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ICCECE
2023

INTERNATIONAL CONFERENCE ON COMPUTER, ELECTRICAL & COMMUNICATION ENGINEERING

COMPUTER SOCIETY OF INDIA
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Preface

Techno India University, West Bengal stands tall as the first private university established in the state of West Bengal. It has always tried to reach unprecedented levels of academic brilliance through an eminent faculty base, state of the art infrastructure and the holistic grooming of its students. The IEEE International Conference on Computer, Electrical and Communication Engineering conducted by Techno India University, West Bengal has inspired researchers from around the globe. This conference seeks submission from national and international researchers showcasing innovative Interdisciplinary Research Papers and cutting-edge data driven and technologically informed solutions to current industrial and academic problems. This innovative initiative has received a robust response from scholars and academicians all over the world overseen by an eminent peer review committee. Currently, this prestigious conference has a stringent 24% acceptance ratio which replicates the finest selection process, thus ensuring an assortment of the best research methodologies. Keynote speeches have been delivered by eminent professors belonging to IITs and ISI, along with stellar organizations such as Google, TCS, and ISRO. This international conference has been a creative effort on behalf of TIU, WB to expand its horizons through the involvement of research personalities belonging to the nation as well as internationally renowned academics. The Conference will propel education to newer heights and is one of the numerous triumphs achieved by Techno India University. It is therefore with great pride, that we announce the participation for ICCECE 2023 has been initiated which is going to be held on 20th and 21st January, 2023.

Message from the Chancellor,
Techno India University, West Bengal

 "Techno India University, West Bengal has always aimed to scale the summit of academic success through top-rung faculty and state-of-the-art infrastructure. The supreme success of ICCECE, the International Conference on Computer, Electrical and Communication Engineering conducted by the university bears witness to the educational standards that this academic institute attempts to reach. I am overwhelmed and grateful for the unconditional support that I always receive from the faculty members, students and staff of this university. I have always been a great believer in practical implementation of ideas rather than abstract, theory-oriented projects as conjectural proficiency in any field of study is incomplete without functional execution. I believe in building an environment friendly nation which will alleviate the suffering of mankind as a whole and to continually undertake initiatives to reach that end. I warmly congratulate all my students, esteemed professors and everyone associated with Techno India Group, and looks forward to many more such splendid endeavors undertaken in its name."

Prof. Gautam Roy Chowdhury

Chairman, Techno India Group
Chancellor, Techno India University, West Bengal

Message from the Vice Chancellor,
Techno India University, West Bengal

"I appreciate the research that is carried on at Techno India University, West Bengal, which forms the actual backbone of an academic institute. The implementation of technology-based research is the sole motto of our university that encourages students and enriches the quality of research papers. The acceptability of papers is enhanced as they always adhere to quality standards, making their way to reputed journals and conferences. I wish a lot of success and best wishes to everyone associated with IEEE International Conference 2023."

<div align="right">

Prof. G. Sengupta

Vice-Chancellor,
Techno India University, West Bengal

</div>

Message from the Registrar,
Techno India University, West Bengal

"Techno India University, West Bengal, is always one step ahead where research has been given the foremost priority for an overall growth of the academic culture. The university has been established with various government projects, namely from ISRO, DST, etc. Interdisciplinary research has, as well, been introduced where various top-notch faculties encourage and involve students in order to let their interests grow, allowing them to excel in their desired fields. I would like to thank all national and international reviewers and participants who are a part of ICCECE 2023. Good luck to all."

Prof. Mohit Chattopadhyay

Registrar,
Techno India University, West Bengal

ACKNOWLEDGEMENT

WALL OF ACCOLADES

"It has been a great privilege to be a part of ICCECE '23. The invited academic speakers have lent great erudition to the event, while the industry experts have given the attendees a glimpse of how innovation plays out in real-time, outcome-sensitive situations. Such events greatly help shape the future paths of prospective researchers, and make the transition from classroom to industry smoother for students. Hope to be part of future editions of this wonderful conference!"

Professor Dan Schonfeld

Department of Electrical and Computer Engineering, University of Illinois Chicago, USA

"ICCECE '23 has really pushed the boundaries of research and innovation in the fields of science, engineering and technology. The path-breaking new ideas and novel applications of established ones presented in the course of this conference have given all of us intellectual sustenance which should keep us going for quite some time! Kudos to Techno India University for pulling off such a massive feat which can serve as a beacon of inspiration to all of us."

Professor Muriel Medard

NEC Professor of Software Science and Engineering Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, Cambridge, USA

"In terms of technical innovation and research output, Techno India University, West Bengal, has attained unprecedented heights of achievement. Its enormous accomplishment in hosting ICCECE 2023, an international conference, serves as a reflection of this success. This university has succeeded in bringing together research, industry, and education on one platform. The participation in this conference of distinguished researchers, scientists, and academicians from leading institutions is a result of this effort. This endeavour will undoubtedly spark a strong interest in technological advancements amongst many students. My sincere compliments go out to the conference team for their arduous work, and I wish these three days of discussions for all the delegates will be productive. Thank you."

