after removing exact duplicate apps from the dataset, the malware detection rate (True Positive Rate) of opcode-based ML models decreased from 0.94 to 0.85, permission-based ML models decreased from 0.94 to 0.90 and API call-based ML models decreased from 0.95 to 0.91. To address this issue, we propose the use of the Euclidean distance metric to identify and eliminate the similar features before evaluating malware detection mechanisms. Implementing this recommendation can enhance the accuracy and reliability of ML-based Android malware detectors.

15:00

**Comparative Analysis of ARIMA and GARCH Models for Forecasting Spot Gold Prices and Their Volatility: A Time Series Study**

Ardra Mani (Saintgits College of Engineering, India)

Jose Joy Thoppan (Saintgits College of Engineering, India)

Gold's reputation as a secure investment offering protection against inflation has solidified its status as a preferred asset among investors. As a result, forecasting gold prices while accounting for their inherent patterns and trends is of significant interest to the research community. A notable trend in existing gold price forecasting studies is their concentration on US Dollar-denominated gold prices, thereby overlooking potential influences from exchange rates and tax rates specific to gold prices denominated in Rupees. This study aims to establish an autoregressive integrated moving average (ARIMA) model as a foundational benchmark for gold price forecasting, followed by the development of a generalized autoregressive conditional heteroskedastic (GARCH) model for the purpose of comparative analysis. Both the ARIMA and GARCH methods are commonly utilized by researchers for time-series forecasting and have been explored independently in various studies. We considered gold prices over a duration of ten years, covering the period from March 2013 to March 2023. Through meticulous utilization of the EViews software, this research rigorously evaluates the outcomes produced by both models. The findings underscore the comparable effectiveness of both ARIMA and GARCH models in adeptly capturing and predicting the intricate dynamics of gold price movements. The research findings could provide valuable insights to investors seeking to enhance their investment strategies in the gold market.

15:15

**A Potential Landslide Early Warning System Based on Threshold Velocity of 1 mm/Min**

Deepak Kumar (University of Delhi, India)

Ajit K. Mahapatro (University of Delhi, India)

Sushil Kumar Singh (Solid State Physics Laboratory, India)

In this article, a potential landslide early warning system (LEWS) based on acoustic emission (AE) technology is discussed. The most critical components of proposed LEWS are active waveguide system (AWS), AE sensor, and correlation between soil slope deformation dynamics and AE behaviour of the slope. We have calibrated the AWS in the laboratory with help of universal testing machine. Multiple AWS and AE sensor assemblies have been used in the study. We have used both resonant and broadband AE sensors. AE characteristics of the AWS in response to its deformation dynamics are analyzed and a correlation between the two is established. Based on the correlation, a threshold deformation velocity parameter of 1 mm/min is proposed for the LEWS. Post calibration, the AWS and AE sensor assemblies are tested on an artificial soil slope created inside a tilt trolley machine. AE behaviour of the artificial soil slope in response to slope angle, water content, and slope displacement is also studied to visualize the performance of the proposed LEWS on real-time landslide prone soil slope. The results from both the experiments are in consistency with each-other that solidifies the potential application of the entire AE sensor system on real-time soil slope for generating early warnings when slope displacement rates breach 1 mm/min.

15:30

**Smart Contract Based Carpooling Application for Secure and Efficient Ride Sharing**

Pranav Sudhir (APJ Abdul Kalam Technological University, India)

Rashmi Joshi (APJ Abdul Kalam Technological University, Kerala, India)

Vighnesh Nair (APJ Abdul Kalam Technological University, Kerala, India)

Vishnu Anilkumar (APJ Abdul Kalam Technological University, India)

Ramani Bai V (APJ Abdul Kalam Technological University, Kerala, India)

Carpooling has emerged as a sustainable approach to mitigate pollutant emissions and alleviate traffic congestion. This paper introduces a pioneering system that tackles the limitations of centralized ride-sharing services through the utilization of smart contracts. By leveraging these contracts, the proposed system aims to initiate the decentralization process for carpooling systems, while ensuring robust data security, confidentiality, and privacy. In the envisioned system, users are granted the flexibility to assume the role of either a driver or a passenger. Drivers can post available rides, while passengers can search for and book desired rides from the published listings. This dynamic platform enables seamless interaction between drivers and passengers, facilitated by the execution of smart contracts. These contracts automatically process user requests triggered by events like ride creation or booking, ensuring a streamlined experience for all participants. One key advantage of the system is the fare calculation mechanism. The fare is determined based on factors such as the passenger's route distance, the current fuel price, and the mileage of the driver's car. As a result, the cost of rides is significantly reduced compared to traditional transportation options. Upon booking a ride, the fare amount is promptly debited from the passenger's account and reserved. It is only credited to the driver upon the successful completion of the ride, ensuring fairness and transparency in payment transactions. The primary objective of this system is to enhance people's lives by reducing travel expenses and alleviating traffic congestion without compromising the security and privacy of the users. By leveraging smart contracts and decentralization, the proposed solution seeks to create a reliable, efficient, and secure carpooling system that benefits both individuals and the environment.

**14:30 - 16:00**

**Session 3: VLSI and Embedded Systems I**

**Research Track 3**

**Session Chairs: T E Ayoob Khan (College of Engineering Karunagppally, India) & Lintu Rajan (NITC, India)**

**Room: Hall 3 - North Block**

**14:30**

**A Model Based System Architecture Methodology Leveraging the ARCADIA Method**

Eric B. Dano (George Washington University, USA & INCOSE New England, USA)

Stephane Lacrampe (ObeoSoft, Canada)

System Architecture, its derived requirements and systems analysis performed, are often attributed to defining 70% of the cost and capabilities of a system. However, after nearly two decades of Model Based Systems Engineering (MBSE), there is a lack of architecture focused methodologies and tools to aid programs in creating a robust, transdisciplinary system architecture. One notable exception is the Thales developed Architecture Analysis and Design Integrated Approach (ARCADIA) method. The ARCADIA Architecture Development Method (ADM) provides instance-based methodologies for each ADM step with rich viewpoints and views to ensure a robust architecture is obtained. As the goal of the proposed methodology is to rapidly create a robust, transdisciplinary system architecture, ARCADIA was selected for its native alignment with this goal. However, the ARCADIA method is like a framework and requires a defined methodology to be applied to it to determine what views, and in what order, constitutes the desired architectural model. The proposed methodology defined these elements based on alignment with the IEEE 15288:2015 architecture standard, and to further the goals of ease of learning, rapid modeling, and reduced modeler workload/errors. In addition, the proposed methodology adds multiple supplemental views into the system model to add context and ensure a transdisciplinary architecture is realized. The proposed methodology also stresses the integration of decision analysis and requirements derivation into all ADM steps to ensure a complete architecture is realized prior to the development phase. Some basic qualitative findings from a partial test of the proposed methodology are described herein. A larger quantitative comparison between the proposed methodology and other MBSE standards is planned for Fall 2023.

**14:45**

**IoT Systems Development Using Upcycled Mobile Phones: A Survey**

Neena Goveas (BITS Pilani K K Birla Goa Campus, India)

Sai Reshwanth Challa (BITS Pilani Hyderabad Campus, India)

Saivinay Goriparthi (BITS Pilani Hyderabad Campus, India)

Chandra Shekar, RK (Birla Institute of Technology and Science, Pilani, India)

Shubhangi Gawali (BITS PILANI GOA CAMPUS, INDIA, India)

Lucy Gudino (BITS Pilani, India)

Rapid advancement of technology has led to a significant increase in electronic waste, including discarded mobile phones. These old mobile phones can still be valuable resources for creating Internet of Things (IoT) systems through upcycling. In this survey we explore the use of upcycled mobile phones in IoT system development. We look at the sensors present on most mobile phones and their usage. These sensors are inbuilt, integrated and are ready for use. Using these saves efforts as compared to any system development from scratch which involves procuring, assembling, testing of a bunch of sensors in isolation and together. We look at some efforts to create an operating system based environment to aide application development on upcycled mobile phones. We look at some projects which are using the mobile phone sensors and some of the applications developed as part of these efforts. We consider some successful deployments and look at the benefits that these efforts had. One of the benefits that arises is due to the possibility of crowd sourcing based data gathering using upcycled mobile phones. This is possible because of availability of mobile phones with a large number of participants. We look at use cases for the IoT systems using mobile phones

in some important fields like healthcare and agriculture. We examine the benefits, challenges, and potential avenues for future research on upcycled mobile phone use cases.

**15:00**

#### **Efficiency and Speed Trade-Offs in 8-Bit CMOS Adders at 180nm: An In-Depth Examination**

Ajith Ravindran (Saintgits College of Engineering, India)  
Abraham George (Saintgits College of Engineering, India)  
Anish M George (Saintgits College of Engineering, India)  
Deepthi Cherian (UST Global Information Technology Parks, India)  
Femi Elsa Thomas (Infosys Limited, India)  
Sarath Kumar (Saintgits College of Engineering, India)

This paper analyses the performance of different adders in terms of power delay and area. Adders are fundamental units in arithmetic circuits. Adders, till now, have undergone several modifications to improve its efficiency. Advancement of adders is necessary for enhancement of complex circuits in which they are employed. The most important parameters that determine the performance effectiveness of an adder are area, power dissipation and delay. Choosing the finest adder with the required properties is crucial to upgrade the performance of the circuits in which its application has a significant effect. This paper compares twelve 8-bit adders based on the above-mentioned performance parameters, thus reducing the hectic task of selecting the proper adder. All these adders are implemented using CMOS logic. Simulation of these adders has been done using Cadence Virtuoso tool in 180nm technology. Power, delay and area values of all these adders are tabulated in this paper. Based on the results obtained from the comparison, it has been observed that 8-bit 14T full adder consumed the least power, carry skip adder exhibits the least delay and the adder which occupies the least area in terms of transistor count is 8T full adder. This paper helps to identify the adder which gives the best performance in 180nm technology node in terms of power, delay and area.

**15:15**

#### **Implementation and Analysis of Single Digit BCD Multipliers Without Generating Partial Products**

Darsana S (APJ Abdul Kalam Technological University, Kerala, India)  
Deepa Susan Jacob (College of Engineering Chengannur, India)  
Sarah Jacob (College of Engineering Chengannur)  
Deepa J (CEC, India)  
Ramesh P (College of Engineering Munnar, India)

Multipliers play a crucial role in signal processing systems, and any improvement in their speed directly enhances the overall system performance. Traditionally, multipliers consist of two main components: partial product generation and addition of these partial products to obtain the final results. Binary-coded decimal (BCD) multipliers additionally require a binary to BCD conversion step to achieve the desired output. Performance enhancement of multipliers can be done by reducing the number of partial products formed or by using compression techniques to reduce the number of bits to be added. Fast adders with reduced propagation delays can also be utilized. While using faster binary multipliers for BCD multiplication, binary to BCD converters are needed. The converters add more delay to the multiplier circuit. The proposed multipliers do away with the need for both partial product generation and its addition along with binary to BCD converters. By eliminating the need for partial product generation and addition, the proposed multiplier achieves notable speed improvements. The multiplier uses Vinculum method for bit reduction. The multiplier is implemented on Basys3 board using Xilinx Vivado 2020.2. When implemented on Artix-7 FPGA shows a speed improvement of 53% compared to BCD multiplier using traditional array multiplier and BCD converter.

**14:30 - 16:00**

#### **Session 4: Signal Processing and Communication Systems I**

##### **Research Track 4**

**Session Chairs: Tomoson Davis (SJCTET, India) & Rakesh R T (National Institute of Technology Calicut, India)**

**Room: Hall 4 - North Block**

**14:30**

#### **A Novel Substrate Cylindrical Cavity 4x4 Fractal Inspired MIMO Antenna for 5G - n258 Satellite Communication**

Arun Raj (NIT Durgapur, India)  
Durbadal Mandal (National Institute of Technology, Durgapur, India)

Modern and next-generation communication requires compact and low-profile antennae that are fabricated easily with multi-purpose applications function. This paper uses five congruent circular ring fractal slots with a novel substrate divider cylindrical cavity to enhance the performance of the MIMO (Multi-input multi-output) antenna. By incorporating cavities, the antenna elements are isolated from each other, reducing the mutual coupling between them. This results in improved radiation patterns, enhanced channel capacity, and minimized interference between antenna elements. Here four port MIMO antenna is proposed with an Inverse mirror imposed placement of ground with fr4 substrate of 35 mm<sup>2</sup>. The proposed antenna covers the 5G - n258 band with a bandwidth range of 3.25 GHz. The proposed MIMO antenna is inspired by five congruent circular ring fractal slots

with its element antenna that has a peak gain and front back to ratio of 5.6 dBi and 26.8 dB with a compact size, respectively. Further, the MIMO configuration parameters, ECC (envelope correlation coefficient) is found to be less than 0.0012, Diversity gain is found to be greater than 9.994dB, and isolation of antenna is enhanced with greater than 20dB with a wide bandwidth of 12.25% for n258 5G applications respectively and the proposed designs are implemented using CST software.

Keywords- MIMO antenna, fractal antenna, 5G MIMO antenna, Congruent ring antenna, microstrip antenna

**14:45**

#### **RF Systems for Aerospace - Evolving Methods, Techniques and Applications**

Sreedharan Pillai Sreelal (Indian Space Research Organization, India)

Bibin Varghese (Indian Space Research Organization, India)

Midhunkrishna P R (VSSC ISRO, India)

Reshma S (VSSC, ISRO, India)

Indu Gopan (VSSC ISRO, India)

Joji John Varghese (IIST, India)

Radio Frequency (RF) and Microwave systems have played a critical role in the field of aviation electronics since the beginning of development of aircrafts and space-crafts. These systems play a central role in vital mission critical functions like telemetry and telecommand in launch vehicles and satellites, radar systems for tracking and deep space long range communication systems in inter-planetary missions. This paper traces the evolution of RF systems for aerospace applications. It discusses the new techniques and implementation methods for systems meant for conventional applications like launch vehicle and satellite telemetry and how they are enabled by advancements in other technology areas like Very Large Scale Integration (VLSI) Integrated Circuits (ICs) and Embedded Systems. Further, some exciting new application areas are explained which are relevant in the context of new generation missions like inter-planetary spacecrafts, Re-usable Launch Vehicles (RLV) and 'fly-by-wireless' drones and aircrafts. A few case studies of actual systems realized and demonstrated in piggy-back flight mode are presented to illustrate how these systems exhibit versatility, efficiency and high performance while preserving the important attributes for the aerospace application domain like reliability and ruggedness. Keywords - Telemetry Transmitter, Software Defined Radio (SDR), Instrumentation, Wireless Sensor Networks (WSN), Sensing Systems, Energy Harvesting, Radar Altimeter

**15:00**

#### **A Miniaturised Low-Cost Telemetry System for Small Satellite Launch Vehicles**

Priya P and Sajin S (Vikram Sarabhai Space Centre, India)

There is an increasing demand world over for launch services for small satellites. The Small Satellite Launch Vehicle (SSLV) of the Indian Space Research Organization (ISRO) is developed with a view to launch small satellites to a low earth orbit in a fast turn-around mode. The avionics system for SSLV thus needs to be a low cost, miniaturized, simple system which is amenable to mass production and fast integration. The telemetry system for SSLV is developed with a view to acquire the measurement parameters all over the vehicle and provide a formatted serial data. Low cost industrial grade, low form factor components with high level of functional integration is used in the subsystem designs. The designs also implement processing in FPGA and use indigenous components wherever available to mitigate obsolescence-related issues. The miniaturized telemetry system has flown successfully in two missions. The flight data is analyzed and the performance of the system is normal. The new system provides a considerable reduction in size, weight, power and cost compared to the telemetry systems used in conventional launch vehicles without sacrificing the performance and reliability requirements of aerospace application. This makes it a suitable candidate for future space missions like Reusable Launch Vehicle (RLV) and inter-planetary missions.

**15:15**

#### **An Efficient Smart-IoT-Aided Waste Management System With Optimal Shortest Path Routing Using Mud Ring Algorithm**

V V satyanarayana Kona (Sathyabama University, India)

Monikavasagom Subramoniam (Sathyabama Institute of Science and Technology, India)

Binson A (Saintgits College, India)

The waste management is a problem for the modern cities as it affects the sustainability of the environment and on the stage of standard recognized by the people. In the past few years, some changes have done in the path of presenting a door-to-door private garbage gathering. An important factor for the victory of these activities is to attain better cooperation from humans. The digital change operation in this field needs much time other than a better handling of information related to the garbage collection approaches. The conventional garbage maintenance model performs according to the daily schedule that is very costly and inefficient. The conventional recycle bin has also revealed its ineffectiveness because of the improper recycling of the waste by the people. With the improvement of "Internet of Things (IoT) and Artificial Intelligence (AI)", the conventional garbage handling model can be exchanged with smart sensors enclosed into the device to process real-time observation and permit for good garbage handling. Hence, to resolve the complication presented in the conventional waste management system, an innovative waste management framework is designed based on deep learning techniques. Initially, essential data for the analysis is occurred from benchmark resources and subjected to weight computing region. Here, the weights computation is performed based on trashcan type and capacity. Next, the weight computed data is utilized to identify the shortest path for the waste-collecting vehicle to reach the suitable waste centers. Moreover, the optimal paths are selected by utilizing Mud Ring Algorithm (MRA) optimization

technique. Hence, the implemented waste management system secures a better performance rate than the conventional techniques in different experimental observations.

**14:30 - 16:00**

**Session 5: Robotic and Control Systems I**

**Research Track 5**

**Session Chairs: Armin Zimmermann (Ilmenau University of Technology, Germany) & Saju K K (Cochin University of Science and Technology, India)**

**Room: Hall 5 - North Block**

**14:30**

**Trans-Domain Sea-Air Integrated Robot**

Philip C Jacob (Adi Shankara Institute of Engineering and Technology, India)

The Trans-Domain Sea-Air Robot (TSAR) design with trans-domain capabilities or converting a normal drone to hybrid technology. It is still a major challenge to achieve miniaturization and enhance the maneuverability and overwater reliability of transmission. In this paper, a Trans-Domain robot is proposed which achieves free trans-domain motion and has the advantages of small size, high maneuverability and high reliability for Autonomous water vehicle operation. The proposed has a dc motor-propellers platform which satisfies the power and small diameter requirements and the blades reduce water drag and facilitate transportation. Further, a stable and efficient trans-domain attitude adjustment system is presented which effectively realizes trans-domain attitude switching. Based on the characteristics of the body additional Esp32 with a camera was been given in order to image processing for human body detection and fish shoal localization. The Sea-Air Integrated Robot is a conceptual design for a multi-purpose robotic system that can operate both on land and water. The robot is designed to be a versatile platform that can perform a wide range of tasks, from surveillance and inspection to scientific research and search and rescue operation. The TSAR has many potential applications, including environmental monitoring, oil and gas exploration, search and rescue operations, and military surveillance. Its modular design and ability to operate in multiple environments make it a versatile platform that can be adapted to a wide range of tasks.

**14:45**

**Project Risk Mitigation in Autonomous Vehicles Systems: The Tesla Way**

Milind Kanbur (Chikka Muniyappa Reddy & Societe Geerale, India)

**Purpose:** The goal of this study article is to examine the techniques used by Tesla, a forerunner in the field of autonomous car systems, to reduce project risks. The study intends to shed light on how Tesla's strategy for risk management in the creation of autonomous car systems can teach the larger automotive and technological sectors important lessons.

**Methodology:** The study uses a thorough technique that involves site scraping and text analytics utilizing Natural Language Processing (NLP). Key risk mitigation measures used by Tesla are extracted and analysed using text analytics of pertinent papers and reports. To collect publicly available information about Tesla's project management procedures, risk assessment techniques, and project outcomes, web scraping techniques are used.

**Findings:** According to the report, Tesla's risk mitigation strategy for developing autonomous car systems is defined by a blend of proactive planning, iterative development, and stringent testing. For the purpose of identifying and addressing potential hazards, the organization prioritizes real-world testing over simulated scenarios. Additionally, Tesla's ongoing over-the-air updates support adaptive risk management, enabling the business to quickly address new threats.

**Conclusions:** The results highlight the value of proactive risk reduction techniques, including iterative development and real-world testing, in the context of intricate projects like autonomous car systems. Tesla's strategy serves as an example of the significance of ongoing innovation and adaptability as key elements of successful risk management.

**15:00**

**Comparative Study of Machine Learning Techniques for Inverse Kinematics in a 5-DOF Manipulator**

Jittu George Eapen (Saintgits University, India)

Chinn Mohanan (KTU, India)

Harinarayanan Nampoothiri M G (Assistant Professor, India)

Solving inverse kinematic problems in mobile manipulators is non-trivial, considering different aspects such as singularity and multiple solutions. Conventionally, the matrices from arm equations are solved using any computational approach, which requires the knowledge of all the parameters of the robot model. Any modern techniques also require the software models such as Unified Robot Description Format (URDF). It will be challenging in actions requiring faster requirements with the modelling or arm matrices of a new robot that is not available such as mobile robot manipulators. The work presents a comparative study of different machine learning frameworks for inverse kinematics to achieve the best classification accuracy. The methods in this study include both statistical and deep learning methods. The evaluation criteria include computational efficiency, solution accuracy, and robustness in handling diverse scenarios, such as singularities and complex workspace configurations. The study delves into the strengths and limitations of each technique, shedding light on their respective applicability and trade-offs. Additionally, insights

are drawn into the suitability of different techniques for real-time applications and their adaptability to varying degrees of manipulator complexity. The study finds that the ensembles of weak classifiers have the same accuracy as state-of-art approaches such as Artificial Neural Networks (ANN) and Support Vector Machines (SVM). The significance of work lies in testing the effectiveness of weaker algorithms than existing methods for robot systems.

**15:15**

#### **Restaurant Order Management With an Automated Serving Bot**

Swathi Mangala Suresh (Government Engineering College Thrissur & APJ Abdul Kalam Technological University, India)

Afrin Ambalath Sajan (Government Engineering College Thrissur, India)

Neha K Binesh (Government Engineering College Thrissur, India)

Salmanul Faris K P (Government Engineering College Thrissur, India)

Automation is happening in every domain around us. In today's world with the Covid-19 scenario and the spread of other deadly diseases, the need and importance of automation in every field, especially in the hospitality industry is surging. Restaurants are places where people directly interact with each other. This could lead to the spreading of contagious diseases. Also, the absence of unskilled labor in many countries resorts to automation in restaurants. Machine-based automation helps restaurateurs and customers to decide how much interaction is needed. This research aims at implementing a cost-efficient automation solution in a restaurant and a waiter-less ordering system. An intelligent food serving robot assistant aids in the automated serving of food in a restaurant. Radio Frequency Identification (RFID) tags are placed on the floor for path planning. Food is ordered through a website by scanning the Quick Response (QR) code on the table. Once the food is prepared, it is delivered to the required table by the robot by detecting the RFID tags placed on the floor. The food is served using a lead screw mechanism. A communication gateway betwixt the customer and the restaurant is set up through a Web Application. Finally, the paper discusses some optimization measures and future directions for the use of robots in the hospitality sector.

**15:30**

#### **Automatic Solar Panel Cleaner**

Gayathry Menon (APJ Abdul Kalam Technological University, India)

Jayan AR (University of Calicut & Govt. Engineering College Trichur, India)

Anjana N Sathyan (APJ Abdul Kalam Technological University, India)

Aswin Ramesh (APJ Abdul Kalam Technological University, India)

John J Tharayil (APJ Abdul Kalam Technological University, India)

It is well known that in future our earth will be threatened by drastic climate change and global warming. Therefore, it is important to find sustainable solutions to fulfill the energy requirements for our present and coming generations. Increasing the use of renewable and non-polluting energy sources to generate electricity is a good solution to this problem. Generating electricity using solar panel is a non-polluting source. The solar PV modules which are located more in dusty environments as in the case of tropical countries like India, the chance for accumulation of dust on the surface of the solar panel is very high. For maintaining maximum efficiency in power generation, solar panels need to be cleaned periodically. In many stations, the cleaning is done manually. In some areas, PV modules which are mounted on roof tops in a clustered fashion may not be easily accessible for manual cleaning. So, this project is about the design and development of an automatic cleaner on the solar panel which checks whether the dust is accumulated on solar panel or not. If it finds any dirt, then it will automatically clean the dirt without any manual intervention that would travel lengthwise along the solar panel. We are building a prototype which should be a cleaning system that will improve the efficiency of the solar panel. And also, an environmental-friendly system which involves recycling of water that was used for cleaning the panels.

**15:45**

#### **Autonomous Water Quality Monitoring Surface Vehicle**

Girish P (APJ Abdul Kalam Technological University, India)

Manushri Saljith Nambiar (APJ Abdul Kalam Technological University, India)

Anirudh Lakshman (APJ Abdul Kalam Technological University, India)

Arjun Ramakrishnan and Abhiram P V (APJ Abdul Kalam Technological University, India)

Water pollution is the contamination of water sources by contaminants that render the water unfit for drinking, cooking, cleaning, swimming, and other uses. Pollutants include chemicals, waste, bacteria, and parasites. Traditional monitoring methods entail manually collecting water samples from various water resources, followed by testing and analysis in the laboratory. The primary goal of these systems is to detect and track any changes or contaminants that may affect water quality and ensure that it remains safe for human and environmental usage. A network of sensors and devices is frequently used in water quality monitoring systems to collect data on a number of factors such as pH, dissolved oxygen, temperature, turbidity, and total dissolved solids. This procedure is frequently ineffective because it is time-consuming and does not produce results in real-time. Water quality should be continuously monitored to ensure a safe supply of water to end users from any water resources or water bodies. Designing and creating a cost-effective system for real-time monitoring of water quality utilizing the Internet of Things is now required. A water vehicle is employed here to house the water quality monitoring system. The vehicle is self-contained, and set locations for measuring water quality can be provided. Using IoT devices and a Wi-Fi module, the proposed system aids in the continuous



monitoring of water quality. The Wi-Fi module enables internet connectivity and sends sensor data to the Cloud. Various sensors are used to measure various factors in order to assess the water quality of water resources.

**14:30 - 16:00**

**Session 6: Robotic and Control Systems II**

**Research Track 5**

**Session Chairs: Sreeja Rajesh (MITE, India) & Abhilash Vijayan (NIT Calicut, India)**

**Room: Hall 6 - North Block**

**14:30**

**Dynamic Positioning of a Ship Using Disturbance Observer Based Sliding Mode Control**

Nikhil Srivastava (IIT Roorkee, India)

Jagannath Samantaray (Indian Institute of Technology, Roorkee, India)

Sohom Chakrabarty (IIT Roorkee, India)

Dynamic positioning (DP) systems play a crucial role in controlling the position and heading of vessels using their own propulsion systems. These systems are extensively utilized for precise maneuvering of marine crafts and sea-going vessels during slow-speed movements and high-seas operations. However, environmental disturbances such as wind, waves, and ocean currents can cause deviations from the desired track, hindering maritime operations. To address these challenges, an effective and robust control technique is required to maintain the heading and orientation of vessels. This research focuses on the application of two different types of disturbance observer (DO) based controllers for DP systems. First, a DO is designed to estimate the external disturbance affecting the dynamics of a ship. Then a sliding mode controller (SMC) with DO is designed for the DP system. However, the classical SMC suffers from chattering, prompting the use of a higher order sliding mode (HOSM) controller with DO for the DP system. The control techniques based on DO contribute to the reduction of control effort while simultaneously improving system robustness. Both control approaches are simulated in MATLAB/Simulink® environment. Then the results of both approaches are compared both qualitatively and quantitatively. The study aims to evaluate the performance of these controllers and assess their effectiveness in maintaining precise vessel positioning and heading in the presence of environmental disturbances.

**14:45**

**A Collision Response Model of an Ackermann Vehicle With Combined Longitudinal and Lateral Velocity**

Samsaptak Ghosh (IIT Roorkee, India)

Felix Orlando (IIT Roorkee, India)

Sohom Chakrabarty (IIT Roorkee, India)

It is anticipated that autonomous vehicles would be able to generate tractive force and steering angles to prevent unforeseen collisions due to vehicle collisions. During the occurrence of such a collision, a variety of conditions arise that affect the motion or trajectory of the vehicle. The autonomous driving algorithm must have a model of the vehicle response under such circumstances to generate required control actions under such unexpected collisions so that the vehicle is restored to its intended path and does not become unstable. This study investigates potential collision scenarios and examines the impact of the same on the vehicle's trajectory or motion using a more generalized single-track Ackermann vehicle model, which incorporates the influence of varying longitudinal velocity and its effect on lateral and yaw dynamics. The motion of a vehicle can be controlled by both the steering angle and the tractive force, which are taken into account throughout the modeling process. Most scholarly literature consider the longitudinal velocity of the vehicle to be constant. However, it is essential to note that the longitudinal velocity is considered to be variable in the presented model, and its effect on vehicle dynamics is incorporated to obtain a closer description of the actual vehicle dynamics in the special conditions of collision. Additionally, the current model considers the coupling of the lateral and longitudinal velocities and the yaw angle of the vehicle during the vehicle motion.

**15:00**

**Learning Based Adaptation of Proportional Derivative Controller for a Novel Rotary Slosh Dynamics Model**

Ashish Kumar Shakya (Indian Institute of Technology Roorkee & Roorkee, Uttarakhand, India)

Gopinath Pillai (Indian Institute of Technology Roorkee, India)

Sohom Chakrabarty (IIT Roorkee, India)

The disturbance in the free liquid surface caused by the movement of a partially filled liquid container is referred to as sloshing. A wide variety of application fields, such as liquid cargo carriers, liquidized natural gas and petroleum storage tanks, the beverage industry, rocket engine fuel tanks, molten metal transfer in steel plants, spacecraft trajectory or attitude manoeuvres, etc frequently experience the sloshing phenomenon. Rotary slosh develops in a partially filled liquid container as a result of 2-dimensional movement of the container. In order to solve the rotary slosh minimization problem, this paper proposes an adaptation of proportional derivative (PD) controller parameters using deep reinforcement learning (DRL) framework. In this paper, for the first time a novel rotary slosh dynamics model is proposed. A spherical pendulum on cart is used to represent the rotary slosh when the cart with partially filled liquid container is moving on a specified path in a 2-D plane. A DRL-based adaptation of PD controller parameters is proposed in order to produce near-optimal performance even with unknown perturbations in the



system model. The decision making of the proposed DRL-based PD controller for the rotary slosh minimization problem is verified in a Python simulation environment, and its performance with unknown perturbations is compared with conventional PD controller approach to validate the performance and robustness of the controller due to the learning based framework.

**15:15**

#### **A Meta Heuristic Algorithm Based LQR Controller for an Inverted Pendulum Stabilization**

Neeraj P C (National Institute of Technology Calicut, India)

Sanjay Joseph Chacko (Indian Institute of Space Science and Technology, India)

Rajesh Joseph Abraham (Indian Institute of Space Science & Technology, India)

Linear Quadratic Regulator control is one of the most prolific methods used to control a linear system and has found widespread applications. The LQR employs a quadratic cost function, incorporating quadratic terms for state and control variables. The behavior of the controller is shaped by weighting matrices. Despite Linear Quadratic Regulator's (LQR) strong performance and solid resilience, developing these controllers have been challenging, largely because there is no reliable way for choosing the Q and R weighting matrices. A deterministic method is used for choosing them in this paper, providing the designers precise control over performance variables. The method is based on the Newton-Raphson method. The stabilization of inverted pendulum system is used to validate this approach. The inverted pendulum is a classic control engineering problem that has been studied for many years. It is a challenging task to stabilize the pendulum in the upright position, as it is an under-actuated system with non-linear dynamics. The deterministic method is then compared with an Artificial Bee Colony (ABC) optimized LQR controller. Based on MATLAB simulations, the proposed method demonstrates the ability to stabilize the inverted pendulum in the upright position with high accuracy and is found to have better stabilizing characteristics over the ABC optimized controller.

**15:30**

#### **Automation of Rubber Coagulating Process Along With Dispensing and Stacking System**

Daru Anna Thomas (Saintgits College of Engineering, India)

Ancy Sara Varghese (SAINTGITS College of Engineering, India)

Abin Shaji (Saintgits College of Engineering, India)

Adhin M (SAINTGITS College of Engineering, India)

Surya Kumar B (SAINTGITS College of Engineering, India)

Maheswari V Nair (SAINTGITS College of Engineering, India)

Rubber coagulation is the first crucial step in processing natural rubber that happens naturally or is induced by various techniques. After collection of the tapped latex, rubber is recovered from the emulsion by coagulation with formic acid, creating crumbs. After detailed research on the methods of coagulation, it is found that the quality of sheets can vary due to the change in the amount of diluted formic acid mixed. The quantity of formic acid varies according to the Dry Rubber Content (DRC) value of the rubber latex. The DRC value can change according to the location, climate, humidity, etc. In this process, time is also a primary factor as the rubber gets hardened over time. Therefore, the process of rubber latex coagulation requires skilled labor. As the quantity of rubber latex increases, the number of laborers increases. 'Automatic Rubber Latex Coagulation System' aims at coagulating rubber latex according to the DRC value. An adequate amount of diluted formic acid is discharged into the rubber latex according to the DRC value automatically. This system mixes the field rubber latex along with the water and diluted formic acid by dispensing them into the aluminum coagulating tray. Since it is fully automatic, it comes along with a releasing and stacking mechanism for trays. This automated dispensing machine helps to reduce labor costs and working time. As the discharged amount of liquid is constant, it can produce sheets of the same quality. Due to the varying value of DRC, the system comes with a provision to enter the DRC value of latex and it automatically calculates the amount of rubber latex, water, and diluted formic acid to be discharged for a tray. This machine focuses on the processing of sheets from fresh field latex rather than from preserved latex using ammonium which has lesser value and quality than the field latex. This machine can be used to produce coagulated rubber irrespective of latex production in the fields. That is, this machine can be used in large-scale as well as small-scale production centers. Such machines and systems can be expected to bring changes in these fields of production. This would also promote the upbringing of rubber tree plantations among the native farmers. This machine can be considered as a part of promoting the agriculture field by reducing the limitations and problems faced by the farmers and by making the process of production easier.

**15:45**

#### **Repetitive Controller Design for Coriolis Mass Flow Meter Using B-Spline Filters**

Rajaprasanna Rameshbabu (Anna University Chennai & Nadar Saraswathi College of Engineering and Technology, India)

This paper addresses the design and implementation of Discrete-Time Repetitive Controller for the widely used industrial flow-measuring device -Coriolis Mass Flow (CMF) meter. CMFM is a versatile flow measuring instrument that measures flow in terms of mass and not volume. The phase difference between two sensor signals placed in the tube is the direct indication of mass measurement. It is subject to various noise. To track and control those signals are indispensable in getting accurate readings. The objective of this paper is to design DRC to track the sensor readings from the U-Shaped twin tube under no flow condition. Actuating signals are provided at the center of twin tube. DRC is the learning based control that learns the input signal information by connecting the discrete-delay element as positive feedback. It is similar to oscillator principle. DRC, thus acts as the autonomous system and delivers the output without any input. Problem in dealing with stability issues in DRC can be overcome by designing

an appropriate low pass filter. The frequencies of the tube which is related to the mass of the flow are estimated using Power Spectral density method. Since the modelling of Coriolis Mass Flow meter shows non-minimal phase behavior, effort has been made to design the compensator for Discrete Repetitive Control (DRC) using b-spline filter banks. A comparison has been made for different DRC compensation techniques using Euclidean norm. The responses are obtained using MATLAB.

**16:00 – 16:15**

**Coffee Break**

**Room: Hall 7- North Block**

**16:15 - 17:30**

**Session 7: Machine Learning II**

**Research Track 1**

**Session Chairs: Reji R (Carmel College of Engineering and Technology, India) & Sobhana N (Rajiv Gandhi Institute of Technology, India)**

**Room: Hall 2 - North Block**

**16:15**

**GPU Acceleration of Multi-Vehicle Detection and Classification for Unmanned Aerial Vehicle Surveillance Application Using YOLOv3**

Devshree Kumar (CSIR-NAL, India)

Satyanarayana P.V Murthy (CSIR-NAL, India)

This paper describes faster computation technique for Object Classification in Unmanned Aerial Vehicle (UAV), real-time flight video data by the use of Graphics Processing Unit (GPU) Acceleration. The implementation was done to prove the concept that FPS rate doesn't drop much in case of GPU in case of multi object detection and classification in video captured by Quadrotor from a height of 50 m above Ground Level as compared to Central Processing Unit (CPU) usage. Here, in-house designed NAL Quadrotor was used for collection of vehicle dataset which were labelled and classified using You Look Only Once (YOLOv3) Object detector using Darknet53 as feature extractor. This detector was specially selected for its accuracy in detecting small objects as aerially viewed from UAV gimbal camera. The approach was successfully implemented on vehicle dataset and proper identification in different categories like car, truck etc., was done. A novel object counter algorithm was designed to count the objects and assign class identification and object counter number. Each objects were accurately detected and assigned proper IDs. The processing of intelligent object classification increased to 10 times when GPU acceleration was used on tensors in PyTorch. The results are attached for understanding and prove that this detector works best for recognition of objects in aerial view.

**16:30**

**Guardian Alert: A Deep Learning Approach for Driver Drowsiness Detection and Force Sensing Integration**

Jitty Tresa Thomas (Saintgits College of Engineering, India)

Joseph Mathew (Saintgits College of Engineering, India)

Melwin George (Saintgits College of Engineering, India)

Meril Rachel Saji (Saintgits College of Engineering, India)

Renju Rachel Varghese (Saint Gits College of Engineering Kottayam, India)

The proposed project addresses the critical issue of driver drowsiness, which is a major cause of accidents on the road. The system utilizes advanced technology, including video image analysis and pressure sensing, to monitor the driver's state while behind the wheel. By detecting the closure of the driver's eyes and measuring the pressure on the steering wheel, the system can accurately determine whether the driver is becoming drowsy or losing focus. The detection of drowsy eyes is particularly crucial, as the duration of eye closure during drowsiness is longer than normal blinking, making it a clear indicator of potential danger. The integration of the pressure sensing system further enhances the accuracy of detecting drowsiness, as it captures instances of loosening grip on the steering wheel, which may signify a decline in attentiveness. This combination of eye and grip monitoring enables the system to issue timely alerts to the driver, warning them to stay alert and avoid potential accidents. Moreover, the ability to detect the presence of hands on the steering wheel also provides an additional layer of safety, ensuring that deliberate actions or distractions are also accounted for. Overall, this comprehensive drowsy eye detection system is seen to be 90% effective and holds significant social importance by preventing accidents, while also delivering economic benefits through reduced accident-related costs and enhanced overall productivity on the roads.

**16:45**

**A Systematic Review on Detection and Classification of Melanoma**

Sreelakshmi Jayasankar (Noorul Islam Center for Higher Education, India)

Brindha T (Noorul Islam Center for Higher Education, India)

The human skin serves as the exterior protective layer of body, shielding the interior organs beneath from damaging UV rays, dust, and pollution. Cancer is one of the main causes of mortality worldwide as per WHO. One-third of all malignancies that have been

diagnosed around the world are skin cancers. Skin cancer has been more common during the last few decades. Melanoma and its global incidence rate have been quickly increasing in recent years. Identifying skin cancer in its early stages can result in a considerable drop in the fatality rate. Melanoma's complicated nature and structure make it difficult to distinguish unique aspects based on the type, shape of the cancer cells, colour and texture. This literature review gives an overview of the present state of melanoma detection methods. The review discusses the numerous approaches and procedures used to diagnose melanoma, as well as their potential accuracy, limitations in accuracy, and prospects for improvement. It will concentrate on various ways of diagnosis, such as imaging techniques such as dermoscopy and various methods in artificial intelligence. The review will also look at the problems and potential breakthroughs in the field of melanoma detection.

Key words: Skin lesion- Melanoma Detection- Dermoscopic images-Skin Cancer- Melanogenesis

**17:00**

### **Enhancing Children's Learning Experience: Interactive and Personalized Video Learning With AI Technology**

Sania Thomas (Saintgits College of Engineering, India)

Children often watch videos on a daily basis to learn new things, but traditional videos have limitations as they are a one-way medium. Children can easily become sidetracked and lose interest over time. By incorporating AI technology into the learning process, children can actively interact with the videos they watch, making the learning experience more enjoyable and effective. AI algorithms can evaluate the student's development, identify areas for improvement, and provide personalized feedback to correct errors and advance their learning. Interactive learning, facilitated by AI, involves a back-and-forth exchange between the learner and the learning system. It moves away from passive information consumption and encourages active participation from the learner. Personalization is a key aspect of interactive learning with AI. By adapting the learning tasks, content, and difficulty level based on the learner's current knowledge and progress, AI ensures that the learning experience is tailored to individual needs. By leveraging AI technology, interactive learning can support children in developing a deeper understanding of the material and achieving their learning goals. It empowers them to actively participate in the learning process, making learning feel like fun rather than a chore. With personalized feedback, adaptive learning, and real-time interaction, AI-enabled learning experiences can revolutionize how children acquire knowledge and skills through videos. The AI model demonstrated a remarkable accuracy of 99.04% when tested on a large dataset.

**17:15**

### **Deepfake Detection Using XceptionNet**

Ashok V (NONE, India)

Preetha Joy (Cochin University of Science and Technology, India)

Deepfakes, the product of deep learning algorithms, have become increasingly accessible through mobile applications, raising concerns about their potential for malicious use. These falsified images present a significant threat to society, as they can violate official rules and ethical norms, while also serving as weapons of mass disinformation and chaos. The emergence of deepfakes is primarily attributed to the advancements in deep learning algorithms for image processing, enabling the creation of deceptive visuals that closely resemble real images. Consequently, the detection of deepfakes has become paramount in combating their harmful effects. To address this challenge, this paper proposes the utilization of the Xception network, a deep convolutional neural network architecture, for the identification and categorization of deepfakes in both images and videos. Convolutional neural networks (CNNs) have demonstrated remarkable success in various computer vision tasks, including image classification, object detection, and image generation. The Xception network, in particular, represents a state-of-the-art CNN model that offers exceptional performance in distinguishing real content from deepfakes. By employing the Xception network, the proposed method aims to overcome the difficulty of discerning between real and falsified images. This is crucial, as deepfakes have reached a level of visual fidelity that makes them indistinguishable to the human eye. Leveraging the power of deep learning, the Xception network analyzes the intricate features and patterns present in the images or videos to identify anomalies indicative of deepfake manipulation. The network learns from a large dataset of both real and deepfake images, enabling it to generalize and accurately classify unseen instances. Overall, the research presented in this paper underscores the pressing need for effective deepfake detection mechanisms in light of their potential harm to society. The utilization of the Xception network provides a promising approach to address this challenge, offering the ability to identify deepfakes and mitigate their detrimental impact on official regulations, ethical standards, and public trust.

**16:15 - 17:30**

**Session 8: Computer Systems and Networks II**

**Research Track 2**

**Session Chairs: Aswath Babu Hanumantharayappa (IIIT Dharwad & IIITDhatwad, India) & Madhu K p (Rajiv Gandhi Institute of Technology, India)**

**Room: Hall 1 - North Block**

16:15

### **A High Secure Video Steganography Based on Effective Quasigroup-Based Encryption and Shearlet Transform**

Tonny Binoy (Saintgits College of Applied Sciences, India)

Meenu Suresh (Saintgits College of Applied Sciences, India)

Steganography satisfies these requirements since it is an art form for hiding sensitive information within a cover medium like a video or image and making sure that a third party is unaware of its existence. Video serves as the cover medium for video steganography, and any text or image could hold the secret data. The expansion of the internet and network technology has made it possible to share large files, such as videos, images, and audio, in a matter of seconds. The quick development of multimedia technologies leaves the networks open to malicious attacks. The most important issues in the digital world are data security and confidentiality. This research proposes a novel video steganography method that uses the shearlet transform and quasigroup-based encryption to conceal secret data. The suggested method finds the key frames by utilizing scene change detection. A shearlet transform is then applied to the key frames to obtain the subbands and orientation. The hidden data is encoded in those values. To improve security, quasigroup based encryption and chaotic maps serve as preprocessors before the secret data is embedded. The testing outcome best exemplifies how the algorithm not only offers greater security but also excellent video quality and robustness.