Professor Sanghamitra Bandyopadhyay (IEEE Fellow)

Professor (HAG) of Machine Intelligence Unit (ISI)
Director, Indian Statistical Institute, Kolkata, India

"What a great experience! I cannot remember the last time I was part of such an intellectually stimulating atmosphere. ICCECE '23 has been a hotbed and nurturing ground of nascent ideas which can transform our current world totally if provided time and proper guidance. I thank the Organising Committee for putting together a conference which shall serve as a benchmark for other conferences for many years to come."

Professor Amit Lal

Department of Electrical and Computer Engineering,
Cornell University, New York, USA

"I feel ICCECE '23 is a game-changer when it comes to the question of research and innovation in the field of science and technology in the Indian context. Where else in the country have, we seen new and out-of-the-box critical thinking encouraged amongst students and budding researchers? ICCECE '23 and its future editions have a real potential to change the educational landscape of the country as well as redefine the relationship between academia and industry."

Professor Umesh Bellur

Department of Computer Science, Indian Institute of TechnologyBombay, Mumbai, India

"The synergy between industry and academia fosters technological progression and innovation. Industry-Academia collaborations are essential for developing top-tier research and a qualified workforce. It catalyses the opportunities for technological exchange and knowledge creation between the participants leading to symbiotic relationships. Industry will be benefited in terms of innovation and financial benefits whereas the academy in terms of intellectual and economic benefits, and the economy of a nation in terms of innovation and growth. With impressively high grades, Techno India University has excelled in its endeavour and significantly influenced students' motivation to pursue successful careers. This conference is an example of such cooperation between academia and industry. So, my best wishes go out to the Techno India Group for their persistent work in skilfully organizing such a momentous event."

Professor Ashish Ghosh

Professor of Machine Intelligence & Soft Computing Research, ISI, Kolkata, India.

"Techno India University is in the process of reaching the pinnacle of technological innovation and originality in research. I sincerely appreciate your kind invitation to participate in ICCECE '23. The presence of so many eminent scholars and academicians has added a different interdisciplinary dimension to the conference. To accomplish great things, we must not only dream but also be disciplined in terms of execution, and I believe Techno India University has always found the right balance and has provided the perfect opportunity for deserving people. Thank you for all that you did to make my participation in this Conference so pleasurable and rewarding."

Professor V. Ramgopal Rao

IEEE Fellow, TWAS, INAE, INSA, IASc, NASI
Pillay Chair Professor, Department of Electrical Engineering,
Indian Institute of Technology Delhi, Delhi, India

"ICCECE '23 hosted by Techno India University, West Bengal brought together under one roof many novel ideas and innovative approaches geared towards solving the pressing problems of today and tomorrow. I consider it a great honor to be a part of this distinguished occasion. This conference has taken on a new dimension as a result of the participation of notable researchers, professors from esteemed institutions like the IITs and ISI, as well as famous worldwide professionals. I'm overjoyed with the conference's overwhelming success and would like to send Techno India Group my best wishes."

Dr. Swapna Agarwal

Scientist, TCS

International Conference on Computer, Electrical & Communication Engineering (ICCECE 2023)

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2. Dr. J. Roy, Techno India University, West Bengal

Event details

19 January 2023

Time	Event Particulars
DAY 1, SESSION I: INAUGURAL SESSION & TUTORIAL LECTURES
Time	**Event Particulars**
9:00AM– 9:45AM	**Desk Open for Registration**
9:45AM– 10:00AM	**Inauguration:** **Welcome address** **Prof.(Dr.)Bidyut Baran Chaudhuri** FNA, FNAE, FNASc, FIAPR, FTWAS, LF-IEEE Pro-Vice-Chancellor, TechnoIndia University, West Bengal
10:00 AM – 10:15 AM	**Reception of Honorable Speakers by:** **Prof.(Dr.)Bidyut Baran Chaudhuri** (Former Professor @ ISI Kolkata, WB) Pro-Vice-Chancellor, TechnoIndia University, West Bengal **Dr. R. Palladhi** Director, Techno India University, WB **Prof. (Dr.). Sambhunath Biswas** (Former Professor @ ISI Kolkata, WB) Professor, Dept. of CSE, Techno India University, WB
10:15 AM – 10:30 AM	**Lamp Lighting Ceremony**
Tea Break
11:00 AM - 11:30 AM	**Professor Ashish Ghosh** Professor of Machine Intelligence&Soft Computing Research, ISI, Kolkata
11:35 AM – 12:05PM	**Ajinkya Nimbalkar** Senior Software Engineer at Google
12:10 AM – 12:40 PM	**Harjit Singh** Research Scientist at Indian Space Research Organisation
12:45 PM – 01:15 PM	**Dr. Swapna Agarwal** Scientist at TCS

20 January 2023

Time	Event Particulars
DAY 2, SESSION I: KEYNOTESESSIONS	
Time	Event Particulars
9:00AM– 9:30AM	**Desk Open forRegistration**
9:30AM– 10:00AM	**Inauguration:** **Welcomeaddress** **Prof.(Dr.)Bidyut Baran Chaudhuri** FNA, FNAE, FNASc, FIAPR, FTWAS, LF-IEEE Pro-Vice-Chancellor, TechnoIndia University, West Bengal
10:00 AM – 10:15 AM	**Reception of Honorable Speakers by:** **Prof.(Dr.)Bidyut Baran Chaudhuri** (Formerly of ISI Kolkata, WB) Pro-Vice-Chancellor, TechnoIndia University, West Bengal **Dr. R. Palladhi** Director, Techno India University, WB **Prof. Mohit Chatterjee,** Registrar, Techno India University, WB **Prof. (Dr.). Sambhunath Biswas** (Formerlyof ISI Kolkata, WB) Professor, Dept. of CSE, Techno India University, WB
10:15 AM – 10:30 AM	Lamp Lighting Ceremony
Tea Break	
10:45 AM - 11:15 AM	**Keynote address** Professor Muriel Medard NEC Professor of Software Science and Engineering, Department of Electrical Engineering and Computer Science MIT, Cambridge, USA
11:20 AM – 11: 50 PM	**Keynote address** Professor Amit Lal Electrical and Computer Engineering Cornell University, New York, USA
11:55 PM – 12:35 PM	**Keynote address** Prof. Sanghamitra Bandyopadhyay (IEEE Fellow) Professor (HAG) of Machine Intelligence Unit (ISI) Director, Indian Statistical Institute, Kolkata, India
12:40 PM – 01:20 PM	**Keynote address** ProfessorDan Schonfeld Department of Electrical and Computer Engineering University of Illinois Chicago, IL 60607, USA
LUNCH BREAK	

1:45 PM – 2:25 PM	**Keynote address** Professor Umesh Bellur Professor, Department of Computer Science Indian Institute of Technology Bombay Powai, Mumbai 400 076, Maharashtra, India
2:30 – 3:10 PM	**Keynote address** Professor V. Ramgopal Rao IEEE Fellow, TWAS, INAE, INSA, IASc, NASI Pillay Chair Professor, Department of Electrical Engineering Indian Institute of TechnologyDelhi Hauz Khas, New Delhi-110 016, India
Session – II (Technical Session, Oral Presentation, each presentation duration: 10+5 mins)
3:15 PM – 4:00 PM	**OS 1 / OS 2 / OS 3 / OS 4**
CHANCELLOR'S CONCLAVE

21 January 2023

DAY 3, SESSION I: KEYNOTE SESSIONS	
Time	**Event Particulars**
10:00 AM -10:40 AM	**Keynote Address** Professor Vishnu S. Pendyala Department of Applied Data Science San Jose State University, USA
TEA BREAK
Session – II (Technical Session, Oral Presentation, each presentation duration: 10 +5 mins)
10:50 AM – 11:50 AM	**OS 05/ OS 06/ OS 07/ OS 08/ OS 09**
12:00 PM – 01:00 PM	**OS10/ OS 11/ OS 12/ OS 13/ OS 14**
LUNCH
2:00 PM – 2:30 PM	Valedictory Session andVoteof Thanks Participants Feedback
Prize and Certificate Distribution
Closing Ceremony

TECHNICAL SESSION
<u>DAY 1</u>

20 JANUARY 2023
FRIDAY

ORAL SESSIONS (I-IV): INTERDISCIPLINARY SCIENCES
TIME: 3:15 PM – 04:00 PM

ORAL SESSION I

PAPER ID: 71

Model Based Test Framework for verification ofFlight Control Software

Chandrashekhar Singh[1*], Jagadish Shivamurthy[1], Asha Garg[1]
[1]Aeronautical Development Establishment (ADE), DRDO, Bangalore, India
*Contact: chandrashekhar.ade@gov.in

PAPER ID: 117

Multiplexing of Infrared Images Using Periodic with Dynamic Stabilization of Sampling Frequency

Sayantan Banerjee[*1], Biswajit Bhattacharyya[1], Sugata Munshi[1]
[1]Department of Electrial Engineering, Jadavpur University, Kolkata, India.
*Contact:sbim6065@gmail.com

PAPER ID: 146

A New Search Algorithm for Calculating the Maximum Loadability of a Transmission System

Jayanta Piri[*1], Gautam Bandyopadhyay[1], Mainak Sengupta[1]
[1]Department of Electrical Engineering, Indian Institute of Engineering Science and Technology, Shibpur, Howrah – 711103
*Contact:jayanta.piri@gmail.com

ORAL SESSION II

PAPER ID: 160

Power Spectral Density, Higuchi' s Fractal Dimension and Detrended Fluctuation Analysis of sEMG at Varying Weights

Sanjoy Kumar Das[*1], Nilotpal Das, and Monisha Chakraborty[1]
[1]School of Bioscience & Engineering, Jadavpur University, Kolkata, India
[*]Contact: sanjoykumar.mlt@gmail.com

PAPER ID: 238

Retinal and Semantic Segmentation of Diabetic Retinopathy Images Using MobileNetV3

Manish Prajapati[1], Santos Kumar Baliarsingh[1], Jhalak Hota[1], Prabhu Prasad Dev[1], Shuvam Das[1]
[1]School. of Computer Engineering KIIT Deemed to be University, Bhubaneswar, India 751024
*Contact: Manishraj7719@gmail.com