16:30

### **Security Risk Assessment of Metaverse Based Healthcare Systems Based on Common Vulnerabilities and Exposures (CVE)**

Ravi Prakash (Kerala University of Digital Sciences, Innovation and Technology, India)

Gayathri R Nayar (Digital University Kerala, India)

Tony Thomas (Kerala University of Digital Sciences, Innovation and Technology, India)

Metaverse has been gaining the attention of industry and academia equally in the recent past. With the immense capabilities backed by cutting-edge technologies, it has the potential to revolutionize every domain, especially healthcare. Metaverse can help to give customized treatment by a specialist to a patient anywhere in the world. However, akin to any new technology, the adoption of a metaverse in healthcare is susceptible to security issues and vulnerabilities. A proper study of the weakness and potential vulnerabilities is required before the active integration of metaverse into healthcare. Therefore, in this paper, we analyze the existing applications of the metaverse and its enabling technologies in the healthcare domain and investigate the security issues that exist or are likely to arise. Through the literature analysis, we identified three essential metaverse components for future healthcare systems, namely, Extended Reality (XR), Blockchain, and Avatar. These components and their combinations in varying degrees will give different dimensions to metaverse-based healthcare solutions. Further, we analyzed the risks associated with these components and their combinations. Here, the overall risk assessment was based on the existing literature and vulnerabilities, new cyber attacks, and the current trend of cyber attacks in the healthcare domain. The vulnerabilities collected from the Common Vulnerabilities and Exposures (CVE) site were used for studying the risks associated with metaverse, healthcare and their integration.

16:45

### **Cyber Threat Analysis and Design of IMC-PID Conventional Controller of PWM DC-DC Buck Converter (Part A)**

Badavath AnilKumar (IIT Roorkee, India)

Yogesh Vijay Hote (Indian Institute of Technology Roorkee, India)

Vivek Kumar (Indian Institute of Technology Roorkee, India)

Md Masood Raza (Delhi Technological University, India)

The main aim of attackers targeting Cyber-Physical Systems (CPS) is to compromise the control and monitoring applications facilitated by the cyber layer. The Gain (also called covert or DoS) attack and the Man-in-the-Middle(MitM) (also called false data injection) attack can disrupt the operation of control systems. In this paper, we have introduced Internal Model Control (IMC) as one of the resilient control techniques for detecting and mitigating cyber-attacks. Here we considered a DC-DC PWM buck converter designed based on the state space averaging(SSA) technique as a plant model. Further, we developed an IMC-PID conventional controller for this model with introduced cyber-attacks in the communication network. The final IMC controller has expressed in the discrete domain as a series combination of Proportional, Integral, and Derivative (PID) terms. The simulations are conducted in MATLAB/SIMULINK environment and validated on a hardware setup using the WAVECT Controller. Here the controller design calculations are done in the transfer function domain because of convenience. Unfortunately, a TF cannot be implemented directly in Z-domain; for it to be implemented, its time domain equivalent has to be determined for realization. Therefore the approach to design the controller is first to discretize the plant. Using this, the controller is designed in discrete time.

17:00

### **Exploring the Impact of Digital Marketing on Hospitality and Tourism: A Bibliometric Review of Current Trends**

Yachna Ramesh Gharde (Savitribai Phule Pune University, India)

Purpose The implementation of digital marketing has brought about a significant transformation in the manner in which hoteliers engage with consumers within the Hospitality and Tourism Industry. This study investigates the utilisation of digital marketing

within the hospitality and tourism industry. A comprehensive investigation spanning a period of more than two decades has been conducted, employing the utilisation of conceptual framework. The aforementioned techniques encompass Network Analysis, Factorial Analysis, Thematic Mapping, Evolution, and Topic Modelling. Design/Methodology This study employed a literature review as a research methodology, wherein a comprehensive analysis was conducted on a total of 181 research publications pertaining to the topic of Digital Marketing in the field of Hospitality and Tourism. This study exclusively utilised published research articles, excluding books, non-English papers, and publications outside the time frame of 2001 to 2023. Findings The findings of the study suggest that, on average, there are 15 citations per document, with an average of 2.689 citations per year per document. In addition, the study utilised a total of 10,022 references. The research employed various descriptive statistical methods and subsequently performed a bibliometric analysis utilising Biblioshiny, a software tool designed to generate bibliometric maps. Practical Implications The study holds practical significance as it offers readers and academics a comprehensive comprehension of digital marketing within the hospitality and tourism sector. The provided resource presents comprehensive data regarding prominent scholarly journals, authors, and countries of affiliation within the specified academic discipline. Additionally, it includes an examination of citation trends and identifies the specific years that have garnered the highest number of citations. This information has the potential to aid in the identification of emerging trends and potential avenues for further research, collaborations, and publications.

Limitations This study is subject to various limitations, with one prominent limitation being the technical constraint encountered in utilising the software Biblioshiny. Specifically, this software lacked the capability to integrate data from disparate databases such as Scopus and Web of Science. In future research endeavours, including quantitative, qualitative, or mixed methods have more comprehensive comprehension of the utilisation of digital marketing within the hospitality and tourism sector. Originality/value This study possesses a distinct and innovative significance as it represents the inaugural comprehensive examination that offers a comprehensive summary of recent changes in the understanding of scholars in the domain of digital marketing within the hospitality and tourism sector. This study presents a distinctive viewpoint and provides valuable insights that can aid researchers and industry professionals in keeping abreast of the most recent advancements and trends in digital marketing within the hospitality and tourism sector.

Keywords Digital Marketing, Hospitality and Tourism, Bibliometric, Biblioshiny, R Studio, Thematic Mapping and Thematic Evolution.

**17:15**

#### **Improvisation in SHA 4 Algorithm**

Sangheethaa Sukumaran (Kerala Technological University, India)

Arun Korath (Vedavyasa Institute of Technology, India)

Ranjana C (APJ Abdul Kalam Technological University, India)

SHA-4 is a secure hash function that was developed by the National Institute of Standards and Technology (NIST). It is a successor to the SHA-1 algorithm, and it is designed to be more secure and resistant to attack. SHA-4 uses a 160-bit message digest, and it is implemented as a 64-round function. SHA-4 is resistant to a variety of attacks, including collisions, preimages, and second-preimages. A collision occurs when two different messages produce the same hash value. A preimage occurs when an attacker is able to find a message that produces a given hash value. A second-preimage occurs when an attacker is able to find a second message that produces the same hash value as a given message. The security of SHA-4 is based on its design and implementation. The design of SHA-4 includes a large message block size, a large number of rounds, and a complex round function design. These features make it very difficult for an attacker to find collisions or preimages for SHA-4. The implementation of SHA-4 is also important for its security. SHA-4 is typically implemented in software, but it can also be implemented in hardware. The implementation of SHA-4 must be careful to avoid side-channel attacks, which are a type of attack that exploits information that is leaked during the execution of a cryptographic algorithm. The security of SHA-4 has been evaluated by a number of independent organizations. These organizations have concluded that SHA-4 is a secure hash function. However, it is important to note that no hash function is completely secure. As technology advances, it is possible that new attacks will be developed against SHA-4.

Keywords - SHA-4, hash function, collision, preimage, second-preimage, security, side-channel attack

**16:15 - 17:30**

#### **Session 9: VLSI and Embedded Systems II**

##### **Research Track 3**

**Session Chairs: T E Ayoob Khan (College of Engineering Karunagppally, India) & Lintu Rajan (NITC, India)**

**Room: Hall 3 - North Block**

**16:15**

#### **Charge-Transport Characteristics in Nitrogen Doped Carbon Quantum Dots Memristor**

Anju Kumari R (REVA University, India)

In recent years, Carbon quantum dots are anticipated to become of the prominent innovative functional active layer material for memristor device application. Here in, we reported the single layer of Nitrogen Doped Carbon Quantum Dots (NCQDs) drop-cast on FTO as substrate and Ag as electrodes exhibits bipolar resistive switching. The further charge transport investigation

highlighted, the resistive switching is dominated by space charge limited current (SCLC) conduction enhanced due to electron trapping and detrapping property of NCQDs.

**16:30**

**Design of a Current Feedback Instrumentation Amplifier for Resistive Sensor Readout Interface**

Anupama A (Vikram Sarabhai Space Centre & ISRO, India)

Deepu Roy (Scientist, India)

Padmakumar K (Scientist SF, India)

This paper describes the design of a fully differential high gain Current Feedback Instrumentation Amplifier (CFIA) suitable for the front-end interface of resistive sensor-based systems. Resistive sensor systems usually have output signals in the range of a few millivolts. Hence the signal needs to be amplified before it can be further processed. The current feedback instrumentation amplifier offers good CMRR and near-rail input common-mode range. The proposed CFIA design can function with an input common-mode voltage range that goes below the negative supply rail. Hence the CFIA can easily handle a wider range of input CM levels than conventional three-op-amp topology. The high gain of the amplifier is achieved with the gain boosted folded cascode structure. The class AB output stage of the amplifier provides a fully differential output with rail-to-rail swing. The output common mode voltage of the CFIA is stabilized using a common mode feedback circuit. Simulation results show that the proposed CFIA achieves an open loop gain of 115dB, unity gain bandwidth of 19MHz and a CMRR of 95dB. It has an input common mode range of -0.8 to 3.5V. The design has been implemented in SCL 0.18 $\mu$ m CMOS process and operates with a 5V supply voltage.

**16:45**

**Application of Concrete Sensors in Different Structural Members**

Sneha M Varghese (Saintgits College of Engineering (Autonomous) & KTU University, India)

The unpredictable nature of crack formation and propagation in reinforced concrete structures may seriously affect the stability and strength of structures, and thus, has been a subject of many studies in recent years. The field of structural health monitoring has gained substantial attention as it plays a crucial role in damage detection. In this study, concrete sensor is manufactured with 0.5% of Multi-Walled Carbon Nano-Tubes (MWCNT) and it is embedded into structural members like reinforced concrete column and beams at different locations. Responses in the form of resistance will be collected from these concrete sensor under loading and analyzed. Beams and columns are modified by introducing change in cross-section at different locations. concrete sensors are placed at different locations in modified structural members. Variation of electric resistance, deflection, initial crack and ultimate crack with the increase in load are studied. Variation in the responses of structural members with modification is compared to the normal structures' response. Crack monitoring is accomplished by analyzing variations in the slope of electrical resistance under load, which enables the replacement of electronic sensors with concrete sensors in structural members. This research contributes to the advancement of crack monitoring techniques in reinforced concrete structures, with the potential for improved structural integrity and safety.

**16:15 - 17:30**

**Session 10: Signal and Processing Communication Systems II**

**Research Track 4**

**Session Chairs: Tomson Devis (St. Joseph's College of Engineering and Technology, Palai, India) & Rakesh R T (National Institute of Technology Calicut, India)**

**Room: Hall 4 - North Block**

**16:15**

**TBSA: Ensuring Secure Data Communication in Wireless Sensor Network**

Joby P P (St. Joseph's College of Engineering and Technology, Palai, India)

Praseetha V M (St. Joseph's College of Engineering and Technology, India)

Akhil Sekharan (APJAKTU & St Joseph's College of Engineering and Technology, Palai, India)

Wireless Sensor Network, a wireless network of spatially dispersed autonomous devices deployed with sensors to monitor the physical and environmental conditions. The sensed data needs to be communicated to the sink where the data get analysed. Wireless Sensor Network requires a reliable, energy efficient architecture to ensure data communication from source to sink. The proposed Tree Based Secure Architecture, adopts a topology of tree with root node as parent node, intermediate and leaf nodes as child nodes. Parent node, the leader and communicates the data received from the child nodes to the sink. For secure data communication between parent node and child nodes, parent node adopts two techniques-one, the distribution of private keys among their child nodes and the other, is sending control message to the child node. As the energy level of parent node drops, then the next level node become the parent node and securely communicate data to the sink without packet loss. The paper also

presents an experimental comparison between proposed Tree Based Secure Architecture and existing techniques towards network performance, false positive rate, drop rate, malicious node detection capability and energy efficiency both with stable nodes and mobile nodes. The Tree Based Secure Architecture ensures the secure data transmission with improved energy efficiency and network performance.

**16:30**

#### **Paradigm Shift From Monolithic to Microservices**

Divarshana Saxena (NIT Karnataka, India)

Biswajit R. Bhowmik (NIT Karnataka, India)

Microservices has been making waves among forward-thinking application development organizations. In the realm of software development, software architecture holds paramount importance because it serves as a guiding force to shape the entire life cycle of a software system. Software architecture is a foundation for complex digital components built upon a software system. Within this domain, two prevalent paradigms, monolithic and service-oriented architecture (SOA), stand distinct. While monolithic simplifies development using its integrated structure, SOA reduces complexity through modular services. However, both paradigms suffer severe scalability, deployment cycles, and flexibility challenges. Subsequently, microservice architecture as a modern paradigm emerges to overcome these challenges. This paper presents an in-depth analysis of the paradigm shift from monolithic to microservice architecture. It begins with exploring the monolithic and SOA conceptual landscape and their pros and cons. After that, we delve into the microservice platform, including its basic architecture and implementation stages. Furthermore, we provide the trend of the paradigm shift that highlights the recent developments in the field and identifies the research challenges associated with it. Thus, the paper brings multiple research dimensions for the researchers and lets the software as well as application development team to improve resilience and expedite their time to market.

**16:45**

#### **Flexible Low Noise Amplifier for IoT Applications in Biomedical Devices**

Athul Krishnan (Indian Institute of Science Education and Research, Bhopal, India)

Dayarnab Baidya (Indian Institute of Science Education and Research Bhopal, India)

Mitradip Bhattacharjee (Indian Institute of Science Education and Research Bhopal, India)

This study focuses on the critical role of Low Noise Amplifiers (LNAs) in achieving low noise and high gain in wireless systems and IoT-based sensing applications. The emphasis on straightforward design is particularly relevant for wearable IoT contexts. The research centers on the creation of a single-stage LNA with notable gain, stability, and noise figure (NF) attributes. The evaluation of this LNA's performance and utility includes an in-depth analysis of its gain, noise figure, and stability characteristics. The design employs a Low Noise Gallium Arsenide FET transistor, optimizing its potential through the application of lumped components for input and output side matching. The outcomes of the study reveal impressive features of the suggested LNA design, notably a forward gain of 16.5 dB and a noise figure of 0.6 dB at a frequency of 2.4 GHz. This renders the LNA suitable for integration with sensors operating in the lower frequency ranges, aligning well with the LS frequency band. A key aspect of the design is its suitability for wearable IoT and disposable biomedical applications, achieved by minimizing component count without compromising performance. In summary, the research underscores the importance of LNAs in enhancing signal quality and presents a well-optimized single-stage LNA design. The outcomes position this LNA as a robust solution for wearable IoT scenarios, underscoring its gain, noise figure, and stability advantages while aligning with the frequency requirements of sensors.

**17:00**

#### **DEM Generation From Mono-Multispectral Images via Uncalibrated Epipolar Rectification and 3D Registration**

Ashutosh Gupta (Space Applications Centre ISRO, India)

Hemant Kumar Lalwani (Space Applications Centre ISRO, India)

Subhajit Paul and Debajyoti Dhar (Space Applications Centre ISRO, India)

Generation of Digital Elevation Model (DEM) typically requires fine image matching between set of images acquired with wide-baseline and appropriate B/H ratio. Wide baseline stereo imaging is an expensive process, since it requires two or more acquisitions at the cost of nominal mono-imaging operations. Due to the wide-baseline, angular separation in views is required, which results in increased occlusion problem leading to holes in the generated DEM. Multiview images taken with wide baselines also have lower overlap area compared to images taken from narrow-baseline systems. Moreover, while making orthorectified maps, large tilts need to be corrected using the processing techniques to obtain top-down view. To alleviate these issues, we propose a novel DEM generation pipeline that utilizes the narrow-baseline information between bands of a single multispectral image. Our method is able to generate sub-pixel accurate disparity maps while tackling the spectral information change. Final DEM is generated from the disparity by using reference Ground Control Points (GCPs) and an iterative control point registration procedure. We demonstrate the effectiveness of our DEM generation pipeline on Resourcesat-2 LISS-IV multispectral image with

a B/H ratio as low as  $\sim 0.018$ . Our results show that subpixel disparity of the order of 1/50th of a pixel can be computed. A visual and quantitative comparison of the generated DEM with the wide-baseline DEM from Cartosat-1 shows that the elevation information is estimated with good overall agreement even for a hilly region. Our technique makes it possible to extract elevation information from mono-multispectral images with unusually low B/H ratios, potentially enabling the generation of DEMs from multispectral images that would not normally be considered viable for this purpose.



## Technical Program: Friday, 10 November

**08:00 - 09:00**

**Registration**

**09:00 - 11:15**

**Industry Forum**

**Room: Main Venue - Mini Auditorium**

### **Industry Forum Opening**

Naveen John Punnoose (Saintgits College of Engineering, India)  
Chair, RASSE 2023 Industry Forum

### **Keynote Talk 1: 10th Machine Age Investments and New Age Innovations – Double Exponentially Disrupting the Confluence of the Transdisciplinary Digital, Physical and Biological**

Stephen Ibaraki (REDDS Capital, Canada)

### **Keynote Talk 2: Internet of Senses**

Sunil Kumar Vuppala (Ericsson, India)

### **Keynote Talk 3: Ethics and Leadership in a Digital Age**

Ashutosh Garg (Guardian Pharmacy, India)

### **Keynote Talk 4: Harmonizing Clean Energy and Green Transportation Systems for the Sustainable & Net Zero Future**

Deepak Waikar (Singapore Institute of Technology, Singapore)

### **Keynote Talk 5: Catalyzing Industry 6.0: OPAL-RT Solutions for Real-Time Testing & Validation of HIL-BMS and FPGA Motor Modeling for Sustainable EV Applications**

Sivakumar Sudhakar (Opal-RT Technologies, India)

**11:15 - 11:30**

**Coffee Break**

**11:30 - 13:00**

### **Expanding Role of AI/AGI in Traditionally Human-Centric Industries**

**Moderator:** Ashutosh Garg (Guardian Pharmacy, India)

**Room: Main Venue - Mini Auditorium**

### **Keynote: Synergistic Symbolic Model for Generative AI**

Paul Lee (Mind.ai, South Korea)

### **Panelists:**

Dileep Viswanathan (Hewlett Packard Enterprises, India)

Nikhil Malhotra (Tech Mahindra, India)

Sunil Kumar Vuppala (Ericsson, India)

Chen-Kuo (Adrian) Chiang (National Chung Cheng University, Taiwan)

**13:00 - 14:00**

**Lunch**

**Room: Abdul Kalam Block Seminar Hall**

**14:00 - 15:30**

### **Blockchain as an Exponentially Disruptive Technology - Applications and Implications**

**Moderator:** Jubilant Kizhakethottam (Saintgits College of Engineering, India)

**Room: Main Venue - Mini Auditorium**

### **Keynote: Reality Check: Separating Blockchain Hype from Practical Utility**

Gigo Joseph (Chainyard, India)

### **Panelists:**

Dinesh Thampi (Tata Consultancy Services, India)

Gigo Joseph (Chainyard, India)  
Panchami V (Indian Institute of Information Technology, Kottayam, India)  
Chintan Oza (Anantam Ecosystems, India)

**15:30 - 16:00**

**Coffee Break**

**16:00 - 17:30**

**Accelerating Innovation for a Sustainable Future**

**Moderator:** Naveen Punnoose (Saintgits College of Engineering, India)

**Room:** Main Venue - Mini Auditorium

**Keynote: Steering Towards a Greener Future - Software Powered Mobility**

Jijimon Chandran (Acsia Tech, India)

**Panelists:**

Ajith Gopi (ANERT, India)

Jijimon Chandran (Acsia Tech, India)

Chocko Valliappa (Vee Technologies, Sona Group, India)

Deepak Waikar (Singapore Institute of Technology, Singapore)

CJ George (Geojit Financial Services, India)

**17:30 - 19:00**

**Cultural Evening**

**Room:** Amphi Theater

**19:00**

**Conference Banquet**

**Room:** Abdul Kalam Block Seminar Hall

## Technical Program: Saturday, 11 November

09:00 - 09:30

Registration

09:30 - 12:00

**Special Session: Privacy and Security of Big Data in Electrical Smart Grid Applications**

**Session Chair: Dr. Vivekanandan (National Institute of Technology, India) & Dr. Bijunakunju K (TKM College of Engineering, India)**

**Room: Hall 6 - North Block**

### **Failure Analysis of Electromechanical Indicating Type Meters in an Industry by Using Fishbone and Pareto Models**

Ananda Mh (REVA University, India)

Industries strive for competitiveness through continuous improvement of production processes, product quality, and increased customer satisfaction levels, achieved by implementing diverse quality improvement programs, methodologies, and approaches. This paper presents a methodology of problem-solving, namely fishbone and Pareto models, coupled with root cause analysis for failure cause identification of faulty meters. The integration of these methodologies is demonstrated in a real-life scenario concerning the potential failure of electromechanical indicating type meters. The findings indicate that iron chips and dust particle deposition are caused by awareness of handling the metres, resulting in the problem of stopped needle in the metre. Such quality improvement endeavors lead to superior product and service quality, ultimately enhancing customer satisfaction.

### **Grey Wolf Optimization for Maximum Power Point Tracking With Incremental Conductance Algorithm**

Rajeswari Bhol (Narsimha Reddy Engineering College, India)

Solar PV operating point tracking and thereby extracting maximum power for the load is a very critical task under varying environmental parameter. Incremental conductance method of tracking the Maximum Power Point is a classical method and again provides optimized MPP if the load is linear. With change in dynamic loading condition the slope or gradient of the MPP also changes in a stochastic manner. To track MPP it is proposed Grey Wolf Optimization (GWO) in this article to precisely determine the duty cycle for the boost converter along with incremental conductance method. Here the system has been analyzed for line to ground fault condition by using a MATLAB Simulink model.

### **Synergistic Energy Utilization for Intelligent EV Charging Stations via Hybrid Sources**

Sudhakar P Rao (REVA University, India)

In this paper, we suggest designing Charging stations for electric vehicles using a hybrid energy source. The proposed system would include solar power generation to provide a reliable and sustainable power supply for charging electric vehicles. The charging station would be equipped with a battery storage system to store the excess energy generated by the hybrid power source, which would ensure the continuous operation of the charging station even during periods of low solar radiation. We are utilizing both a solar system and grid supplies in this arrangement. Depending on the source's priority, the controller will automatically switch the source. A detailed experimental setup using solar panels and a grid has been designed in a scaled-down format. The model has been verified concerning duty cycle, voltage, and current during the charging and discharging mode of operation in the vehicle application.

09:30 - 11:00

**Session 11: Computer Systems and Networks III**

**Research Track 2**

**Session Chairs: Aswath Babu Hanumantharayappa (IIIT Dharwad & IIITDhatwad, India) & Jobin Jose (Indian Institute of Information Technology Kottayam, India)**

**Room: Hall 1 - North Block**

09:30

### **Priority-Based Optimal Routing for Intelligent Transportation System**

Vivek Kumar (Sardar Vallabhbhai National Institute of Technology, Surat, India)

Ananya Tripathi (Sardar Vallabhbhai National Institute of Technology, Surat, India)

Mukesh Zaveri (Sardar Vallabhai National Institute of Technology, surat, India)

Dhaval Karshanbhai Patel (School of Engineering and Applied Science-Ahmedabad University, India)

Intelligent Transportation Systems have a critical issue finding users' precise and effective routes in urban traffic networks. It enables consumers to be better informed and use transport networks in a safer, more efficient, and more innovative manner. ITS integrates various technologies, including sensing, analysis, control, and communications, for ground transportation. This issue has a significant influence on the capacity of transportation, safety, user happiness, and quality of life. However, this challenge is difficult because of the enormous and complicated traffic networks, the dynamic and uncertain traffic circumstances, and the

different competing user demands. It uses V2X technology to communicate with other elements of the environment. V2X, or Vehicle-to-Everything communication (V2X), allows vehicles to talk with one another and with their surroundings. Unlike typical sensors, which attempt to imitate a sense we already have, such as vision, V2X adds a whole new level to human and machine perception. Thus, vehicle-to-infrastructure (V2I), vehicle-to-vehicle (V2V), vehicle-to-network (V2N), and vehicle-to-pedestrian (V2P) interactions are mostly covered by V2X technology. In this paper, we propose a novel approach for priority-based optimal routing in ITS that generate the shortest route using A\* algorithm for the priority vehicle, and the waiting time at the junction becomes negligible when that vehicle comes closer to a junction. We have simulated scenarios using Netsim and SUMO traffic generators. The proposed approach shows that our algorithm gives minimum waiting time and traveling time for priority vehicles at the junction.

**09:45**

#### **A Survey on the Impact of Blockchain in Effective Organ Transplantation**

Liz George (APJ Abdul Kalam University, India)

Last decade has witnessed revolutionary changes in the field of Information Technology & Health Care. The digitization of healthcare data has enabled the effective storage, retrieval and sharing of medical information of the patients. It simplifies the tedious paper work involved in traditional data storage approaches providing cost effective and better health assistance. Given the sensitivity of medical information, it must be handled with the utmost care while maintaining confidentiality and privacy. Organ donation and transplant process is the most complicated area of health sector. There are several factors like scarcity of organs, lack of awareness among public, complexities involved in organ removal and implantation processes and black marketing that makes it challenging. To enable more transplants before patients on the organ waiting list pass away, an upsurge in the number of donors, handled by a more secure and accountable platform, is required. Blockchain with its distributed ledger technology offers a wider canvas for organ matching, breaking the regional barriers, with international waitlist databases. The security and immutability features of blockchain can ensure the privacy of the patients and reduces black market organ donations. This paper reviews the role that can be played by blockchain in improvising the existing organ transplantation procedure. Different systems implemented using blockchain technology are analyzed, highlighting their unique features.

**10:00**

#### **Steady State Analysis of a UOP SBS Fluid Catalytic Cracking Unit in Aspen HYSYS**

Binson A (Saintgits College, India)

Anish Thomas, Sr (Assistant Professor (Sr) & National Institute of Technology, Calicut, India)

This research paper presents a comprehensive study on the steady-state simulation and control of a Fluid Catalytic Cracking Unit (FCCU) operating under complete combustion mode. Employing Aspen HYSYS as the simulation platform, we systematically investigated the impact of key input parameters on the unit's performance under both open and closed-loop operations. In open-loop operation, the influence of catalyst circulation rate (FC) and regenerator inlet air flow rate (FA) on conversion, product yields, and other crucial output parameters was analyzed. Remarkably, it was observed that the reactor section had a profound impact on the regenerator, while the reverse relationship was not as pronounced. Closed-loop performance assessment revealed the necessity of adjusting feed oil temperature and oxygen concentration in the flue gas to restore Naphtha yield when deviations occur. Notably, variations in feed flow rate had a direct effect on conversion and Naphtha yield, with adjustments in feed oil inlet temperature (TA) or oxygen concentration offering avenues for restoration. Crucially, this study underscores the one-way interaction between the reactor and regenerator sections, wherein reactor performance strongly influences the regenerator. These findings provide valuable insights for optimizing the operation of FCCUs and developing effective control strategies to enhance Naphtha yield while maintaining process stability.

**10:15**

#### **An Economical Method for Modeling, Fabrication, Testing, and Characterization of a Bio-Phantom for Pulmonary Edema**

Irfana P (National Institute of Technology Calicut, India)

Resmy S Anand (Sree Chitra Tirunal Institute for Medical Sciences and Technology, India)

Anup Aprem (National Institute of Technology Calicut, India)

Vishal V (Sree Chitra Tirunal Institute for Medical Sciences and Technology, India)

Shaj Upendran (Sree Chitra Tirunal Institute for Medical Sciences and Technology, India)

Harikrishnan S (Sree Chitra Tirunal Institute for Medical Sciences and Technology, India)

Cardiac pulmonary edema is a disorder that causes an accumulation of fluid in the lungs as a result of heart problems. It is a life-threatening illness that may lead to congestive heart failure, medical emergencies, and even death. The fluid build-up in the lungs affects its dielectric properties mostly through permittivity changes. This correlation between lung tissue water content and dielectric characteristics can be exploited in diagnostic systems. Microwave technology is a cutting-edge and emerging alternative way for continuous monitoring of pulmonary edema. To develop diagnostic systems for pulmonary edema using microwave technology, a phantom that replicates the dielectric properties of the human torso is essential. The human torso has a complex layered structure consisting of epidermal skin, subcutaneous fat, and numerous layers of muscles and critical organs like the heart and lungs. In this paper, an affordable semi-solid gelatin-based layered phantom is proposed and fabricated to model skin, fat, and muscle layers. In addition, a microstrip ring resonator is modeled, simulated, and fabricated to verify the dielectric constant

of each manufactured phantom layer. Finally, the torso phantom, formed by stacking the tissue layers, is validated against existing models in the literature. Numerical results show that the proposed semi-solid gel-like human phantoms are reliable for use in the UHF frequency band.

**09:30 - 11:00**

**Session 12: Signal and Processing Communication Systems II**

**Research Track 4**

**Session Chairs: Manju Manuel (Rajiv Gandhi Institute of Technology, India) & M V Rajesh Maliyeckal (Kerala Technological University, India)**

**Room: Hall 4 - North Block**

**09:30**

**A Cluster Based Relay Assisted Communication for Prioritized Mobile End-Users**

Ashok K (New Horizon College of Engineering, India)

Sudha T (Saintgits College of Engineering (Autonomous), Kottayam, Kerala, India)

Rachna P (New Horizon College of Engineering, India)

Monika Gupta (New Horizon College of Engineering, India)

Santhosh Krishna B v (New Horizon College of Engineering, India)

Next Generation wireless networks are primarily focused on minimizing the power wastage issues among communication nodes. The user nodes can be highly prioritized like a mobile ambulance that always seeks priority and uninterrupted service throughout. The existing Millimeter Wave Beamforming (MMW-BF) algorithms steer and switch the beams as desired, but the nodes are subjected to excessive power wastage issues. The proposed cluster based hybrid optimization algorithm when used in MMW beamforming, involves both Butterfly Optimization Algorithm (BOA) and Ant Colony Optimization Algorithm (ACO). The combined Butterfly- Ant Colony Optimization Algorithm (BACOA) minimizes the excessive power wastage by choosing an optimum cluster head to relay the information and simultaneously finding the optimum path of relaying the information to the destination. The novel BACOA approach in MMW-BF minimizes the power wastage and maximizes the overall energy efficiency while serving the critical or prioritized nodes like mobile ambulance, subjected to preemptive decision rules. The simulation results shows that the proposed BACOA outperforms the conventional ACO and BAO in terms of convergence rate, Achievable sum rate and Energy Efficiency. The proposed method finds wide application in providing uninterrupted connectivity for prioritized mobile end users like emergency mobile ambulance that expects an interrupted connectivity throughout.

**09:45**

**Energy Efficient Trust Routing Based on Mud Ring Optimization in Wireless Sensor Network**

Maradona N (India)

Jaya T (Assistant Professor, India)

One of the most challenging tasks in constructing a routing model for a Wireless Sensor Network (WSN) is ensuring energy efficiency. Various energy-efficient routing strategies are developed to guide data packets across Cluster Heads (CH) along secure paths. However, within the context of a WSN, achieving both network longevity and substantial scalability proves to be a formidable challenge. Traditional trust-based routing solutions are inadequate in offering security against attacks, and as a result, trust management remains a significant obstacle in routing. To address the need for routing data packets securely and efficiently to their intended receivers, a novel routing model is devised. This model employs the Trust Routing based on Mud Ring Optimization (TR-MRO) algorithm. By incorporating the principles of the TR-MRO algorithm, which takes into account recent trust, direct trust, indirect trust, and probability requirements, the proposed model guides the routing process through CHs. Through the TR-MRO algorithm, the most optimal and secure path for data transfer is determined based on fitness considerations. The performance of the proposed network is evaluated in terms of several key metrics, including network lifetime (3050 rounds), delay (0.03s), throughput (0.93kbps), trust (0.9), and packet delivery ratio (0.98). The evaluation is conducted in comparison to existing models, highlighting the effectiveness of the proposed approach.

**10:00**

**Sum Rate Maximization in Cooperative Non-Orthogonal Multiple Access Based 5G Wireless Networks**

Aswathi Vijayan (Vellore Institute of Technology, Vellore, India)

Rahul Manohar O (Kerala Technological University & Christ College of Engineering, India)

Priyesh Ranjan (Centre for Development of Advanced Computing, India)

This paper addresses a coordinated direct and relay transmission (CDRT) network with a downlink non-orthogonal multiple access (NOMA) over Rayleigh fading channels. A Coordinated Direct and Relay Transmission network consists of a base station (BS), two downlink users (one near user and one far user or cell edge user), and a relay. The near user will receive its intended message directly from the BS, whereas the far user or cell edge user will access and be supported by a full-duplex (FD) decode and forward (DF) relay to receive its message. Since the paper considers a NOMA network, the near user will be allocated with a lower power and the far user will be allocated with a higher power to ensure user fairness. The first section of this study discusses the system

model, signal models and associated signal-to-interference plus noise ratios (SINRs). The joint optimisation problem for maximising the minimum sum rate is defined in the second half. Mathematical analysis is used to generate the joint power allocation factor and the results of both optimal and non-optimal conditions are plotted using Monte-Carlo simulations. Through various analyses, this paper establishes that using optimal power allocation factors can significantly improve the system's performance.

**10:15**

#### **Resource Allocation in V2V Sidelink Communication**

Abbas Salim (Mar Baselios College of Engineering and Technology (Autonomous), India)

Joshua G. Reji (Mar Baselios College of Engineering and Technology (Autonomous), India)

Geethu Bindu (Mar Baselios College of Engineering and Technology (Autonomous), India)

Mekha Ambili Suresh (Mar Baselios College of Engineering and Technology (Autonomous), India)

Sherry Varghese George (Mar Baselios College of Engineering and Technology (Autonomous), India)

Jayakumari J (Mar Baselios College of Engineering and Technology, India)

The global status of road safety shows that accidents will cost the world economy approximately 1.8 billion dollars. So, it has become a true global social objective where the Internet of Vehicles (IoV) comes into play which is an extension of the Internet of Things (IoT) concept where the vehicles are connected so as to form an Intelligent Transportation System (ITS). IoV relies on vehicular communications to allow vehicles to communicate in real-time with other vehicles, Roadside Units (RSU) infrastructure, and pedestrians. The ITS service uses 5.9 GHz band of spectrum. V2V communication uses a PC5 interface where the base station is not involved. Cooperative Awareness Messaging (CAM) is used to obtain the vehicle status information where the messages are broadcasted periodically. According to 3GPP TS 38.211, there are a number of physical signals and channels used for transmitting data and control signals in the sidelink. These signals are mapped onto a resource grid to form the frame structure. There is a parameter called Modulation and Coding Scheme (MCS) which is varied for different values to analyze the Packet Error Rate (PER) performance of the system. The performance is also evaluated in terms of Packet Receive Ratio (PRR), which is defined as the ratio between the number of neighbours correctly decoding a message at a given distance and the total number of neighbours at the same distance. Based on the performance, it can be inferred that PRR decreases as the vehicle density increases with increasing distance between the vehicles. Therefore, an optimum value of vehicle density needs to be maintained for 5G V2X communication.

**10:30**

#### **Joint Channel Estimation and Signal Detection in MIMO-NOMA Wireless Systems Using Deep Learning**

Beena A O (A P J Abdul Kalam Kerala Technological University, India)

This paper presents the performance of deep learning (DL) in joint channel estimation and multi-user detection in non-orthogonal multiple access (NOMA) based multiple-input multiple-output (MIMO) wireless systems. Generally, in NOMA systems, the sequential decoding of multiple users is performed by the conventional successive interference cancellation (SIC) method at the receiver. Due to the effects of error propagation, with SIC, the accuracy of detection is dependent on the accuracy of detection of preceding users. DL-based MIMO-NOMA receiver is intended to detect messages for several users in a single step, without explicit estimation of the channel state information. The DL-based receiver for the MIMO-NOMA system can be implemented by a deep neural network (DNN) that conducts the estimation of channel parameters and the detection of signals jointly. The DNN is trained offline and is then used to directly detect the transmitted data during the online testing phase. Results indicate that the DL-based systems outperform the systems with traditional channel estimation methods and are more tolerant to variation in the number of pilot symbols and length of cyclic prefixes (CP). It is validated that the DL-based scheme is able to mitigate the SIC-based detector's error propagation effects. It is also observed that the DL method can perform better than the least square (LS) and minimum mean square error (MMSE) detector even in severe inter-symbol interference (ISI).

**09:30 - 11:00**

**Session 13: Energy and Power Electronics Systems I**

**Research Track 6**

**Session Chairs: Rajesh Joseph Abraham (Indian Institute of Space Science & Technology, India) & Veerpratap Meena (IEEE Systems Council, India & Malaviya National Institute of Technology Jaipur, India)**

**Room: Hall 2 - North Block**

**09:30**

#### **Data Driven Energy Management of Residential PV-Battery System Using Q-Learning**

Krishna Baberwal (Malviya National Institute of Technology, India)

Anshul Kumar Yadav (Council of Scientific & Industrial Research, India)

Vikash Kumar Saini (MNIT Jaipur, India)

Ravita Lamba (Malaviya National Institute of Technology Jaipur, India)

Rajesh Kumar (Malaviya National Institute of Technology, India)

Data-driven energy management of residential PV-battery systems using Q-learning offers several benefits, including optimal energy consumption, integration of renewable energy, improved grid stability, cost savings, and flexibility. These advantages

contribute to the efficient and sustainable operation of residential energy systems and support the transition towards a cleaner and more resilient energy future. This research focuses on making a violation-free, automated energy management system for residential loads using a model-free reinforcement learning (RL) algorithm. The objective is to minimize the energy consumption of the system by leveraging the capabilities of the Photovoltaic (PV) system, battery storage, and home load. The energy management problem formulates and describes Q-learning's state space, action space, and reward structure. This approach learns an optimal policy for energy management based on historical data and feedback from the system. A comprehensive reward function is proposed to ensure a proper battery energy utilization policy. The Australian household PV profile and load curve over a 24-hour horizon with an interval of half an hour are used to examine the performance of the proposed method. The results demonstrated the effectiveness of the proposed algorithm in the form of reward cost, Q-value in different actions, and violation per hour. The numerical results present that the total power purchased from the grid is 2.579 kW, while the total power sold to the grid is 3.479 kW.

**09:45**

### **Fractional Order Control of Three Level Dual Active Bridge Converter for EV Applications**

Ashna Joseph (Mar Athanasius College of Engineering, India)

Latha P g (Cochin University of Science and Technology, Kochi, India)

This paper outlines a solar photo-voltaic based EV charger which has a bidirectional flow of active and reactive powers. A modified 3 level Dual Active Bridge (3-L DAB) converter is employed for bidirectional power flow with inherent soft switching. In comparison to a normal DAB, a 3L-DAB lessens voltage stress, enables working with lower voltage rated devices with better performance characteristics, and lowers conduction and switching loss of power devices. The paper illustrates the different modulation strategies of DAB. It also explains fractional order proportional resonant controller (FOPR) incorporated with triple phase shift modulation of three level DAB. The fractional exponents in the integro-derivative parts of the proposed FOPR controller results in a controller with an additional degree of freedom. The phase delay can be improved across a broad frequency range when compared to the conventional proportional-resonant controllers thanks to this degree of freedom. The simulation of the proposed converter is carried out in MATLAB/ Simulink. The three level voltage obtained in simulation is illustrated. The presence of zero level completely eliminates the reactive power component. Also the performance of the same is verified under varying solar irradiance conditions. It is shown that irrespective of the changes in solar insolation, the FOPR controller can effectively take care of the sudden changes in the input.

**10:00**

### **Experimental Determination of Nanoparticle and Surfactant Concentration in Silica Nanofluid for Transformer Insulation**

Balamurugan Ramadass (National Institute of Technology Puducherry, India)

Raja S (National Institute of Technology Puducherry, India)

Koperundevi G (National Institute of Technology Puducherry, India)

Ram Jethmalani C (National Institute of Technology Puducherry, India)

In high-voltage engineering, a nanofluid is a heat transfer fluid containing a small fraction of nano-sized filler materials. These nanoparticles exhibit unique properties compared to those of the same material at the bulk scale. Nanofluids enhances has better dielectric properties compared to conventional fluids. Nanofluids made from transformer oil are reported to perform better at heat transfer and have higher thermal conductivity than regular transformer oils. They also have better insulation properties. This work studies the electrical and physical properties of the silica nanoparticles-based transformer nanofluid. Further, it investigates the influence of Cetyl Trimethyl Ammonium Bromide (CTAB), on the properties of the nanofluid. It also quantifies the amount of Silica and CTAB to be added in the nanofluid. The optimum values of Silica (SiO<sub>2</sub>) and CTAB nanoparticles dispersed in mineral oil to achieve enhanced dielectric Breakdown voltage (BDV) with improved physical properties are obtained by experimentation. As per the experimental results, the optimized level of silica concentration in silica nanofluid (SNF) is 0.05g/L. Adding silica nanoparticles and CTAB enhances the AC BDV and Inter Facial Tension (IFT) of SNF. In comparison with virgin mineral oil, SNF with CTAB shows 79.16% and 90.84% percentage enhancement in AC BDV and IFT, respectively. SNF with CTAB shows improved flash point and fire point values as well.

**10:15**

### **A Multi-Objective Control Strategy for Power Quality Improvement With Enhanced LVRT Operation of a Grid-Interfaced Dual Voltage Source Inverter**

Nimitha Muraleedharan (IITM, India)

With an increased penetration of renewable energy sources (RESs) into the grid, extracting maximum energy from them and also operating in grid supporting manner are the major challenges in a microgrid system. This paper focuses on the control technique implemented on utility connected dual voltage source inverter (DVSI) integrated with RES and hybrid energy storage unit to improve the power quality, reliability and low voltage ride through (LVRT) capability of the system. The microgrid system consists of two inverters, which supplies real power from RESs into the grid and also compensates the harmonic, reactive and unbalance components of the load independently. The control scheme ensures that the DVSI stays connected to the grid under fault conditions fulfilling the LVRT requirements according to grid code compliance. It enables the compensator to ride through voltage sags arising from grid side faults by providing maximum reactive power support which improves the point of common coupling

(PCC) voltage and voltage recovery time along with load compensation to maintain grid current balanced and sinusoidal under various operating conditions. The DC link voltage is maintained constant throughout and the photovoltaic (PV) system operates with maximum power point tracking (MPPT) under all conditions. The presented control strategy of DVSI is simulated and validated in MATLAB/Simulink under voltage sag, low irradiation (LiR) and high irradiation (HiR) conditions.

**10:30**

**Networked Hybrid AC-DC Microgrids: Leveraging Fog Computing and Linear Solver for Efficient Energy Management**

Vikas Ranveer Singh Mahala (Malviya National Institute of Technology, Jaipur, India)

Anshul Kumar Yadav (Council of Scientific & Industrial Research, India)

Dipti Saxena (Malaviya National Institute of Technology, India)

Rajesh Kumar (Malaviya National Institute of Technology, India)

The global electricity landscape is undergoing a profound transformation, with an increasing demand for resilient and sustainable energy infrastructure. In this context, microgrids (MGs) have emerged as a promising solution, offering localized, decentralized energy generation and distribution. This research paper proposes a distributed energy management system for grid-connected hybrid AC-DC MGs, interconnected through a DC link. The work proposes a three-layer cloud fog-enabled energy management system of networked MGs which aims to minimize the energy cost by facilitating optimal energy utilization within each MG as well as among the connected MGs. The paper presents a fog-enabled comprehensive mathematical model of networked MGs to ensure fast data transmission and real-time decision-making within the system. K-mean clustering is used to segregate the load into three categories residential, commercial, and industrial each of which is primarily supplied by an individual MG. Python 3.10.12 programming has been employed for simulating the model, ensuring a realistic and adaptable approach to assess the suggested energy management system's efficacy and performance within the context of networked MGs. Simulation results demonstrate that the proposed model of networked MGs integrating fog computing and MILP optimization, enhances optimal energy allocation and utilization within and among MGs along with minimizing the operating cost of networked MGs effectively.