PAPER ID: 74

A Fast-Converging Radial Basis Function Neural Network-Based MPPT Controller for Static and Dynamic Variations in Solar Irradiation

Chepuri Venkateswararao*[1], Kanasottu Anil Naik[1]
[1]Department of Electrical Engineering, National Institute of Technology, Warangal, Warangal, India.
*Contact: venkateswararao.chepuri@gmail.com

ORAL SESSION III

PAPER ID: 169

Building a Classification Model based on FeatureEngineering for the Prediction of WineQuality byEmploying Supervised Machine Learning andEnsemble Learning Techniques

Mauparna Nandan[*1], Harsh Raj Gupta[2], Moutusi Mondal[2]

[1]*Department of Computer Applications, Techno Main Salt Lake, Kolkata, India*
[2]*Department of ECE, Dr. B. C. Roy Engineering College, Durgapur, India*
*Contact: mauparna2011@gmail.com

PAPER ID: 116

Detection and Identification of Rice Pests Using Memory Efficient Convolutional Neural Network

Zihad Hossain Nayem[*1], Md. Iqbal Jahan[1], Abdul Aziz Rakib[1], Md. Solaiman Mia[1]

[1]*Department of Computer Science and Engineering, Green University of Bangladesh, Bangladesh*
*Contact:zihadhossainnayem@gmail.com

PAPER ID: 90

An Autonomous Assistance Robot for Multi-Purpose Medical Applications Using ROS

Pawan Kadam[*1], Pratik Padalkar[1], Aniket Mohite[1], Shantanu Mirajgave[1], Santwana Gudadhe[1]

[1]*Pimpri Chinchwad College of Engineering, Savitribai Phule Pune University, Pune, India*
*Contact:pawankadam1107@gmail.com

ORAL SESSION IV

PAPER ID: 87

Diabetic Retinopathy - An Ensemble Approach

Aditi Rastogi, Timsal Zehra Rizvi, Dr Deeba Kanan

Department of Computing Technology, SRM Institute of Science and Technology, Chennai, India
*Contact:ar5204@srmist.edu.in

PAPER ID: 109

Predicting Gender from Human or Non-human Social Media Profile Photos by using Transfer Learning

Sadman Sakib*, Nur Mohammad Fahad, Mohaimenul Azam Khan Raiaan, Md. Anisur Rahman, Abdullah Al Mamun, Salekul Islam, Md. Saddam Hossain Mukta

Department of CSE, United International University (UIU), Dhaka, Bangladesh
*Contact: ssakib191097@bscse.uiu.ac.bd

PAPER ID: 96

Analyzing and Addressing Data-driven Fairness Issues in Machine Learning Models used for Societal Problems

Vishnu S. Pendyala[1], Hyung Kyun Kim[2]

[1]*Department of Applied Data Science, San Jose State University,* San Jose, United States
[2]*Department of Computer Science, San Jose State University,* San Jose, United States
*Contact:vishnu.pendyala@sjsu.edu

TECHNICAL SESSION
DAY 2

21 JANUARY 2023
FRIDAY

ORAL SESSIONS (V-IX): COMPUTER SCIENCE & ENGINEERING
TIME: 10:50AM – 11:50 AM

ORAL SESSION V

PAPER ID: 258

Prediction of Idiopathic Recurrent Spontaneous Miscarriage using Machine Learning

Dadoma Sherpa[1], Rajwade Dhruva Abhijit[2], Imon Mitra[1], Dhruba Dhar[1], Sunita Sharma[3],Pratip Chakraborty[3], Koel Chaudhury[*1]

[1]*School of Medical Science and Technology Indian Institute of Technology Kharagpur, Kharagpur, India*
[2]*Department of Biotechnology, Indian Institute of Technology Kharagpur, Kharagpur, India*
[3]*Institute of Reproductive Medicine, Kolkata*
*Contact: koel@smst.iitkgp.ac.in

PAPER ID: 40

Ensemble Learning And its Application in Spam Detection

Arka Ghosh[*1], Raja Das[1], Shreyashi Dey[1], Gautam Mahapatra[1]
[1]*Department of Computer Science Asutosh College, Kolkata, India*
*Contact: arkag30@gmail.com

PAPER ID: 165

A New hybrid Feature Selection-Classification model to Improve Cancer Sample Classification Accuracy in Microarray Gene Expression Data

Ritaban Bandyopadhyay[1*], Arijt Das Sharma[1], Bidya Dasgupta[1], Ankita Ghosh[1], Chandra Das[1], Shilpi Bose[1]
[1]*Department of CSE Netaji Subhash Engineering College Kolkata, India*
[*]*Contact: ritabanbanerjee2510@gmail.com*

ORAL SESSION VI

PAPER ID: 252

Investigation on Efficient Machine Learning Algorithm for DDoS Attack Detection

R. Sahila Devi[*1], R. Bharathi[2], P. Krishna Kumar[3]
[1]*Department of Computer Science and Engineering, Rohini College of Engineering and Technology, Palkulam, India.*
[2]*Department of Electronics and Communication Engineering, University College of Engineering, Konam, India.*
[3]*Department of Computer Science and Engineering, Amrita College of Engineering and Technology, Erachakulam, India*
*Contact:sahiladevi6@gmail.com