**10:45**

**Predictive Modeling of Residential Energy Usage With Deep Learning and IoT Devices**

Rovin John Regi (APJ Abdul Kalam Technological University, India)

Polly Thomas (A P J Abdul Kalam Technological University, India)

Karthik Prakash T (APJ Abdul Kalam Technological University, India)

Joseph Joseph (APJ Abdul Kalam Technological University, India)

In this paper, we present an IoT-enabled system for accurate energy consumption prediction in residential buildings using deep learning models. Our goal is to forecast hourly energy usage, optimizing resource allocation and sustainability. We establish a smart building environment [1] integrating Current Transformers (CT), Potential Transformers (PT), Arduino, and ESP8266 for real-time data collection. The data is seamlessly transmitted to ThingSpeak and Google Spreadsheet cloud platforms, ensuring centralized storage over a comprehensive six-month period. Given the pressing need for energy-efficient solutions in residential contexts, our research holds significant relevance. Precise energy consumption prediction empowers homeowners and utilities to make informed decisions regarding resource allocation. Our methodology entails meticulous data collection with IoT device calibration and synchronization. Ensuing data preprocessing guarantees data integrity. To address the prediction task, we harness deep learning models – Convolutions Neural Networks (CNN), Long Short-Term Memory networks (LSTM), and Gated Recurrent Units (GRU) - renowned for their proficiency in handling time series data [2]. Our experimental protocol adheres to rigorous standards, partitioning data into training, validation, and test sets to preserve temporal coherence. We present detailed model architectures and hyperparameters, with optimization strategies enhancing training outcomes. In assessing predictive performance, we employ established metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and R-squared (R2). Results provide insightful model comparisons, aiding the selection of the optimal approach for residential energy consumption prediction. Through the integration of IoT data collection, cloud storage, and advanced deep learning techniques, our work significantly advances energy efficiency efforts. Moreover, it establishes a versatile framework for analogous investigations. Ultimately, this research contributes to the sustainable management of energy resources in residential buildings, promising a greener future.

**09:30 - 11:00**

**Short Papers**

**Session Chairs: Joby P P (St. Joseph's College of Engineering and Technology, India) & Binu Mathew (Saintgits College of Engineering, India)**

**Room: Hall 3 - North Block**

**09:30**

**Modeling, Simulation, and Optimization of a Gravitational Water Vortex Power Plant for Enhanced Power Generation**

Vinayakumar B (Saintgits College of Engineering, India)

Nagalingam Mahendran (Saintgits College of Engineering, India)



In the pursuit of sustainable energy solutions, the gravitational water vortex (GWV) has emerged as a promising avenue for harnessing kinetic energy from fluid dynamics. This research paper delves into the comprehensive study of a Gravitational Water Vortex Hydroelectric Power Plant (GWVHP) through a blend of simulation techniques and optimization strategies. The primary objective centers on identifying an optimal parameter, specifically, the number of rotor blades, that significantly impacts the performance of the GWV setup. Utilizing COMSOL Multiphysics, the GWV phenomenon was simulated to decipher the intricate interplay between fluid dynamics, mechanical elements, and energy conversion processes. The research is grounded in Finite Element Analysis (FEA), employing a mesh-based approach to numerically predict system behavior. The simulation results vividly portray diverse turbine designs contingent upon the variation of rotor blade numbers. Key findings stem from an in-depth analysis of rotor blade influence on rotor speed. By systematically varying the number of rotor blades, the ensuing effects on speed were meticulously observed. The correlation between blade count and rotor speed is visually represented, underscoring the pivotal role of the chosen parameter. By providing a robust foundation for future GWVHP development, this study advances the cause of renewable energy and contributes to the broader framework of sustainable power generation.

**09:45**

### **Detection of Early Lung Cancer Cases in Patients With COPD Using eNose Technology: A Promising Non-Invasive Approach**

Binson A (Saintgits College of Engineering, India)

The integration of electronic nose (eNose) technology and advanced machine learning methodologies presents an innovative pathway for the non-invasive differentiation of chronic obstructive pulmonary disease (COPD) and lung cancer. This study utilizes a group of 84 COPD patients and 53 lung cancer patients to evaluate the effectiveness of a developed classification model. Through the cross-validation, the model displays outstanding accuracy, achieving 94.16% precision in distinguishing between these two respiratory conditions. Impressively, the model demonstrates sensitivity and specificity rates of 96.34% and 90.91%, respectively. The model's robust performance is measured by an impressive Area Under the Curve (AUC) value of 0.91, highlighting its capability to apprehend intricate patterns within exhaled breath data. Furthermore, observed disparities at baseline between COPD patients who later developed lung cancer and those who did not underscore the model's potential as a prognostic tool. These findings exemplify the capacity of technology-driven diagnostics to reshape the arena of respiratory disease identification. The model's precise differentiation, combined with its elevated sensitivity and specificity, holds potential for early detection and intervention. In this scenario, eNose technology emerges as an innovative instrument in the realm of healthcare, spotlighting the integration of cutting-edge sensor arrays and machine learning algorithms to elevate patient care and prognosis.

**10:00**

### **Precision Diagnostic Algorithm for Multisubtype Arrhythmia Classification**

Binson A (Saintgits College of Engineering, India)

Monikavasagom Subramoniam (Sathyabama Institute of Science and Technology, India)

Arrhythmia, a condition often linked to lung health, affects individuals across various age groups. With multiple distinct subtypes, categorized based on heart rate irregularities observed in the PQRST waveform, Arrhythmia presents a complex diagnostic challenge. Currently, clinicians manually diagnose specific Arrhythmia types from ECG recordings. The integration of computer aided diagnosis has the potential to significantly enhance diagnostic precision and subsequent treatment strategies. This paper introduces a diagnostic algorithm designed to address this need. The proposed algorithm employs a combination of wavelet feature extraction and Support Vector Machine (SVM) classification techniques. By extracting intricate details from ECG recordings using wavelet analysis, the algorithm captures nuanced patterns characteristic of Abnormal Arrhythmia (ARR), Congestive Heart Failure (CHF), and Normal Sinus Rhythm (NSR). Subsequently, the SVM classifier deciphers these features to accurately categorize ECG signals. Remarkably, the algorithm achieves a test accuracy of 98%, demonstrating its effectiveness in discerning between different Arrhythmia types. The implementation of this computer aided diagnostic tool not only streamlines the diagnosis process but also equips medical professionals with a valuable tool for enhanced decision-making, leading to improved treatment outcomes. This research highlights the potential of technology-assisted medical diagnostics, fostering more accurate and efficient patient care in the realm of Arrhythmia management.

**10:15**

### **Exploring Educators' Acceptance on Education 5.0 and Their Anxiety Towards Its Implementation: A Research Inquiry**

Chithra Vimal (Saintgits College of Engineering, India)

Elgin Alexander (HOD & Associate Professor, India)

As the field of education continues to evolve with the emergence of new technologies and pedagogical approaches, in the era of education 5.0, the education system is undergoing a paradigm shift from the traditional teacher-centered approach to a technology-driven blended learning model that integrates human skills with artificial intelligence and other advanced technologies. This transition is expected to be met with varying acceptance levels among educators. This study aims to gain insights into higher educational institutions educators' acceptance, and anxiety towards Education 5.0. The focus of the study is to identify strategies to alleviate anxiety and enhance their acceptance in embracing this newer approach in the rapidly evolving educational era. The data needed for the study is collected from 100 educators using a structured questionnaire. The study revealed that educators had a higher level of acceptance and a moderate level of anxiety toward the integration into Education 5.0. The study revealed a noteworthy correlation between higher levels of acceptance among educators and a corresponding decrease in their

anxiety levels. This research demonstrated that younger teachers exhibit greater levels of acceptance and reduced anxiety compared to their older counterparts. The insights from the study pave the way for targeted interventions that can improve educators' preparedness and enthusiasm toward Education 5.0.

Key Words: Education 5.0, Pedagogical Approach, Technology-driven Learning, Advanced Technologies.

**09:30 – 11:00**

**PhD Forum**

**Session Chairs:**

**Room: Hall 5 - North Block**

**09:30**

**Improving the Resolution of Ultra Faint Dwarf Galaxies Using Various Image Processing Techniques**

Vishnu Vasudev (APJ Abdul Kalam Technological University, India)

Images of Ultra Faint Dwarf Galaxies obtained from telescopes have poor resolution, because of the presence of faint stars in the dwarf galaxy. Stellar dynamics are very difficult to calibrate with this data which hinders our insights on dark matter studies. Dark matters are nonbaryonic particles, which means that it is not made of protons and neutrons but some other materials which we don't know. UFD galaxies are tiny galaxies that orbit large, massive galaxies like natural satellites orbiting planets. These dwarf galaxies possess exceptionally high mass-to-light ratios. UFD galaxies are one type of dwarf galaxy with a disproportionately high mass-to-light ratio. Therefore, they are the objects most dominated by Dark matter. This low-resolution problem of dwarf galaxies can be overcome by applying various image processing techniques such as interpolation, deconvolution methods etc. Nevertheless, the image may contain inaccuracies caused by cosmic rays, which form bright spots that might be mistaken for stars and obscure weak galactic structures. Before improving the resolution, an interpolation-based approach for rejecting cosmic rays is used to eliminate these spots. Several metrics, such as the Structural Similarity Index (SSIM), peak signal-to-noise ratio (PSNR), comparison of grayscale plots, and difference map, are utilized to validate the suggested method. We can measure the stellar population properties of the galaxy before and after the processing with the proposed methods.

**10:15**

**Image Based Machine Learning for Materials Science**

Deepa S Dev (Mahatma Gandhi University, India)

Materials research studies are dealing with a large number of images, which can now be facilitated via image-based machine learning techniques. The use of machine learning has made a tremendous impact in the field of materials science. Minerals supply the raw materials necessary for the development of modern societies. Detailed study of minerals provides knowledge of our planet, the solar system and the universe. Their identification and characterization are critical to many fields. Only a few experts can accurately identify minerals without analytical instruments. Minerals are uniquely characterized by their color and crystal structure. Raman spectroscopy is a powerful tool for the identification of mineral species. Advancement in computer vision led to the classification and identification process more easier. Discriminant analysis, support vector machines (SVM), k-nearest neighbour (KNN), random forests etc are supervised machine learning algorithms, used for classification purposes. These algorithms train a model to predict unknown Raman data using known Raman data. Convolutional neural network is deep neural network plays an important role in classification of Raman Spectra. But the data hungry nature of CNN is a major problem. To overcome the limitations, transfer learning is used. In transfer learning, a model developed for a particular task can be reused as a starting point for a model for another task. The main advantage of using transfer learning is that, in this only a few layers are changed based on the application. Other layers are maintained as such, that means weight and biases of such layers are kept as same. This study proposed an artificial intelligence approach for rapid automatic detection of mineral samples from RRUFF database based on their Raman Spectra. The main part of the mineral detection system is the convolutional neural network, ResNet50. Total 720 spectra from 24 minerals are used for learning process of neural networks. In this study, the performance of ResNet50 over different network parameters is also considered.

**11:00 - 11:30**

**Coffee Break**

**Room: Hall 7 - North Block**

**11:30 - 12:30**

**Session 14: Computer Systems and Networks IV**

**Research Track 2**

**Session Chairs: Jobin Jose (Indian Institute of Information Technology Kottayam, India) & Joby P P (St. Joseph's College of Engineering and Technology, Palai, India)**

**Room: Hall 1 - North Block**

**11:30**

**Pioneering Efficient Blockchain in IoT: A Review of Tailored Protocols for Modern Devices**

Tibin Thomas (Saintgits College of Engineering, India)

Jubilant J Kizhakethottam (Saintgits College of Engineering Kottayam, India)

Neethan Elizabeth Abraham (Mangalam College of Engineering Kottayam, India)

The dawn of the digital age has transformed our world, with the Internet of Things (IoT) at its heart, where billions of devices are seamlessly connected. Essential to the vision of smart cities these devices deliver convenience that carries some do not but also pose a serious security risk. This paper dives deeper into the potential of blockchain - a decentralized ledger system - as a solution to these challenges, specifically focusing on its adaptability to IoT constraints. Through detailed analysis we conduct few key experiments to map the landscape that blockchain protocols are optimized for IoT and we discuss their features and shortcomings. These reviews cover policies from managing secure transactions to verifying payments, approving channels, and more. Despite the promise these protocols show, the use of blockchain in the IoT is fraught with challenges, mainly due to the limited features of many IoT devices, and, while blockchain promises security communicatively, it does not protect against all possible threats such as physical changes. The purpose of the paper is to compare these protocols and give the readers a panoramic view on the convergence of IoT and blockchain. Looking ahead, the research will focus on how to adapt to the ever-evolving world of IoT and address existing challenges, ensuring a future where our devices are better connected and it is safe.

**11:45**

**The Potential of Quantum Techniques for Stock Price Prediction**

Naman Srivastava (IIITDharwad, India)

Gaurang Subhash Belekar (IIIT Dharwad, India)

Neel Ninad Shahakar (IIITDharwad, India)

Aswath Babu Hanumantharayappa (IIIT Dharwad & IIITDhatwad, India)

We explored the potential applications of various Quantum Algorithms for stock price prediction by conducting a series of experimental simulations using both Classical as well as Quantum Hardware. Firstly, we extracted various stock price indicators, such as Moving Averages (MA), Average True Range (ATR), and Aroon, to gain insights into market trends and stock price movements. Next, we employed Quantum Annealing (QA) for feature selection and Principal Component Analysis (PCA) for dimensionality reduction. Further, we transformed the stock price prediction task essentially into a classification problem. We trained the Quantum Support Vector Machine (QSVM) to predict price movements (whether up or down) and contrasted its performance with classical models and analysed their accuracy on dataset formulated using Quantum Annealing and PCA individually. We focused on stock price prediction and binary classification of stock prices for four different companies, namely Apple, Visa, Johnson and Jonson and Honeywell. We primarily used the real-time stock data of the raw stock prices of these companies. We compared various Quantum Computing techniques with their classical counterparts in terms of accuracy and F-score of the prediction model. Through these experimental simulations, we shed light on the potential advantages and limitations of Quantum Algorithms in stock price prediction and contribute to the growing body of knowledge at the intersection of Quantum Computing and Finance.

**12:00**

**A Technical Assessment of SIR, SIR-V and SEIR Epidemic Models**

Jacob P Cherian (Saintgits College of Engineering, India)

Jubilant J Kizhakethottam (Saintgits College of Engineering Kottayam, India)

The accurate modeling of epidemic dynamics plays a pivotal role in understanding and managing the spread of infectious diseases. In the wake of the global COVID-19 pandemic, the application of mathematical models to comprehend disease transmission has gained renewed importance. This paper presents a meticulous comparative analysis of three prominent epidemic models-SIR (Susceptible-Infectious-Recovered), SIR (Susceptible-Infectious-Recovered with Vaccination) and SEIR (Susceptible-Exposed-Infectious-Recovered)-in the context of COVID-19. Through a comprehensive examination of these models, this study explores their efficacy in capturing the intricate dynamics of the COVID-19 pandemic. It delves into the underlying assumptions, mathematical formulations, and practical implications of each model. Furthermore, it highlights the suitability of each model based on real-world epidemiological data and the dynamic nature of the pandemic. The analysis encompasses key factors such as varying immunity levels, the role of exposed individuals, and the potential for reinfection. In conclusion, this comparative analysis serves as a guide for researchers, epidemiologists, and policymakers seeking to better understand and forecast the spread of COVID-19 and similar infectious diseases. It sheds light on the nuances of each model's applicability and provides a foundation for informed decision-making in disease control and mitigation strategies. This paper compares the model variations when epidemic parameters are adjusted.

12:15

**A Study on Formal Verification of Smart Contracts in Distributed Ledger Technology**

Gokulnath G (APJ Abdul Kalam Technological University, India)

Jubilant J Kizhakethottam (Saintgits College of Engineering Kottayam, India)

This study paper explores the critical topic of formal verification of smart contracts in distributed ledger technology (DLT) systems. Distributed Ledger Technology (DLT) and blockchain are closely associated standards that play a important function in enabling decentralized and trustless structures. While blockchain is a selected type of DLT, the terms are regularly used interchangeably. Smart contracts, self-executing code running on blockchain platforms, have gained widespread adoption in various industries due to their automation and transparency benefits. However, the decentralized and immutable nature of DLT raises concerns regarding smart contract security, leading to vulnerabilities and potential exploits. Smart contracts in DLT offer large advantages in terms of automation, transparency, and performance. They are reshaping various industries and riding the adoption of blockchain era throughout diverse use instances. However, addressing security concerns, scalability and regulatory challenges will be important for the continued boom and success of smart contracts in the DLT panorama. Formal verification methods offer a systematic approach to analyze smart contracts for correctness and safety. This paper provides an overview of smart contracts, DLT, and the importance of formal verification. It reviews various formal verification techniques and presents state-of-the-art tools and frameworks. The paper concludes with discussions on challenges, future research opportunities, and the role of formal verification in enhancing DLT-based applications' security and usability.

11:30 - 12:30

**Session 15: Signal Processing and Communication Systems IV**

**Research Track 4**

**Session Chairs: Manju Manuel (Rajiv Gandhi Institute of Technology, Kottayam, India) & M V Rajesh (College of Engineering Chengannur, India)**

**Room: Hall 4 - North Block**

11:30

**RF Energy Harvesting Rectenna for Wearable Applications**

Riboy Cheriyan (SAINTGITS College of Engineering, India)

Sudha T (Saintgits College of Engineering (Autonomous), Kottayam, Kerala, India)

Lakshmi Anil (Saintgits College of Engineering (Autonomous), Kottayam, Kerala, India)

Bijo Babu Cherian (Saintgits College of Engineering (Autonomous), Kottayam, Kerala, India)

Radio Frequency (RF) energy harvesting is a promising technology for powering wireless sensor network devices that require a minimal amount of power to function. RF energy harvesting and rectenna system design have become increasingly popular in recent years, attracting the attention of a number of researchers. An overview of some recent publications on RF energy harvesting is presented in this paper. The technique of taking energy from the environment and turning it into electrical power is known as energy harvesting. The goal of energy harvesting is to eliminate the need for battery for operation. There are a number of natural resources that behave differently over time based on the environment in which they are used such as solar, vibration, thermal, friction, radio frequency, and wind. There are two types of energy transfer: dedicated transfer (high power values) and harvesting of ambient energy (low power values). Many individuals use wearable devices, but the batteries they require are a significant stumbling block. To address this issue, an energy harvesting system operating at 2.45GHz (ISM band) is proposed to eliminate the need for batteries and so as to improve system portability. The antenna and the rectifier circuit which converts RF power into DC signal is known as rectenna. The proposed rectenna is compact in size and measures 30 x 33 x 1 mm<sup>3</sup> in total. This proposed rectifier performs well with a conversion efficiency of 72% at the designed frequency of 2.45GHz for use with the wearable low power devices in Wireless Body Area Networks (WBAN) applications.

11:45

**FPGA Implementation of Sphere Decoding in MIMO Systems: Challenges Solutions and Design Issues**

Girija M G (KTU, India)

Sudha T (Saintgits College of Engineering (Autonomous), Kottayam, Kerala, India)

Riboy Cheriyan (SAINTGITS College of Engineering, India)

Multiple-input multiple-output (MIMO) systems have gained significant attention due to their ability to enhance wireless communication performance. A promising method for symbol detection that offers better performance than conventional detection algorithms is the incorporation of sphere decoding in MIMO systems. Field Programmable Gate Array (FPGA)-based implementations become increasingly popular for real-time and power-efficient signal processing. This paper presents a comprehensive study on the challenges, solutions, and design issues encountered in FPGA-based sphere decoding

implementations for MIMO systems. The findings contribute to the growing body of knowledge on FPGA-based MIMO signal processing and offer valuable insights for researchers and engineers aiming to deploy high-performance and resource efficient MIMO systems in practical applications. The FPGA implementation in MIMO systems holds the promise of revolutionizing wireless communication by meeting the increasing demands for higher data rates and reliable connectivity. The FPGA implementation of sphere decoding in MIMO systems combines digital signal processing and hardware design to achieve accurate and dependable signal detection, vital for high-performance wireless communication. This paper highlights the difficulties encountered when sphere decoding was implemented in MIMO systems and the suggested solutions to those difficulties. The pros and cons of some of the FPGA implementations of sphere decoding in MIMO systems are also compared.

**12:00**

**Non Local Means Denoising of CT, MRI and US Images: An Investigation of Performance Under Varying Noise Levels**

Preena Prasad (Saintgits, India)

Medical imaging's diagnostic accuracy hinges on clear images, often compromised by noise. To date, researchers have introduced a variety of noise reduction methods, each with distinct advantages and drawbacks. This study conducts a comprehensive analysis of Non-Local Means (NLM) denoising across diverse noise levels in medical images. Medical images affected by varying noise levels undergo NLM denoising using fixed patch and window sizes, in addition to a randomized 'h' parameter. The investigation aims to reveal the denoising process's impact on image quality across different noise levels. Performance evaluation relies on Peak Signal-to-Noise Ratio (PSNR) and Structural Similarity Index (SSIM) metrics, delivering quantitative insights into denoising effectiveness and structural preservation. A diverse dataset encompassing computed tomography (CT), magnetic resonance image (MRI), and ultrasound (US) images is utilized for experimentation. Throughout the experimentation, a consistent patch size of 3 and window size of 11 are employed. By systematically assessing denoising outcomes, this research contributes to understanding the potential of NLM denoising in enhancing image quality under varied noise conditions. Additionally, the study explores the influence of the 'h' parameter on denoising performance. The findings underscore NLM denoising's capacity to enhance medical image quality across a range of noise scenarios, thereby advancing the field of medical image processing.

**12:15**

**A Systematic Review of Noise Types, Denoising Methods, and Evaluation Metrics in Images**

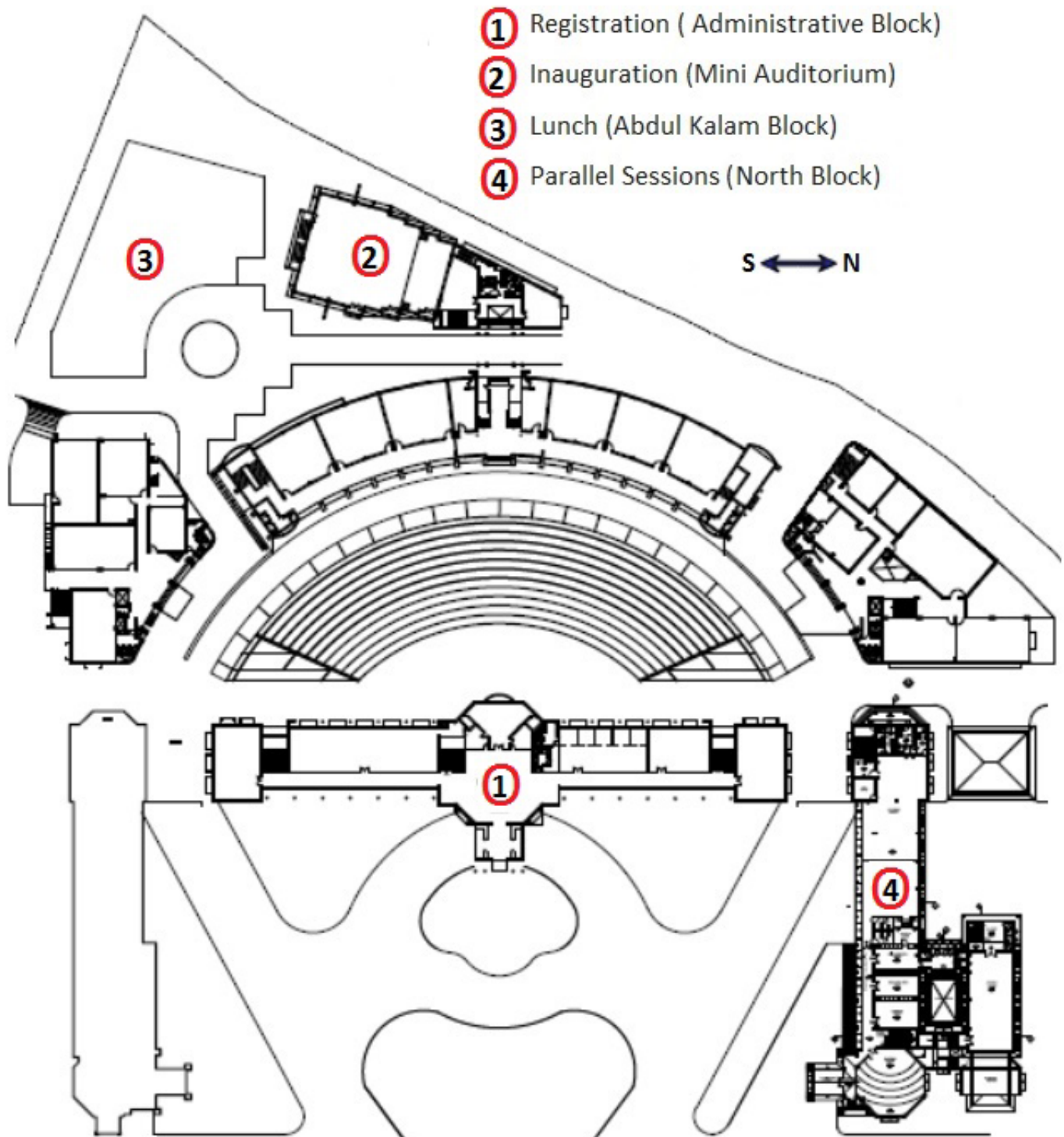
Preena Prasad (Saintgits, India)

Noise removal from images, while preserving their quality and essential information, stands as a pivotal task within the realm of image processing, recognized as image denoising. With the ever-expanding utilization of digital images spanning diverse domains such as medical imaging, astronomy, and microscopy, the challenge of image noise has gained heightened prominence. Image noise, characterized by undesired variations in brightness or color, wields the potential to significantly undermine the integrity and utility of images. To address this concern, a multitude of noise reduction techniques have been developed, encompassing approaches like filtering, wavelet denoising, and deep learning-based methodologies. However, the judicious selection of an appropriate denoising method tailored to specific noise characteristics and image contexts remains an intricate endeavor. To objectively evaluate the efficacy of diverse techniques, the utilization of precise performance metrics is imperative. Consequently, a comprehensive review that traverses the landscape of various noise manifestations encountered in digital images, the array of available denoising strategies, and the spectrum of performance metrics deployed for evaluation is paramount. This expansive review offers a profound understanding of the capabilities and constraints inherent in diverse denoising techniques. It consequently empowers researchers and practitioners with the knowledge necessary to discern and implement the most apt denoising method, optimizing its applicability across distinct applications.

**12:45 - 13:00**

**Conference Closing**

## Venue Layout



## Tutorial Presentations

Wednesday, 8 November 2023

13:30 – 16:45



### Reliability Design of Complex Systems - Modeling and Efficient Simulation

**Dr. Armin Zimmermann**

*Technische Universität Ilmenau, Germany*

**Bio:** Armin Zimmermann, is a computer science expert with a diverse academic and research background. He is actively involved in various professional organizations, and teaches courses on a wide range of topics. His research interests encompass modelling, performance evaluation, optimization, and control of technical systems using discrete-event models and their tool support. Since 2008, he has served as Associate Editor of IEEE Transactions on Industrial Informatics in the area of Formal Methods, Distributed and discrete Event Systems in Automation and Embedded Systems.

**Abstract:** Reliability is an important non-functional requirement of many man-made systems, especially when failures may lead to catastrophic events. When such systems are too complex to be understood and designed by one person, the resulting effect of local design decisions on overall system properties are not obvious. Mathematical models can help to describe such systems and to compute their reliability with the help of appropriate software tools.

Unavoidable faults may be masked or tolerated by static or dynamic redundancy measures, all at a considerably increasing cost. The main task is to design a system such that its reliability and safety requirements are achieved with the least amount of resources. Classic models and tools for static analysis are not able to cover systems in which the complex behavior influences failures, or if dynamic reconfigurations are applied (possibly because of a better resource / reliability trade-off).

Depending on the complexity of the system behavior and the corresponding size of the state space, Markov chains and stochastic Petri nets are applied to reliability problems. They are attractive models as long as the underlying assumption of a Markov behavior is realistic (Phase-type distributions can emulate others up to a certain accuracy, but this is paid for with an even larger state space). Petri nets have been adopted as a suggested tool for reliability engineering of complex systems in an international standard recently.

However, non-Markovian delay distributions (necessary, for instance, in the case of deterministic deadlines or maintenance cycles) are characteristic of technical systems. However, their numerical analysis is restricted, only allowing the application to special cases. An alternative evaluation technique is simulation, but the problem here is that the computational effort to generate enough failure states to achieve statistical confidence in the estimated results is usually intractable.

This problem is well-known as rare-event simulation, and there are two main approaches used: importance sampling and splitting. They have the common goal to increase the frequency of the rare event in order to gain more significant samples out of the same number of generated events. For methods that can be automated and implemented in a software tool for industrial applications, the latter technique has the advantage of requiring less insight into the model details, and with the RESTART algorithm there are efficient and robust implementations available.

This tutorial covers motivation, use, and advantages of stochastic Petri nets as a tool for reliability evaluation of complex systems. Rare-event simulation techniques are demonstrated, which are applicable to a wide class of reliability problems. While this approach is known in the academic world, it has not yet been adopted much in industrial applications despite its apparent benefits. Additional topics are advances in rare-event simulation for this model class as well as the standard IEC62551 for dependability evaluation with Petri nets. New results in performability evaluation using an integration of simulation and numerical analysis are presented as well. Example case studies and tool support are demonstrated.



### Reinforcement Learning Based Control System Design

**Dr. Sohom Chakrabarty**

*Indian Institute of Technology Roorkee, India*

**Bio:** Dr. Sohom Chakrabarty is serving the role of Assistant Professor in Electrical Engineering Department at Indian Institute of Technology Roorkee. He is in the group of Systems and Control, and his research interests are in sliding mode control and observation, reinforcement learning-based control system design, robotics and autonomous vehicles. He is passionate to develop RL frameworks for feedback controller design, so that best performance may be obtained from the control system as well as robustness may be ensured.

**Abstract:** Control system research and design have traditionally been based on detailed mathematical models of the system with well-known models of uncertainties. In contrast, Reinforcement Learning (RL) attempt to learn control actions and models directly from experiments and data using a trial and error formalization, akin to human learning. The systems for which detailed mathematical models have already been developed with known disturbance models, RL have limited scope to be utilized in the feedback controller design. However, the RL approach can prove to be extremely beneficial in situations where such precise mathematical models are absent, the multiple control objective goals are too complex and diverse, or there is a significant amount of uncertainty from unidentified sources. The advanced automatic feature extraction abilities of deep neural networks are used to improve learning in RL algorithms. With only raw visual input signals, the advanced Deep Reinforcement Learning (DRL) algorithms can resolve some of the most challenging decision-making problems. In challenging board games like Go, Chess, and Shogi, DRL agents have outperformed humans. However, extending the RL agent from application like game playing and extracting data from raw visual inputs to feedback controller development is not trivial. The designer needs to have system understanding in order to formulate the RL agent effectively to solve the problem and bring out effective performance from the control system.



## Keynote Speakers



**Pao-Ann Hsiung**

*National Chung Cheng University (CCU), Taiwan*

**“Smart Observer for Working Conditions in Distant Water Fisheries”**

**Bio:** Pao-Ann Hsiung, received his Ph.D. in Electrical Engineering from the National Taiwan University, Taipei, Taiwan, ROC, in 1996. Since August 2007, he has been a full Professor at the National Chung Cheng University (CCU), Taiwan. Currently, he is the Dean of Information Technology at CCU, Director of the Research Center on AI and Sustainability at CCU, and Director of the Taiwan-India Joint Research Center on Artificial Intelligence at IIT Ropar and CCU. Previously, he was the Department Chair, Dean of International Affairs, and the Director- General of Intelligence Technologies Department, Chiayi City Government. He has published over 300 papers in international journals and conferences. He was the recipient of the 2010 CCU Outstanding Research Award, 2001 ACM Taipei Chapter Kuo-Ting Li Young Researcher, and 2004 CCU Young Scholar Research Award. He helped Chiayi to achieve 2018 TOP7 Smart City in the Intelligence Community Forum world competition. Dr. Hsiung is a fellow of the IET, a senior member of the IEEE and the ACM, and a life member of the IICM. Dr. Hsiung’s main research interests include smart system design, deep learning, AIoT, smart city technology such as smart traffic and smart grid, embedded real-time system design.

**Abstract:** Distant water fishing vessels go far out in the sea for at least half a year before returning. Fishermen can easily be exploited by being forced to work for long hours onboard, with high work intensity. Working on real CCTV videos on fishing vessels from Taiwan, in this talk, we demonstrate how an on-vessel system can be designed to monitor fishermen working conditions using a combination of AI and statistical methods. To replace manual record of fishermen work hour attendance, we designed an on-vessel face recognition based work hour attendance system with both offline caching and online updating of attendance records. Further, we show how real-life videos can be very difficult to analyze and thus the monitoring system needs to consider different AI and statistical techniques to produce feasible results. Compared to the global fishing watch (GFW) satellite data that is popularly used for vessel monitoring worldwide, our on-vessel monitoring system, called Smart Observer, gives a more accurate estimation of the working hours of fishermen. Our work hour estimation error is within 30 minutes in a span of 24 hours, while that of GFW is around 90 minutes. We encourage future researchers to work on how to integrate on-vessel video data with satellite data for a much more accurate estimation.

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**Ramesh Loganathan**

*Indian Institute of Technology Hyderabad, India*

**“Challenges in Translating Research from Lab to Land (products/solutions)”**

**Bio:** After 25 years in the product R&D space, moved to IIIT Hyderabad as faculty in 2016. As Professor Co-Innovation, heading the Research/Innovation outreach at IIIT Hyderabad. Helped start and grow the Technology Transfer Office, Co-Innovation (corp) labs, and the Centre for Innovation & Entrepreneurship. Association with IIITH started in 2002 as Adjunct faculty. Also, was visiting faculty at IIT Hyderabad (Innovation), and a member of governing board of incubators at IIIT-H, IIT Hyd, IIIT-Delhi and BITS.

Prior to academics worked in the tech industry bay area and since 2000 in Hyderabad, as product R&D leader. Most recently was the India Head for Progress Software. Prior to Progress, was VP of Middleware Technologies at Pramati, and also headed Product Engineering.

Was the Interim Chief Innovation Officer of Telangana state in 2017 and One of the Founders of Headstart Network (StartupSaturday). Also Chaired ACM Hyderabad Chapter 2012-14. Active in industry organizations. Most recently was President of HYSEA (Hyderabad Software Industry Association) and Regional council member at Nasscom. Also on several committees and panels of state and central government including Meity (Gov of India) panel on innovation, BIRAC ACE fund of funds committee and state Blockchain District.

An accomplished Technologist, with over 20 years product engineering and R&D leadership experience. Regularly speak at tech workshops and seminars in India. Recently co-authored a book on ‘SOA approach to Integration’, published by Packt Publishers. Member of several Standards Expert groups including J2EE 1.3. Active in Product/Startup circles.

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**Chiti Babu**

*Indian Institute of Technology, Design and Manufacturing (IIITDM), India*

**“Investigation on the Control Techniques for Grid-tied Solar PV System”**

**Bio:** B. Chitti Babu received Ph.D degree in Electrical Engineering from National Institute of Technology Rourkela, India in 2012. He was an Assistant Professor in the Department of Electrical Engineering, National

Institute of Technology Rourkela, India from 2007 to 2013. He had Post-Doctoral research appointments with the Wroclaw University of Science and Technology, Poland, during 2013-2014, and with the VSB-Technical University of Ostrava, Czech Republic, during 2014-2015. Both of these appointments were sponsored by the European Commission, UK.

He was an Assistant Professor in faculty of engineering, University of Nottingham (U.K) Malaysia Campus during Sep 2016- June 2018. Currently he serves as an Associate Professor and Head of Electronics Engineering department, Indian Institute of Information Technology, Design and Manufacturing, Chennai, India. He was a recipient of Young Systems Scientist Award 2019 sponsored by Systems Society of India. And also, he received IEEE MAS Best Researcher Award from IEEE Madras Section, India during Feb 2021.

Since January 2023, he serves as an Editor-in-Chief of International Journal of Ambient Energy, T&F. And also he serves as an associate editor of peer reviewed journals, including IET Renewable Power Generation, IET Generation, Transmission, and Distribution, Electrical Engineering, and Energy Sources-Part A etc., His current research interests include power electronics applications in smart distribution grids containing renewable energy sources, Design of Low power Photovoltaic (PV) system including MPPT Algorithm, control and grid integration of Renewable energy systems.

He is a senior member of IEEE, IEEE Power & Energy Society, IEEE Industrial Application Society.

**Abstract:** The PV power generating system was cherished by the research fraternity as an exceptional source because of its ease of installation, negligible maintenance, and reduced greenhouse effect. Therefore, grid-tied solar PV systems are widely used for on-grid operation to provide pollution-free energy. These systems are connected to the utility grid with the help of power electronic converters with advanced controllers. Apart from that, while considering the intermittent nature of the PV generation system, single stage or double-stage static power electronics converter is used to interface the solar PV power at the point of common coupling (PCC) for satisfying the AC grid connection/code requirements. The single-stage PV system consists of only a three-phase VSI, but it requires a large number of solar PV arrays; hence researchers departed toward a double-stage solar PV system. Double stage solar PV system has a DC-DC asynchronous boost converter in continuous conduction mode as a source-side converter and a three-phase power PWM VSI module as a grid-side converter. Further, due to widespread use of non-linear electronic loads including adjustable AC drives causes power quality problems with high-frequency harmonics injection into the grid and degrades the quality of power. In contrast, an optimal PLL and its control strategy are still required to trigger the grid-side three-phase VSI, which will track the phase angle and estimates the grid frequency accurately.

Therefore, a suitable control technique is essential for the grid-tied power converter for simultaneous operation of active power injection and power quality enhancement. In addition, it is mandatory to propose a control strategy that mitigates the power quality issues and manages the flow of power. In this work, several control techniques have been analysed and the proposed control techniques ensures control signal generation with accurate, precise, and optimal detection of phase and frequency with a simple phase locked loop which is adaptive in nature. The superiority of the investigation is then verified through MATLAB®/Simulink-based simulation studies and then tested by real-time hardware prototype using dSPACE-1104 based digital signal processing (DSP) microcontroller.



**Chithirai Pon Selvan**

*Curtin University, Dubai*

**“The Importance of Engineering Research and Innovation in Advancing Sustainability”**

**Bio:** Prof. Chithirai Pon Selvan has extensive experience in teaching engineering students and has worked in academia for over twenty-five years. He has published/presented more than 150 research articles in journals and conferences. He has been invited and honored as keynote speaker, session chair, resource person, and technical committee member of various conferences held in UAE, India, Thailand, Malaysia, Germany, Italy, Australia, Qatar, and the UK. His research interests are in the areas of machine design, optimization techniques, manufacturing practices, renewable energy, and engineering sustainable development.

He is a well-known researcher in the field of Abrasive Waterjet Cutting Technology and has evaluated several PhD theses in Mechanical Engineering from various universities. He is the approved supervisor of many universities including Curtin University, Australia to guide PhD scholars and has produced many PhDs. He is a member of many professional societies including SAE, ASHRAE, IMechE, ASME, EI, ASQ, and ISTE. He is also a Senior Fellow of the Higher Education Academy (SFHEA), UK and Associate Fellow of Curtin Academy, Australia.

Prof. Pon has received several prestigious awards in UAE including the following:

- “Teaching Excellence Award (2014)” from Manipal University, Dubai.
- “Dubai Award for Sustainable Transport (2017)” from Road Transport Authority (RTA), Govt. of Dubai.
- “Dr. Kalam’s International Excellence Award for Education (2017)” from Dr. APJ Abdul Kalam Lovers Foundation, UAE.
- “Distinguished Conservation Project Award (2018)” from Dubai Electricity and Water Authority (DEWA), Govt. of Dubai.

- “Alleem Sustainability Researcher Award (2018)” from Alleem Research and Development Centre, Sharjah.
- “Sustainability Ambassador Award (2019)” from Road Transport Authority (RTA), Govt. of Dubai.
- “Research Excellence Award (2020)” from Curtin University, Dubai.
- “TAG Founders Award - Academic of the Year (2021)” from Transnational Academic Group (TAG), Dubai.
- “Curtin Global Award (2022)” from Curtin Global, Curtin University.
- “Ezhumin Award for Education - Dubai (2023)” from News 7 Tamil News Channel.

**Abstract:** Since most natural resources are on the verge of being depleted, the world is concentrating on environmentally friendly technologies. Sustainable development is about forms of progress that combine economic development, social advancement, and environmental protection and is widely recognized by the public, private, and civic sectors as one of the major challenges for the 21st century. The current engineering education focuses solely on developing technologies to meet the demands of large consumer markets. On the other hand, there is a lack of emphasis placed on material sustainability, concern for the environment, greenhouse gases, and other forms of livelihood. Considering recent revelations about the state of the world's ecosystems, technological experts have begun advocating for policies that will protect the planet. Redesigning materials and products for circular use would boost innovation across different sectors of the economy. Learners in higher education are significant future stakeholders. Their enthusiasm as aspiring engineers, scientists, leaders, and decision-makers will make a difference. Positive change begins with awareness. Awareness empowers people to act. This presentation will raise awareness about the importance of engineering research and innovation by providing a more comprehensive understanding of sustainable development.



**Wei-Min Liu**  
*National Chung Cheng University (CCU), Taiwan*  
**“Development of Deep-Learning Based Systems Used in Radiotherapy and Smart Agriculture Fields”**

**Bio:** Wei-Min Liu received a B.S. degree in applied mathematics from the National Chiao Tung University, Taiwan, and an M.S. and Ph.D. in electrical engineering from the University of Maryland, Baltimore County (UMBC), Baltimore, MD, USA. Following his doctoral studies, he served as a post-doctoral fellow in the Dept. of Regenerative Medicine, Naval Medical Research Center (NMRC) and National Institute of Biomedical Imaging and Bioengineering (NIBIB), Bethesda, MD, USA.

He joined National Chung Cheng University, Taiwan in 2011, and is currently an Associate Professor in Dept. of Computer Science and Information Engineering and the Director of the Laboratory of Imaging in Medicine and Remote Sensing. His research interests include multi/hyperspectral imaging and data analysis, medical image processing and system development, biomedical signal processing, and optical imaging and instrumentation. The fields of received grants and paper publications involve oncology, neurology, microcirculation, thermal imaging, smart agriculture, and remote sensing.

**Abstract:** In the talk, I will present two of my research projects related to the development of innovative systems. The first one is centered on the field of oncology, addressing the critical challenge of multi-organ contouring (MOC) in the context of radiotherapy. Manual contouring of organs is currently a labor-intensive and time-consuming task during cancer treatment, with far-reaching implications for both patients and healthcare providers. In response, we have engineered an automatic contouring tool designed to alleviate the burdens on oncologists, streamline the workflow, and reduce scheduling delays caused by the rising cancer patient population.