PAPER ID: 255

Effectiveness of Feature Collaboration in Speaker Identification for Voice Biometrics

Arunima Das[*1], Lakshi Prosad Roy[1], Santos Kumar Das[1]
[1]*Department of Electronics and Communication Engineering,National Institute of Technology Rourkela, India*
*Contact:519EC1009@nitrkl.ac.in

PAPER ID: 155

Prediction of Recurrence in Non-Small Cell Lung Cancer Patients with Gene Expression Data Using Machine Learning Techniques

Sudipto Bhattacharjee[1], Banani Saha[1], Sudipto Saha[1]
[1]*Department of Computer Science and Engineering, University of Calcutta, Kolkata, India*
*Contact: ttsudipto@gmail.com

ORAL SESSION VII

PAPER ID: 181

Early Screening of Valvular Heart Disease Prediction using CNN-based Mobile Network

Tanmay Sinha Roy*[1], Joyanta Kumar Roy[2], Nirupama Mandal[3]

[1]Haldia Institute of Technology, Department of Electrical Engineering, West Bengal, India
[2]Eureka Scientech Research Foundation, Kolkata, West Bengal, India
[3]Department of Electronics Engineering, IIT (ISM), West Bengal, India Kolkata, India Dhanbad, India

Contact: tanmoysinha.roy@gmail.com

PAPER ID: 126

Real-Time Emotional Analysis

Andreas Savva*[1], Vasso Stylianou[1]

[1]Department of Computer Science School of Sciences and Engineering University of Nicosia Nicosia, Cyprus

Contact:savva.a@unic.ac.cy

PAPER ID: 14

Human Interaction-Free Object Localization in a Scene

Sabyasachi Moitra*[1], Sambhunath Biswas[1]

[1]Department of Computer Science & Engineering, Techno India University, West Bengal Kolkata, India

Contact:moitrasabyasachi@gmail.com

ORAL SESSION VIII

PAPER ID: 93

Effect of barrier variabilities on the strain propagation and 2DEG profile of GaN/AlGaN HEMT heterostructures

Priyesh Kumar*[1], Jhuma Saha[1]

[1]Department of Electrical Engineering, Indian Institute of Technology Gandhinagar, Gujarat, India

Contact:kumarpriyesh@iitgn.ac.in

PAPER ID: 113

Detection and Identification of Rice Pests Using Memory Efficient Convolutional Neural Network

Zihad Hossain Nayem*[1], Md. Iqbal Jahan[1], Abdul Aziz Rakib[1], Md. Solaiman Mia[1]

[1]Department of Computer Science and Engineering, Green University of Bangladesh, Bangladesh

Contact:zihadhossainnayem@gmail.com

PAPER ID: 174

Analysis and Processing of Spatial Remote Sensing Multispectral Imagery using Deep Learning Techniques

Omar Soufi*[1], Fatima Zahra Belouadha[1]

[1]Mohammadia School of Engineers Mohammed V University in Rabat AMIPS research team, Rabat,Morocco.

Contact:soufiomario@gmail.com

ORAL SESSION IX

PAPER ID: 108

Envy Prediction from Users' Photos using Convolutional Neural Networks

Mohaimenul Azam Khan Raiaan[1], Abdullah Al Mamun[1], Md. Adnanul Islam[2], Mohammed Eunus Ali[3], Md. Saddam Hossain Mukta[1]

[1]Department of CSE, United International University (UIU), Dhaka, Bangladesh
[2]Department of CSE, Monash University, Australia
[3]Department of CSE, Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

Contact:mraiaan191228@bscse.uiu.ac.bd

PAPER ID: 127
TiO$_2$ Thick film Gas sensor for Detection H$_2$S Gas Using ANN and Machine Learning Technique Amit Gupta*[1], Shashi Kant Dargar[2], Abha Dargar[2] [1]*School of Engineering, Department of Cyber Security, Malla Reddy University, Telangana, India* [2]*Department of ECE, Kalasalingam Academy of Research Education, Tamil Nādu, India* **Contact:dramitguptacv@gmail.com*
PAPER ID: 163
Employee attrition prediction for imbalanced data using genetic algorithm-based parameter optimization of XGB Classifier Karabi Konar*, Saptarshi Das, Samiran Das *Centre for Data Science, JIS Institute of Advanced Studies and Research,JIS University* **Contact: konar.karabi@gmail.com*
ORAL SESSIONS (X-XIV): ELECTRONICS & ELECTRICAL ENGINEERING **TIME: 12:00NOON – 01:00 PM**
ORAL SESSION X
PAPER ID: 51
A Review of Multi-Band Reflectarray Antenna Designs with Mutual Coupling Considerations Venkatraman S*[1], and Komathi B J[2] [1]*Department of Electronics Dolcera Information Technology Services (P) Ltd., Telangana, India* [2]*Department of Electronics and Communication Engineering RMKCET, Thiruvallur, India* **Contact: svenkatcnjp@gmail.com*
PAPER ID: 07
Investigation of Hybrid Power Performance with Solar Module & Wind Turbine in MATLAB Md. Shajedul Islam*[1], Sharifur Rahman[1], Suman Chowdhury[1] [1]*Department of Electrical and Electronic Engineering (DEEE) International University of Business Agriculture and Technology (IUBAT) Dhaka-1230, Bangladesh* **Contact: shajedulislam726@gmail.com*
PAPER ID: 42
Optimal Design of (α + β)-Order Butterworth Filterand Its Realization Using RL$_\beta$C$_\alpha$ Circuit Shibendu Mahata*[1], Ritu Rani De (Maity)[1] [1]*Department of Electrical Engineering, Dr. B. C. Roy Engineering College, Durgapur, India* **Contact: shibendu.mahata@bcrec.ac.in*
PAPER ID: 62
Design And Development of Cost-Effective Automatic Solar Panel Cleaning System Abdullah Mohammed Zaki Khayyat[1], Abdulrahman Hamad Alharthi[1], Faisal Lafi Almohammadi[1], Ziyad Saad Almarwani[1], Tawfeeq Ahmed[1], Mohammed Alshahat[1], Youssef Mobarak[1], Nithiyananthan Kannan*[1] [1]*Electrical Engineering Department, Faculty of Engineering, Rabigh, King Abdulaziz University, Jeddah, Saudi Arabia* **Contact: nmajak@kau.edu.sa*
ORAL SESSION XI
PAPER ID: 70
Comparative Analysis of MIMO Multiuser Signal Detection Subhrajit Dey*[1], and, Soumitra Bhowmick[1] [1]*Department of Electronics and Communication Engineering, Techno India University West Bengal, Kolkata, India* **Contact: deysubhrajit3@gmail.com*

PAPER ID: 88

Multiplexing of Infrared Images Using Periodic with Dynamic Stabilization of Sampling Frequency

Sayantan Banerjee[*1], Biswajit Bhattacharyya[1], Sugata Munshi[1]
[1]Department of Electrial Engineering, Jadavpur University, Kolkata, India.
*Contact:sbim6065@gmail.com

PAPER ID: 164

Network Throughput Improvement in Wi-Fi 6 overWi-Fi 5: A Comparative Performance Analysis

Dwaipayan Bandyopadhyay[*1], Sammilita De[2], Sinjini Hom Roy[1], Deepshikha Biswas[1], Madhura Bhose[1],
Raja Karmakar[1]
[1]Department of Computer Science and Engineering, Techno International New Town, Kolkata, INDIA 700156
[2]Department of Electrical Engineering, Techno International New Town, Kolkata, INDIA 700156
*Contact:dwaipayanofficial2001@gmail.com

PAPER ID: 180

Performance Analysis of Three-Phase Cascaded H-Bridge Multi-Level Inverters

Rudra Pratap Singh[*1], Dharmbir Prasad[2], Azizul Islam[3], Aritra Roy[4], Ranadip Roy[5], Sushri Mukherjee[6]
[1,2,3,4]Asansol Engineering College, Asansol, WB, India.
[5]Sanaka Educational Trust's Group of Institutions, Durgapur, West Bengal, 713212, India
[6]Indian Institute of Technology Delhi, New Delhi, India
*Contact: rudra.ee@aecwb.edu.in

ORAL SESSION XII

PAPER ID: 246

Optimized Novel DC to DC Converter for PV Fed Grid Tied EV Charging Station

Tharwin Kumar[*1], Christober Asir Rajan[1]
[1]Department of Electrical and Electronics Engineering, Puducherry Technological University, Puducherry, India
*Contact:tharwin.eee@gmail.com

PAPER ID: 251

Flop Resistance Controlled Circulating Current Minimization of Parallel Quadratic Step-Up Converter in DC Micro grid Applications

S. Hema[*1], Dr.Y. Sukhi[2], R. Suguna[1]
[1]Department of Electrical and Electronics Engineering Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology, Chennai-62, India.
[2]R.M.K Engineering College, RSM Nagar, Kavaraipettai– 601 206, India.
*Contact: hema35589@gmail.com

PAPER ID: 254

Seven Level CHB Multilevel Inverter based STATCOM using Decoupled Control & DC Voltage Balancing

Vineet Bharadwaj[*1], Samudra Panda[1], Sourabh Kundu[1], Subrata Banerjee[1]
[1]Department of Electrical Engineering NIT, Durgapur Durgapur, India
*Contact: vineetbharadwaj6@gmail.com

ORAL SESSION XIII

PAPER ID: 260

Relative Study on Performance analysis of DMFET and DMTFET based Transducers

Shayantika Dhar[1], Bishal Maji[1], Sunai Das[1], Munai Das[1], Sangeeta Jana Mukhopadhyay[1]
[1]Electronics & Communication Department Dr. Sudhir Chandra Sur Institute and Sports Complex, Dum Dum, West Bengal, India
*Contact:shayanatikadhar123@gmail.com

PAPER ID: 107

Analysis of a Hysteresis Current Control DC–DC Buck Converter Suitable for Wide Range of Operating Conditions