In the second part, we delve into the realm of smart agriculture with a focus on pest control. We have devised a novel method that harnesses the power of everyday smartphones to monitor pest populations, particularly on lotus leaves. These pests, being mere millimeters in size, pose a significant challenge for traditional detection methods. To overcome this, we've ingeniously combined the YOLO network with a super-resolution model to vastly improve the performance of small object detection. This transformative approach has the potential to ease pest management in agriculture and enhance crop yields, contributing to sustainable and efficient farming practices.



**Vinay Ramanath**  
*Siemens Technology, India*  
**“Role of Optimization as a Key Enabler for Systems Engineering”**

**Bio:** Vinay Ramanath is the Principal Key Expert Scientist at Siemens Technology and holds the key responsibility to drive optimization, and uncertainty quantification into the products and tools segments of Siemens. His passion lies in exploring the vast domains of optimization and the innovations that arise at the intersection of optimization with generative AI, industrial metaverse, digital twins, quantum algorithms, systems engineering, etc. Vinay has over 9 patents to his credit.

**Abstract:** The talk will look into how optimization plays a critical role to address the challenges in systems engineering. The presentation will further focus on multi-disciplinary optimization for systems thinking and also give a glimpse of generative engineering in exploration of product architectures and synthesis to avoid design fixation. A peek view into Siemens approach will be presented along with the MBSE offerings.

## Industry Forum Keynote Speakers

Friday, 10 November

09:00 – 11:15

**Theme:** Exponentially Disruptive Technologies (EDT) catalyzed by Industry 6.0/2030, generative AI / AGI, metaverse, blockchain, quantum computing, new compute, and added transformative innovations in all domains: Implications for Business, Investments, Education, Governments, new technologies, and Society

1. Accelerating Innovation for a Sustainable Future
2. Pioneering the Digital Frontier: Metaverse, Web3.0, and Beyond
3. The Next Computing Revolution: New Compute and Biomedical Breakthroughs
4. Navigating the Ethical and Social Landscape of EDT Adoption

### Industry Forum Opening

**Naveen John Punnoose**

*Saintgits College of Engineering, India*

Chair, Industry Forum



**Keynote - Stephen Ibaraki**

*REDDS Capital, Canada*

**“10th Machine Age Investments and New Age Innovations”**

**Bio:** Serial entrepreneur, investor, and futurist, Stephen’s accomplishments and global leadership positions with more than 100 programs / organizations, 300+ recognitions, thousands of engagements / actions annually, are too numerous to list. His leadership roles working daily with more than 1 million CEOs, Investors, Scientists with the world’s leading CEO, scientific, technical and financial organizations allow him a unique vantage point to oversee where transformative innovation and investments are heading in the coming years. Stephen is the visionary behind REDDS whose tireless work has positioned REDDS to take advantage of the globally unique superior intelligence received by the group.

As a small sampling representing under 1% of Stephen’s current activities:

- Founder of UN ITU, AI FOR GOOD, adopted by governments, corporations, and academia, impacting directly 8+ billion people, planetary life, and all Earth’s ecosystems, as the world’s largest AI innovation solutions program, startup Innovation Factory, daily programming, 9 focus/working groups on AI solutions, and annual global summit driving AI top innovative business solutions such as generative AI (BingAI, Microsoft Azure OpenAI, GPT4-5) across 17 United Nations Sustainable Development Goals and empowering CEO-led impact programs for the benefit of humanity and Earth Ecosystems such as with KIN; His most recent contribution is judging the Grande Finale at the in-person #AIForGood summit in Geneva July 6-7, 2023 and announced in this UN ITU news story of the winner. The 2023 summit produced hundreds of news pickup with reach of more than 3 billion including this CNN story featuring WFP Innovation Accelerator Head Bernhard Kowatsch. Stephen is a founding member of the World Food Programme (WFP) Innovation Accelerator Advisory Council which is the world’s largest humanitarian funding program and accelerator for zero hunger. The Focus Group AI for Health with UN ITU and WHO completed their work at the #AIForGood summit in July 5 2023 where Stephen served as vice-chair with the announcement of launch on July 6th of Global initiative AI for health with ITU / WHO / WIPO where Stephen is requested to scale startup innovation. During COVID, Stephen also served on a global leadership private roundtable hosted by the WHO to scale solutions for addressing COVID.
- Founder of Fintech Ideas Festival, Technology Advisory Council, providing industry solutions ten years into the future for the top 100 CEOs representing nearly US \$100 Trillion in managed assets where the CEOs invested in all the transformational tech solutions and startups identified from Stephen in 2015 including blockchain, digital identities, mobile financial services, AI/ML, cybersecurity, biometrics, 5/6G, quantum computing, future of fintech, future of the workforce, privacy and data analytics, personalization and precision services, new user/consumer experience from the confluence of the digital / physical / biological. Stephen directed the CEOs into execution focused working groups, monthly innovation forums, private summits. The public facing parts of this private work is captured in an article Stephen wrote for IT World in January 2017, “ Top CEOs and futurists on the future of financial services and technology”, a rare public video from January 2017 private CEO summit, where Stephen provides his foresight insights to questions. The President and chair of the CEOs technology group introduces Stephen, “Introduce Stephen Ibaraki. Stephen is the entrepreneur and chairman of the Fintech Ideas Festival, a tremendous help and a lot of the people are here today came through Steve’s connections and his work in the industry. Steve’s has a fantastic executive leadership career, distinguished advisor for startups and global fortune 500 companies and governments specifically on strategy, most recently organizing the current AI for Good Summit in Geneva in June 2017 with the United Nations ITU and XPRIZE.” There is a joint article written for the CEOs which also appeared with the United Nations in 2017, “Trending: AI in finance”



by Stephen Ibaraki, founding chairman FSR technology advisory council and Hari Gopalkrishnan, managing director, platforms and technology Bank of America. Article from Forbes in 2019: <https://www.forbes.com/sites/cognitiveworld/2019/04/17/is-financial-services-ready-for-broad-5th-machine-age-technology-adoption/?sh=46d1cec376cf> Is Financial Services Ready For Broad 5th Machine Age Technology Adoption?

- Founding chair YPO Impact Advisory Board and YPO EU Impact Summit Advisory Board, creating workable business solutions for the world's largest opportunities/challenges and focused on purposeful leadership / business / capital & investments / innovation. YPO: 33K CEOs, US \$9 Trillion annual revenue across 145 countries. With work underway since May 2019, the first summit Oct 2020 and continuing as chair impact advisory board with first global impact summit (YPOGIS2023 in Feb 2023) and continuing in 2024; board member Million Peacemakers scaling peace: Transform Conflict Into Nonflict
- Recipient of 21 Microsoft Global Awards (18 MVP Awards), with seven years 2018-2024 in AI with the world's largest and top corporation in technology and advising Microsoft under NDA since the 1970s, recognizing decades of lifetime achievement, global-leadership, entrepreneurship, investments, disruptive innovation including judging Microsoft's Imagine Cup running for 22 years with 2.2 million plus participant empowering student/youth innovation and recently centered on AI and AI for Good. Microsoft releasing a news story on the winners in June 2023 with Stephen quoted on diversity, inclusion, student innovation --
- "The Imagine Cup Junior is more than a competition. It is a learning journey that empowers students to develop their skills in AI and other technologies. These students have shown us how AI can be used for good, to solve some of the world's most pressing problems and create a better future for everyone. I'm proud to be a part of this journey and congratulate all the competitors – and winners -- for their remarkable achievements." Stephen Ibaraki, Founder, UN AI for Good and Imagine Cup Junior 2023 judge.
- Decades serving in leadership with the global scientific, engineering, ICT organizations including CIPS (past chair and president, founding fellow), NPA (past vice-chair and founding fellow), GITCA (founding global chair, founding fellow), IFIP (founding chair global industry council and vice-chair IFIP IP3), ACM (past chair and practitioner board member, chair board PDC, member board committees), within IEEE (past board and current board development committees). More than 1000 interview appears within these organizations (examples, CIPS, ACM, IEEE, NPA, The Brand Called You, IFIP,... ).
- Contributor to Forbes / Cognitive World and IT World Canada on leading new investments, innovation, entrepreneurship.



#### **Keynote - Sunil Kumar Vuppala**

*Ericsson, India*

**"Internet of Senses"**

**Bio:** Dr. Sunil is working as the Director – Data Science at Ericsson R&D, Bangalore. He has 19+ years of industrial and research experience in Machine learning, Deep learning, Analytics, Internet of Things, and Automation. He is an inventor of 40+ patents (6 US granted, and 35+ published), published 30+ papers, and delivered 100+ guest lectures. He is a senior member of ACM, IEEE, and a fellow of IETE and IEI. He is one of the Top 10 data scientists in India for 2019, 40 under 40 data scientists in India for 2019, recipient of Zinnov Technical Role Model in Emerging Technology award 2020, IEEE TEMS Engineering Manager of the Year 2020, ACM distinguished speaker, ACM India Eminent Speaker, and IETE - Biman Behari Sen Memorial Award for 2021. He is an alumnus of IIT Roorkee, IIIT Bangalore, IIM Ahmedabad, and NLSIU, Bangalore.



#### **Keynote - Ashutosh Garg**

*Guardian Pharmacy, India*

**"Ethics and Leadership in a Digital Age"**

**Bio:** Ashutosh Garg, has worked in the corporate sector for 25 years. He worked for ITC Limited for 17 years, leaving in 1995 as Managing Director of one of the ITC group companies, based in Singapore. Thereafter he spent 8 years in the aerospace industry as head of Asian operations. He founded Guardian Pharmacy in India in 2003 and grew it to the second largest pharmacy chain in India with over 200 stores. He also brought in GNC as a nutraceutical partner to India. Ashutosh exited from the company he founded, in August 2016. He is a certified Business and Executive Coach and coaches / mentors several CEO's around the World on business matters, governance, strategic planning, succession planning, personal accountability, people and culture issues ([www.equationcoaching.com](http://www.equationcoaching.com)).

Ashutosh has served as a director of GAVI, The Vaccine Alliance ([www.gavi.org](http://www.gavi.org)), headquartered in Geneva, for 8 years. He has also served as the Chairman of "Bizdome", a Startup Incubator of the Indian Institute of Management, Rohtak, and as a Member of the Advisory Council of the Centre for Policy Research, New Delhi. In January 1995, he was recognized as a Global Leader for Tomorrow by the World Economic Forum, Switzerland. He is an active member of YPO and has served as the Chairman for YPO Gold, South Asia. He is also a Charter Member of TiE. He has written 9 highly acclaimed best sellers titled "The Buck Stops Here – my journey from Manager to Entrepreneur"; "The Corner Office"; "Reinvent Reboot Rewire. Managing Retirement in the 21st Century"; "The

Buck Stops Here - Learnings of a Startup Entrepreneur" and "An Eye for an Eye", "The Brand Called You" and "How to Survive Failure and come out Stronger." His latest book is "7 Chakras of Management – Ancient Wisdom from Indic Scriptures," expected to be published in Nov 2023.

He writes regularly for various online publications like Times of India, Business Insider, Inc., Business World, and Entrepreneur and has a very significant presence on social media. He can be seen frequently on CNN News18 as a panelist commenting on vaccination, political and current affairs. Ashutosh in his new role as a Storyteller, hosts a very successful video and podcast titled "The Brand Called You" ([www.tbcy.in](http://www.tbcy.in)), bringing stories of successful entrepreneurs, professionals and senior corporate leaders to millions of listeners. He has interviewed over 1700 people from over 45 countries around the World. The podcast is viewed and heard by over 150,000 people every day or over 4 million every year.

His wife Vera is a Historian and teaches at the American Embassy School, New Delhi. His older son, Varun works for Visa in Singapore as their Senior Director and his younger son Ashwin works for Procter and Gamble in Fayetteville, Arkansas as their Senior Director. A keen golfer, he plays the Indian flute and enjoys reading and listening to Indian classical and vocal music.

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#### **Keynote - Deepak Waikar**

*Singapore Institute of Technology, Singapore*

**"Harmonizing Clean Energy and Green Transportation Systems for the Sustainable & Net Zero Future"**

**Bio:** Dr. Deepak L. Waikar, Visiting Research Fellow at the Singapore Institute of Technology, Ex-Managing Partner of EduEnergy Singapore, has been involved in education, training, research, and management fields for more than three decades. He started his professional career as an Assistant Director at the National Power Engineers Training Institute in India after his post-graduation from the Institute of Technology, Banaras Hindu University in India. He has been associated with the premier institutions, polytechnics, colleges, and academies in India and Singapore as well as with British and Australian Universities offering courses in Singapore. He has authored/co-authored books, book chapters, research articles, and policy papers on power, energy, management, sustainable development, leadership, and education-related topics. He has served on various committees in **professional** bodies such as the **Chair** of the Institute of Electrical & Electronic Engineers (IEEE), Power & Energy Society (PES) Chapter, Singapore, and **Chair** of the IEEE Education Society Chapter Singapore. He is a recipient of the IEEE-PES **Outstanding Power Engineers' Award** 2003 and the SP **Green Buddy Award** 2004. Dr. Waikar has been associated with **Singapore Certified Energy Manager's** programme for more than a decade. He has also been an advisory committee member of the Indo-Universal Centre for Engineering Education (IUCEE). He has served as Editor and Reviewer for the conferences and journals. He has also been invited as an external examiner for assessing Master's and Doctoral Theses. He has delivered hundreds of invited keynotes, plenary, and panel session presentations on power, sustainable and clean energy, education, management, sustainable development, and leadership related topics at international conferences, seminars, and forums in North & South America, Europe, Australia, New Zealand, and Asia. Dr. Waikar has conducted hundreds of students, faculty, and management development programmes on various topics such as Sustainable & Clean Energy, Designing & Managing Innovative Research and Development projects, Strategies for Infusing Blended Learning, Rethinking Teaching and Learning, Trainopreneurship, Problem/Project-based Learning, Design Thinking, and Transforming Higher Education. He is a Senior Member of IEEE USA and a Life Member of the Institution of Engineers, India with **Ph.D.** from the National University of Singapore, **M.S.** from the University of Saskatchewan, **Canada**, **M.Tech.** from the **Banaras Hindu University, India**, and **PD Certificate** in **University Teaching** from the University of Newcastle, **Australia**. He obtained **PG-DBM** and **B.E.** degrees from **Nagpur University** and **Marathwada University** in India, respectively. His research interests include Sustainable Energy Development, **Rethinking Teaching, Learning and Academic Leadership**, Re-inventing, and **Transforming Tertiary Education**, **SMART Model** for Talent and Leadership Development, **Innovative Project Design** and Management, and Smart and Micro Grid. His hobbies include cricket, chess, and poetry.

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#### **Keynote – Sivakumar Sudhakar**

*Opal-RT Technologies, India*

**"Catalyzing Industry 6.0: OPAL-RT Solutions for Real-Time Testing & Validation of HIL-BMS and FPGA Motor Modeling for Sustainable EV Applications"**

**Bio:** Mr. Sivakumar earned his Bachelor's degree from Amrita University in Electrical and Electronics Engineering (EEE) and continued his studies at the same institution, pursuing a Master's program with a specialization in Power Electronics and Drives. His academic journey has nurtured his expertise in power converter control, with a particular focus on motor drives and renewable energy applications.

Currently, Mr. Sivakumar serves as a Field Application Engineer at OPAL-RT Technologies India Pvt. Ltd. He actively collaborates with OPAL-RT Headquarters in Montreal, primarily focusing on the development of FPGA firmware. These efforts involve intricate signal processing using ADC/DAC technology and the modeling of machines and power converters.

In addition, he is responsible for creating factory acceptance test plans, ensuring the validation of FPGA firmware. He also provides technical support, both on-site and remotely, to clients across India who utilize real-time digital simulators. He plays a crucial role in crafting Simulink models tailored to the specific needs of clients operating within the domains of Power Electronics and Power Systems. These models are vital for various simulation applications, including Model-in-Loop, Rapid Control Prototyping, Hardware-in-Loop, and Power-Hardware-in-Loop simulations.

Mr. Sivakumar possesses comprehensive proficiency in integrating customer Devices Under Test (DUT) with OPAL simulators, utilizing communication protocols such as CAN, IEC61850, C37.118, and Modbus.

His technical expertise and interests span across simulation modeling, Variable Frequency Drives (VFDs), and control systems. As an integral member of the Opal-RT Tech Team, Mr. Sivakumar has developed and executed comprehensive technical training programs, precisely meeting the requirements of the organization.



## Industry Forum Panel

Friday, 10 November 2023

11:30 – 13:00

### Panel 1: Expanding Role of AI/AGI in Traditionally Human-Centric Industries



**Keynote:**

Paul Lee

*Mind.ai, South Korea*

**“Synergistic Symbolic Model for Generative AI”**

**Bio:** Paul is the founder and CEO of Mind AI that leads the endeavor of open and decentralized AI. Paul is a clinician, scientist, and a serial entrepreneur. He is a graduate of the University of Oxford with a degree in Molecular and Cellular Biochemistry, Masters from Seoul National University and an M.D. from The School of Medicine at the Catholic University of Korea. Paul is also a graduate of Futuremed at Singularity University 2013 and Exponential Medicine 2014. As CEO & Co-founder of Curely and Kuddly, he grew the platform into one of the largest media channels in North America for the health and pet health industries with a viewership of over 6B. Paul also co-founded JNP LAB in Seoul which acts as a development hub for global exponential technologies.

**Accolades**

2019 – National Grand Prize in Artificial Intelligence

2020 – AI Unicorn Battle ASIA & Australia Winner

2020 – Ministry of SMEs and Startup: Grand Prize in Innovation

2021 – Ministry of Trade, Industry and Energy: Grand Prize in Technology Innovation

2021 – Ministry of Science and ICT: Grand Prize in R&D Innovation

2021- 2022 – Korea’s Influential CEO of the Year Award

**Abstract:** The field of Artificial Intelligence (AI) has evolved significantly from its humble inception in the middle of the last century. Currently, all the rage is focused on generative models, the GPTs in their variety which have been useful for a broad range of applications. Above and beyond them, a promising avenue of development is within synergistic symbolic models, to capitalize on all the attention. These would combine a new paradigm of symbolic AI, called Canonical Reasoning, and the deep learning approach which has delivered these recent advances. A new paradigm of symbolic AI model brings logical reasoning, transparent knowledge representation, and benefits critical tasks in medicine and legal practice. These are fields which require dealing with facts, cause and effect, and hard rationale, when you need accountability for the results of a thinking machine. Our Canonical Foundation Model brings transparency, as well as the logical processes of deduction, induction, and deduction, all in concert within a single, patented data structure. Bringing transparency and fact checks based on logical reasoning, our Canonical Foundation Model will be able to tackle the persistent problem of hallucinations that every generative AI has been struggling with. The synergy between these complementary approaches expands the horizons of all AI, generative and beyond. For increasingly sophisticated, creative systems which are context-aware and verifiably knowledgeable, shaping the future of AI technology.

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**Panelists:**



**Dileep Viswanathan**

*Hewlett Packard Enterprises, India*

**Bio:** Dileep Viswanathan is a certified Program & Project Management Professional with over 20 years of experience in the Information Technology industry with focus on Research and Development for Platform and Cloud engineering. He is currently working as a Senior Cloud Program Manager for Hewlett Packard Enterprise, based out of Bangalore. He is a strategist and implementer with demonstrated success in end-to-end Project and Program management.

Dileep is a technologist who led different teams in the domain of Server Software and Firmware development. He was instrumental in rolling out some of HPs proprietary software for Server Management and Orchestration. For the last two years he has been working with Hewlett Packard Enterprise's Cloud Modules Programs.

Dileep is an active volunteer for Project Management Institute, a not-for-profit organization based out of USA, and served in various leadership roles for PMI Kerala Chapter. Dileep is a writer, storyteller and an International Speaker and Trainer as well. He received various prestigious awards for his activities in the field of Project Management and Social impact programs.

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**Nikhil Malhotra**  
*Tech Mahindra, India*

**Bio:** Nikhil Malhotra is the Global Head - Maker's Lab, a unique Thin-Q-Bator space within TechMahindra with 22+ years of experience. Nikhil is also a World Economic Forum AI Fellow working on responsible AI and Quantum ethics. Nikhil has been a researcher all his life and is now leading the growth of AI, robotics and Quantum Computing research within Tech Mahindra. Nikhil started his research on AI with IBM. His area of personal research has been how quantum Computing, AI and neuroscience would inspire the growth of AI. He consults various businesses and academic organizations on the future of AI and Quantum. He has won numerous awards including the 2020 and 2021 Innovation Congress award for most innovative leader in India.

Nikhil is also a TEDx speaker and an author of a best seller book – Courage, the journey of an innovator.

One of his vision is to enable machines to talk in local Indian dialect. There are 1645 dialects in India and 26 mother tongues and 80% of Indian population does not speak English. Nikhil is researching on Sanskrit and how this ancient Indian language could sow the seed for the next computer revolution. Nikhil is also actively researching on Indus Script as he calls it his weekend project.

His hobbies include playing tennis, football and reading books on quantum mechanics and biographies. He holds a master's degree in computing with specialization in distributed computing from Royal Melbourne Institute of Technology, Melbourne and is an avid physicist. Nikhil currently resides in Pune with his wife Shalini and sons Angad and Rudra.

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**Sunil Kumar Vuppala**  
*Ericsson, India*

**Bio:** Dr. Sunil is working as the Director – Data Science at Ericsson R&D, Bangalore. He has 19+ years of industrial and research experience in Machine learning, Deep learning, Analytics, Internet of Things, and Automation. He is an inventor of 40+ patents (6 US granted, and 35+ published), published 30+ papers, and delivered 100+ guest lectures. He is a senior member of ACM, IEEE, and a fellow of IETE and IEI. He is one of the Top 10 data scientists in India for 2019, 40 under 40 data scientists in India for 2019, recipient of Zinnov Technical Role Model in Emerging Technology award 2020, IEEE TEMS Engineering Manager of the Year 2020, ACM distinguished speaker, ACM India Eminent Speaker, and IETE - Biman Behari Sen Memorial Award for 2021. He is an alumnus of IIT Roorkee, IIIT Bangalore, IIM Ahmedabad, and NLSIU, Bangalore.

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**Chen-Kuo (Adrian) Chiang**  
*National Chung Cheng University, Taiwan*

**Bio:** Chen-Kuo Chiang is an associate professor at the Department of Computer Science and Information Engineering of National Chung Cheng University. He received his Ph.D degree in computer science department at National Tsing Hua University, Hsinchu, Taiwan, in 2011. He received his B.S. degree in the department of computer information science at National Chiao Tung University, Hsinchu, Taiwan, in 1998, and M.S. degree in the department of computer science information engineering at National Taiwan University, Taipei, Taiwan, in 2000. He was a software engineer from 2001 to 2005 at the Institute of Information Industry. His research interests include: machine learning, pattern recognition and computer vision.

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**Moderator:**

Ashutosh Garg, *Guardian Pharmacy, India*

## Industry Forum Panel

Friday, 10 November 2023

14:00 – 15:30

### Panel 2: Blockchain as an Exponentially Disruptive Technology - Applications and Implications



**Keynote:**

Gigo Joseph  
*Chainyard, India*

**"Reality Check: Separating Blockchain Hype from Practical Utility"**

**Bio:** Gigo Joseph is working as Vice President of Blockchain services at Chainyard. He has over 25 years of global information technology experience across the US, India & ME.

Before Chainyard, Mr. Joseph worked in multiple roles, from software engineer to CEO of SmartCity (Kochi), where he developed India's first greenfield smart city. Earlier in his career, he worked for Infosys as Group Delivery Manager, 3Com as International Product Manager, and IBM as a software engineer. He holds many patents in information technology.

Gigo holds an undergraduate degree from the prestigious NIT Calicut India, an MS from DePaul University Chicago, and an MBA from Northern Illinois State University. Gigo was a board member in multiple organizations, including educational institutions, a motivational speaker, and a part-time policymaker for the state government.

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#### Panelists:



Panchami V  
*Indian Institute of Information Technology, Kottayam, India*

**Bio:** Dr. Panchami.V, HoD, CSE-Cyber Security Department, Indian Institute of Information Technology, Kottayam. She is the founder and faculty incharge of CyberLabs IIIT Kottayam. Her research area includes Lightweight Cryptography, Authentication Schemes, Blockchain and Cryptocurrency, Post-Quantum Cryptography, Cryptanalysis using Quantum Algorithms and Network Security.

She has co-authored over 15 research publications that have been published in prestigious international journals and standard conferences. Dr. Panchami V is also an IEEE member, a member of ACM and a member of the editorial boards of various international journals and the technical program committees of several IEEE conferences. She serves as a reviewer and speaker for several reputed international conferences and IEEE journals. She is the Principal Investigator and a Co-Principal Investigator of funded research projects. She is the principal investigator for MeitY sponsored Quantum Computing Applications Lab (QCAL) and received the grant credits as well. She also obtained a research grant to access time to IonQ Trapped Ion Quantum Computer for the research proposal as part of IonQ research Credits Programme. She got NASSCOM award for the 'Ladies Safety App' and received best research paper award in various conferences. She also received the Young Woman Researcher in Cryptography, Awarded by Centre for Advanced Research and Design, Venus International Foundation, 2022.

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Chintan Oza  
*Anantam Ecosystems, India*

**Bio:** Chintan has 23 years of intrapreneurship experience in the telecom and ICT sectors. Chintan is an alumnus of IIT Mumbai, UC Berkeley, and Oxford University. In 2022, he also completed the Innovation and Technology Commercialization Professional Certification from Georgia Tech.

He spent an equal amount of time in his career with Reliance and Tata Group, deploying strategic telecom projects on a national and international scale. At present, Chintan is the local leader of Founder Institute in Mumbai and, as Regional Director, helps the Founder Institute expand in India. Chintan collaborates with entrepreneurs, helping them with go-to-market strategies and scaling up the technology. He has worked with 102+ cohorts across six continents and has mentored over 320 plus entrepreneurs as they launch and scale their businesses.

Chintan is an active volunteer at PMI, IEEE, TEMS, BMA, OneQuantum, Emerging Technologies Forum, and Rotary International. Chintan is on the advisory boards of various startups and academic institutions. He has been an angel investor in three startups. He is part of the investment committee for various venture capital funds, collaborates with investment syndicates and angel investors.

Recently, he co-founded Arnima Energy Solutions, which is gearing up to launch a range of electric vehicles and high-speed chargers. This year, Chintan is the India Region Lead for IEEE Entrepreneurship. There would be various virtual events on the theme of protecting innovation, i.e., intellectual property rights, patents, innovation monetization etc.

Chintan is Member of Council for Alliance Taskforce at Startup20. Startup20 is newly formed engagement group within G20 under India's presidency in 2023. In July 2023, Chintan delivered a talk on "Leadership imperatives for Transformation in Business and Social Practices for a Sustainable Future" at the Sustainable Business and Climate Change Summit organised by the Consulate General of the United Arab Emirates in Mumbai. This was a side event as part of COP28 being held in presidency of the UAE in 2023.

Recently, Chintan was invited to the BRICS Innovation Forum, which was held in Moscow on August 27-29, 2023. The forum is an emerging global platform to discuss the future of cities as technology hubs. The theme of this year's forum is Cloud City: how digital technologies help communities, governments and companies successfully address modern challenges, create sustainable urban environments, and deliver a new quality of life. Chintan attended three panel discussions and had opportunity to network with global leaders from BRICS member countries.

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Dinesh Thampi, Tata Consultancy Services, India (not pictured)  
Gigo Joseph, *Chainyard, India*

**Panel Moderator:**

Jubilant Kizhakethottam, *Saintgits College of Engineering, India*

## Industry Forum Panel

Friday, 10 November 2023

16:00 – 17:30

### Panel 3: Accelerating Innovation for a Sustainable Future



**Keynote:**

Jijimon Chandran  
*Acsia Tech, India*

**"Steering Towards a Greener Future - Software Powered Mobility"**

**Bio:** Jijimon Chandran (Jiji) is an esteemed entrepreneur and celebrated technologist. He serves as the Founding Director and CEO of Acsia Technologies Private. Ltd., a pioneering global leader in Automotive Software and Embedded Technology. His expertise in emerging technologies and commitment to innovation has earned Acsia partnerships with some of the world's foremost car manufacturers, such as Mercedes Benz, Porsche, Volvo, and Ford.

Jijimon educational background is as impressive as his professional journey, with a Master's in Software Systems from Birla Institute of Technology (BITS Pilani) and a Bachelor's in Information Technology from the same institute. As someone who truly values continuous learning, he has participated in executive management programs at Stanford University and the Intensive Entrepreneurship & Innovation Program offered by Scalabl Academy.

Jiji's foray into the technological landscape began with a role in Global Software Technology development at Hitachi Corporation Japan in 2000. His contributions to the design of Hitachi's Digital Power Plant Control Systems and the localization of Hitachi's ATM for the Indian market are still recognized.

Later, he went on to develop Automotive Electronic Control Units (ECUs) for leading car manufacturers while working with Mitsubishi Electric Corporation. He is an expert in embedded systems, Artificial Intelligence, and Machine Learning in the Automotive and Industrial domains.

Jiji founded Acsia Technologies, which now has offices across Japan, Germany, Sweden and vital R&D Centers in India. Under his capable leadership, Acsia Technologies has grown into a well-known software company with 500+ professionals and an annual revenue of USD 15-20 million.

In addition to being a successful businessman, Jiji demonstrates a commitment to corporate social responsibility, motivating and leading his team in initiatives that aid the less fortunate with the Acsia Foundation Trust and Rotary. He has made tremendous contributions to CII/Young Indians since 2018 by serving as Chapter Chair in 2020 and Vice Chairman of CII Trivandrum Zone. His stellar accomplishments extend beyond the local community, representing India at the 10th Annual G20 Young Entrepreneurs Alliance (YEA) Summit in Japan 2019.

Overall, Jijimon Chandran's journey as an inspired entrepreneur exemplifies the kind of spirit our world needs more of - always ready to make a difference for those in need and ignite positive change in the lives of others.

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### Panelists:



Ajith Gopi  
*ANERT, India*

**Bio:** Dr. Ajith Gopi secured his PhD in Solar Energy from the Universiti Malaysia Pahang, a State University in Malaysia under the Research Group of Renewable Energy & Environmental Engineering. Dr. Ajith Gopi is currently serving as a Joint Chief Technical Manager in ANERT, heading Technical Consultancy in Solar PV Projects and Wind Energy Programme at ANERT. Dr. Ajith has got more than 32 years of experience in Renewable Energy field.

He has conceptualized and implemented ANERT's first Remote Solar Village Electrification Project which brought light to thousands of remote tribal families in Kerala. The project included Solar Micro Grids and thousands of Solar Home Systems in remote tribal hamlets in Kerala.

Under his leadership, ANERT had commissioned a 2MW Solar Photovoltaic Power Plant Project at Kuzhalmannam, Palakkad, which is the first Solar IPP Project in the State of Kerala. He has accomplished many Solar Technical Consultancy Roof-top Projects in major Government Buildings including Municipal Corporations, Universities, Government Courts, Govt Hospitals and Techno parks.

In the past, Dr. Ajith Gopi had lead the Renewable Energy Consultancy Group for Parsons Brinckerhoff, a Global Engineering Consultancy organization for their Renewable Energy Division in the Indian Subcontinent. As part of this group he has got Solar Consultancy experience of several MW projects including a 25MW Solar Power Plant project at Gujarat Solar Park and International projects in China and Portugal. With the same group, he was Project Manager for a 91.8MW Wind Farm Project in Kutch in Gujarat and has experience in several Wind Farm Resource Assessment projects.in Gujarat, Rajasthan, Maharashtra, Tamilnadu & Karnataka.

He had worked as a leading Techno-Management team member that had launched the Indian operations of SunTechnics, the PV Integrator Company under the CONERGY Group, Germany. Under SunTechnics, he could install several solar PV projects in India including a 50kWp Solar Wind Hybrid System at Lay Ladak and several Off-Grid Projects in Chhattisgarh State.

Dr. Ajith Gopi is a Senior Member of IEEE, and currently the Chair of IEEE-Power and Energy Society, Kerala Chapter. He is also an Alumni Member of LIFE Academy, Sweden and a Member of International Solar Energy Society and International Experts Network in Renewable Energy.

In addition to his PhD, Dr. Ajith Gopi holds an International Diploma in Wind Power Development from LIFE Academy, Sweden, M-Tech from College of Engineering, Trivandrum, and M.B.A from Indira Gandhi National Open University. He is an internationally recognized Speaker in Renewable Energy field. Dr. Ajith Gopi has published several papers in the Solar Energy field in reputed SCI Journals and also a reviewer for Elsevier Journal.

He has visited Sweden, Denmark, Norway, China, Singapore, Tanzania & Malaysia as part of various Renewable Energy Training Programmes.



Chocko Valliappa  
*Vee Technologies, Sona Group, India*

**Bio:** A fourth-generation entrepreneur, Chocko Valliappa, founded IT services company Vee Technologies in 2000 and serves as its CEO. Vee Technologies' healthcare practice serves major US hospitals including six of the top 10 healthcare groups handling transactions valuing over \$35 billion with Six Sigma accuracy. The company's e-governance practice plays a significant role in India's digitization efforts. Its product engineering team works on Product Lifecycle Management (PLM) design and Architecture, Engineering and

Construction (AEC) assignments for global customers that include designing some of the iconic buildings around the world and a large percentage of American Fire engines. The company's product-focus led to the development of talent acquisition and talent management platform, HireMee, started as a social enterprise in 2017. Vee Technologies has delivery centres in Karnataka, Tamil Nadu, Andhra Pradesh in India, in the Philippines and in the USA.

Chocko co-founded Valliappa Software Technology Park in Bangalore in 1995 that became first home to tech multinationals – Cisco, Oracle and Verifone.

He serves as a member of the Syndicate of Anna University, India's foremost technical University since 2023. An active CII and Nasscom member, Chocko serves on the Entrepreneurs Organization and Young Presidents Organization (YPO) earning the YPO's Global Social Impact award in 2018.

To access Chocko's rich and varied experience in policy, corporate citizenry, industry-focused technical skill development, and technology, he is an invited to speak and write on education, technology and skill development by business publications. He is also the Vice-Chairman of The Sona Group of Institutions – Sona College of Technology, Sona College of Arts and Science, Thiagarajar Polytechnic College and the Sona School of Management – and drives research efforts at these institutes with over 10,000 students.

Chocko is passionate about empowering the community through Valliappa Foundation. Its recent activities include skilling women at the Women Technology Park, Salem and Sona FM community radio. Sona Yukti offers skill-based training in a variety of sectors. A graduate of Christ College, Bangalore, Chocko did his Textile Technology and Management from the South India Textile Research Association (SITRA) and advanced research in the Czech Republic. Chocko is a fitness and cycling enthusiast and in his spare time likes to go on long rides.





Deepak Waikar  
*Singapore Institute of Technology, Singapore*

**Bio:** Dr. Deepak L. Waikar, Visiting Research Fellow at the Singapore Institute of Technology, Ex-Managing Partner of EduEnergy Singapore, has been involved in education, training, research, and management fields for more than three decades. He started his professional career as an Assistant Director at the National Power Engineers Training Institute in India after his post-graduation from the Institute of Technology, Banaras Hindu University in India. He has been associated with the premier institutions, polytechnics, colleges, and academies in India and Singapore as well as with British and Australian Universities offering courses in Singapore. He has authored/co-authored books, book chapters, research articles, and policy papers on power, energy, management, sustainable development, leadership, and education-related topics. He has served on various committees in professional bodies such as the Chair of the Institute of Electrical & Electronic Engineers (IEEE), Power & Energy Society (PES) Chapter, Singapore, and Chair of the IEEE Education Society Chapter Singapore. He is a recipient of the IEEE-PES Outstanding Power Engineers' Award 2003 and the SP Green Buddy Award 2004. Dr. Waikar has been associated with Singapore Certified Energy Manager's programme for more than a decade. He has also been an advisory committee member of the Indo-Universal Centre for Engineering Education (IUCEE). He has served as Editor and Reviewer for the conferences and journals. He has also been invited as an external examiner for assessing Master's and Doctoral Theses. He has delivered hundreds of invited keynotes, plenary, and panel session presentations on power, sustainable and clean energy, education, management, sustainable development, and leadership related topics at international conferences, seminars, and forums in North & South America, Europe, Australia, New Zealand, and Asia. Dr. Waikar has conducted hundreds of students, faculty, and management development programmes on various topics such as Sustainable & Clean Energy, Designing & Managing Innovative Research and Development projects, Strategies for Infusing Blended Learning, Rethinking Teaching and Learning, Trainopreneurship, Problem/Project-based Learning, Design Thinking, and Transforming Higher Education. He is a Senior Member of IEEE USA and a Life Member of the Institution of Engineers, India with Ph.D. from the National University of Singapore, M.S. from the University of Saskatchewan, Canada, M.Tech. from the Banaras Hindu University, India, and PD Certificate in University Teaching from the University of Newcastle, Australia. He obtained PG-DBM and B.E. degrees from Nagpur University and Marathwada University in India, respectively. His research interests include Sustainable Energy Development, Rethinking Teaching, Learning and Academic Leadership, Re-inventing, and Transforming Tertiary Education, SMART Model for Talent and Leadership Development, Innovative Project Design and Management, and Smart and Micro Grid. His hobbies include cricket, chess, and poetry.

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CJ George, *Geojit Financial Services, India* (not pictured)  
Jijimon Chandran, *Acsia Tech, India*

**Panel Moderator:**

Naveen Punnoose, *Saintgits College of Engineering, India*

## Workshop

Wednesday, 8 November 2023

10:00 – 12:00



### AI for Reduced Order Modelling in Complex Engineering Systems using MATLAB & Simulink

**Dr. Debanand Singdeo**

*MathWorks, India*

**Bio:** Debanand Singdeo, PhD works as senior engineer in the Education Team at MathWorks India Private Limited (Bangalore). In this role, he collaborates with academic institutions for effective utilization of MathWorks resources in education and research in areas of Electrification, Data Science and Internet of Things. He has an interdisciplinary background with a Bachelor's degree in Physics (Hons.) from Visva Bharati, Santiniketan, followed by MSc-PhD degree from the Department of Energy Science and Engineering, IIT Bombay. In previous roles, he has worked as a postdoctoral fellow in the Department of Energy Technology, Aalborg University, Denmark where he was part of an industry-academia consortium that focused on fuel cell commercialization. He has also taught courses and simulation lab on Energy Systems as DST Inspire faculty at Tezpur University, Assam.

**Abstract:** Deep learning is a key technology driving the Artificial Intelligence (AI) megatrend. Popular applications of deep learning include autonomous driving, speech recognition, and defect detection. When deep learning is used in complex systems it is important to note that a trained deep learning model is only a small component of a larger system. Deep learning models can also be used for replacing a detailed, high-fidelity model of the machine or a process. This is known as reduced order modeling. In this presentation we will use examples to understand and explore the use of reduced order modeling in complex engineering systems using MATLAB & Simulink.



## Special Session

Saturday, 11 November 2023

09:30 – 12:00

### Special Session: Privacy and Security of Big Data in Electrical Smart Grid Applications



#### Organizers:

**Dr. Vivekanandan Subburaj**

*National Institute of Technology (NIT), India*

**Bio:** Dr. Vivekanandan Subburaj is an Assistant Professor of Electrical Engineering at the National Institute of Technology (NIT), Silchar, Assam. He holds a Ph.D. in Electrical and Electronics Engineering from NIT Karnataka and achieved top university rankings during his Master's program. His research focuses on low-voltage DC-DC converter topology design, with a special interest in low-power electronics for portable computing, power management ICs, and power chargers. Dr. Subburaj received the Best Paper Award at TENCON 18, a prestigious Asian conference. He is an IEEE member, has editorial board roles in various conference committees, and has published research articles in high-impact journals, including IEEE, IET, and Elsevier. Additionally, he has organized Scopus-indexed conferences, IEEE conferences, and supported numerous government-led workshops and training programs.

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#### Dr. Ritesh Dash

*REVA University, India*

**Bio:** Ritesh Dash, received his Ph.D from School of Electrical Engineering, KIIT University and presently working as Associate Professor at REVA University, Bangalore. He has a research experience of over 10 years and has sound knowledge in the field of Artificial Intelligence, FACTS and Machine learning. He has published more than 100 numbers of research papers both in International Journal and Conference. Earlier he has also published a book under CRC press. He has also served the Govt. of India as a Design Engineer, Electrical at WAPCOS Ltd. A Central PSU under Ministry of Water Resources & Ganga Rejuvenation. His current research interests include Artificial Intelligence and Machine learning in high voltage engineering applications.

He has received Madhusudan Memorial Award and Institutional Award from the Institution of Engineers, India. He is associated with Many International Bodies such as IEEE, Indian Science Congress, The Institution of Engineers, Solar Energy Society of India, Carbon Society of India etc.

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#### Dr. Kalvakurthi Jyotheeswara Reddy

*REVA University, India*

**Bio:** K Jyotheeswara Reddy has more than 7 years of teaching experience in various reputed institutions/universities. He has actively participated in all the academic and administrative activities at various levels and produced successful results in academia and research. He completed his Bachelor degree from JNTU-Kakinada and Master's degree from Sathyabama University, Chennai. He completed his Ph. D degree from VIT University. He served as an Associate Professor in Sree Vidyanikethan Engineering College, Tirupathi. Presently, he is working as an Associate Professor in School of Electrical and Electronics Engineering, REVA University-Bangalore. He has authored and co-authored more than 15 publications in reputed International Journals (SCI & Scopus Indexed Journals) and conferences. He is a member of IEEE and IAENG. He served as Conference organizer, Session Chair, Technical Program Committee, reviewer of many reputed journals including IEEE/Elsevier/Springer etc. His research area includes Power Electronic Converters, Renewable Energy Sources and Electric Vehicles.

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#### Dr. Saahithi S

*REVA University, India*

**Bio:** Saahithi S received the B.Tech. from JNTU Hyderabad and M.Tech. degrees in electrical and electronics engineering from VTU, Karnataka, India, in 2006 and 2014, respectively, and the Ph.D. degree from the School

of Electrical and Electronics Engineering, REVA University, Bengaluru, India, in 2023. She was awarded University Rank Holder and Gold Medallist in her MTech degree. She was with REVA, where she was involved in power electronics converter-based design. She joined the School of Electrical and Electronics Engineering, REVA University, India, in 2014, where she is currently an Assistant Professor. Her current research interests include low-voltage dc–dc converter topology design. Saahithi S is the Member of IEEE. She served as Editorial board member of many conference committees. Published his research articles in high impact journals. She organized Scopus index conferences, IEEE conferences and supported many workshops and training programs conducted by the government organization.

## Committees

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Justin Mathews  
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Philip Jacob Perakathu  
Polly Thomas

### PhD Forum

#### **Arun Madhu**

#### **Ajith Ravindran**

Jithin Kurian Andrews  
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Prinu Chacko Philip  
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Starlet Ben Alex  
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### Publication

#### **Binson V A**

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Prinu Chacko Philip  
Sania Thomas  
Soumya Sara Koshy

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#### **Antony Joseph**

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#### **Jubilant J Kizhakkethottam**

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Sony George  
Soumya Sara Koshy  
Tom Das

### Registration and Certification

#### **Jyothish Chandran G**

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Manoj C.M  
Nishanth P.R  
Preetha S  
Rizwana Akbar

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#### **Anju Pratap**

Ancy Sara Varghese  
Tobin Thomas  
Vishna Devi D

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#### HarinarayananNampoorthiri M G

Agitha M S  
Gokulnath G  
Maheswary Sreenath  
Pratap Pillai

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#### **Sony George**

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Jithin Kurian Andrews  
Philip Jacob Perakathu  
Sariga S  
Soumya Sara Koshy  
Vinu Koshy

**Workshop**

**Pradeep C**

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