Roshan Ghosh[*1], Koustav Dasgupta[2], Sakti Prasad Ghoshal[2]

[1]*Department of Electrical Engineering, Budge Budge Institute of Technology Kolkata, India*
[2]*Department of Electrical Engineering Techno India University Kolkata, India*
Contact: ghosh.roshan@gmail.com

PAPER ID: 120

A Novel Low-Complexity Power-Efficient Design of Standard Ternary Logic Gates using CNTFET

Anisha Paul[1], Buddhadev Pradhan[1]

[1]*Department of Electronics and Communication Engineering, Techno India University, Kolkata, India*
*Contact:*anip26@gmail.com

ORAL SESSION XIV

PAPER ID: 147

Development of a Laboratory Prototype of a Three Phase Three Bus Transmission System Emulator

Jayanta Piri[*1], Gautam Bandyopadhyay[1], Mainak Sengupta[1]

[1]*Department of Electrical Engineering, Indian Institute of Engineering Science and Technology, Shibpur, Howrah – 711103*
*Contact:*jayanta.piri@gmail.com

PAPER ID: 153

Improvement of Transient Stability in Power System Using Rotating Disc Type Passive Magnetic Fault Current Limiter

Asit Kumar Mondal*[1], Tapan Santra[2]

[1]*Department of Electrical Engineering, Haldia Institute of Technology, Haldia, WB, India*
[2]*Department of Electrical Engineering, Kalyani Government Engineering College, Kalyani, Nadia, WB, India. *Contact:*asitmondal969@gmail.com

PAPER ID: 140

Satellite Wi-Fi Terminal for Post-Disaster Emergency Communication Management

Leena Kohli Kapoor[1], Sunkara Ashish[2]

[1]Satellite Communication Technology Division Space Application Centre (ISRO) Ahmedabad-380015, India

[2]Baseband Systems Division National Remote Sensing Centre (ISRO)Hyderabad-509216,
Contact: leena@sac.isro.gov.in

INTERDISCIPLINARY SCIENCES

Model Based Test Framework for verification of Flight Control Software

Chandrashekhar Singh[1*], Jagadish Shivamurthy[1], Asha Garg[1]
[1]Aeronautical Development Establishment (ADE), DRDO, Bangalore, India
*Contact: chandrashekhar.ade@gov.in

Abstract-Verification and Validation (V&V) of Safety Critical Software such as that of Flight Control Computer is an effort intensive and critical task. Accordingly, standards like DO-178C lay much importance on the V&V aspects of the airborne software. Generation of typical and relevant test vectors over short sequences of time, calculating the expected outputs on a frame-by-frame basis and thus confirming the behaviour of the software are daunting tasks. This paper brings out a Model Based Test (MBT) Framework to accelerate the functional testing. The Framework leverages the fact that, key and functional aspects of flight control such as Control Laws including advanced features such as Auto pilot are modelled and validated through simulation studies before generating software requirements. The Framework provides GUI based utilities to generate test vectors involving several external inputs over time durations such as 10 seconds covering multiple requirements. Such vectors are converted into frame-by-frame test matrix which is fed to both the model and the program under test. The outputs of the model and program are automatically compared and differences beyond threshold are flagged for examination. The Framework additionally generates structural coverage reports both at the model and code levels which are the means to figure out that not only 100% MC/DC for the code is achieved but also there are no missing requirements. These coverage reports provide confidence and certification credits.

Keywords— Light Combat Aircraft (LCA), Flight Control System (FCS), Digital Flight Control Computer (DFCC), Onboard Flight Program (OFP), Model Based Testing (MBT), Control Laws (CLAW), Modified Condition/Decision Coverage (MC/DC), Degree of Freedom (DOF).

Multiplexing of Infrared Images Using Periodic with Dynamic Stabilization of Sampling Frequency

Sayantan Banerjee[*1], Biswajit Bhattacharyya[1], Sugata Munshi[1]

[1]*Department of Electrial Engineering, Jadavpur University, Kolkata, India.*

*Contact:sbim6065@gmail.com

Abstract-A real time FIR filter has been implemented using an ATmega2560 based microcontroller. The digital filter designed theoretically cannot be implemented in practice until the sampling frequency remains constant on different boards, using different versions of compilers and the order of the filter, therefore, can be assessed accurately. Present work is a solution of such inter-linked problems.

Keywords—Real-time FIR filter, Dynamic stabilization, Hamming window, ATmega2560, Microcontroller.

PAPER ID: 146

A New Search Algorithm for Calculating the Maximum Loadability of a Transmission System

Jayanta Piri[*1], Gautam Bandyopadhyay[1], Mainak Sengupta[1]

[1]*Department of Electrical Engineering, Indian Institute of Engineering Science and Technology, Shibpur, Howrah – 711103*
Contact:jayanta.piri@gmail.com

*Abstract-*In today's deregulated electric power systems both government and private utilities are participating in all the available sectors i.e., generation, transmission and distribution. The ownership of each sector may belong to different agencies or companies. In such a scenario the scope of each sector is clearly segregated. A transmission system evacuates electrical power from the generating stations and caters power to different load points. Any shortcoming on the part of the transmission system may prevent the loads from receiving adequate power even in case of availability of adequate generation. As such it is imperative to know the real strength of the existing transmission system to utilise its full capacity and to make necessary improvements of the overall performance of a power system. Technically speaking, the strength of a transmission system is evaluated through Loadability studies wherein the total load of the system is maximised without violating operating constraints. Loadability studies play important role in planning a power system since enhancement of the strength of a transmission system by installing new lines require a large capital investment and right-of-way. Hence every effort should be made to utilise the capacity of an existing transmission system to its fullest extent. In the present work a new search algorithm has been proposed to calculate the loadability of a transmission system. This algorithm has then been used to determine the maximum loadability of power systems taken for a sample study.

Keywords—Transmission System, Maximum Loadability, Line-loadability limit, Angle Stability Limit, DC Load Flow

Power Spectral Density, Higuchi' s Fractal Dimension and Detrended Fluctuation Analysis of sEMG at Varying Weights

Sanjoy Kumar Das[*1], Nilotpal Das, and Monisha Chakraborty[1]

[1]*School of Bioscience & Engineering, Jadavpur University, Kolkata, India*

[*]*Contact:* sanjoykumar.mlt@gmail.com

Abstract-Our muscle cells produce rhythmical potentials that get totalized as millions of cells discharge simultaneously and represent as a waveform, the recording of this waveform is known as Electromyogram (EMG). The device is used this recording is called Electromyograph and process of this recording is known as Electromyography. The primary objective of this work is to see the changes in muscles dynamics when a person lifts various weights. This study used power spectral density (PSD) for linear analysis of surface EMG (sEMG) signal and total powers of the muscles were evaluated. This study used HFD (Higuchi' s Fractal Dimension) analysis to estimate fractal dimension of the sEMG signal during biceps and forearm muscles activities.

Using Detrended Fluctuation Analysis (DFA) nonlinear analysis the change in the pattern of the sEMG signals was observed with varying weights. Surface electrodes with required signal collection circuitry were used for the experiments, and signal data was acquired using a laptop and processed using MATLAB 2013 platform. The signal was also subjected to frequency domain analysis to measure muscle power at varying weights conditions.

The fractal dimension measured varies depending on the applied weights. The investigation of the nonlinear nature of the sEMG signal at various weight situations might yield substantial results as time-based quantitative monitoring of muscle durability and regeneration.

Keywords— Surface Electromyogram (sEMG), Power Spectral, Density (PSD), HFD (Higuchi' s Fractal Dimension), Fractal Dimension, Nonlinear, Detrended Fluctuation Analysis (DFA)

PAPER ID: 238

Retinal and Semantic Segmentation of Diabetic Retinopathy Images Using MobileNetV3

Manish Prajapati[1], Santos Kumar Baliarsingh[1], Jhalak Hota[1], Prabhu Prasad Dev[1], Shuvam Das[1]

[1]*School. of Computer Engineering KIIT Deemed to be University, Bhubaneswar, India 751024*

*Contact: Manishraj7719@gmail.com

Abstract-The eye is affected by diabetic retinopathy (DR), a condition caused by diabetes. DR may initially show no symptoms or cause minor vision problems. However, it may lead to blindness if not diagnosed and treated early. The goal of this research is to segment and classify DR into five stages: no DR, mild, moderate, severe, and proliferative retinopathy. In this work, a deep learning-based convolutional neural network (CNN), namely, MobileNetV3 is employed on a set of 5590 images to identify the stages and patterns of DR. For this, accurate retinal vascular analysis is necessary. This can be accomplished by retinal segmentation to provide a precise result. Retinal segmentation is the process of automatically identifying blood vessel borders. It is designed to handle heavy-duty use cases as well as low-resource use cases. Here, retinal segmentation is carried out by U-net architecture. Due to the region merging process, characteristics loss in the segmentation are preserved and passed on to the image classifier, which has an accuracy rate of up to 97%. MobileNetV3-Large and MobileNetV3-Small are both deep neural networks designed for heavy and low-resource uses, respectively. A model with variable parameters is tweaked and used to identify objects and perform semantic segmentation tasks. Implementation results show that MobileNetV3-Large is 3.2% more accurate than MobileNetV2, while the latency has been reduced by 20% compared to MobileNetV2. MobileNetV3-Small is 6.6% more accurate than the MobileNetV2 model with equal latency.

Keywords—Diabetic Retinopathy, Classification, Deep Learning, CNN, Retinal Segmentation

PAPER ID: 74

A Fast-Converging Radial Basis Function Neural Network-Based MPPT Controller for Static and Dynamic Variations in Solar Irradiation

Chepuri Venkateswararao*[1], Kanasottu Anil Naik[1]
[1]Department of Electrical Engineering, National Institute of Technology, Warangal, Warangal, India
*Contact: venkateswararao.chepuri@gmail.com

*Abstract-*The use of maximum power point tracking techniques, often known as MPPT algorithms, is required to improve the performance of PV systems. In rapidly varying atmospheric conditions, the traditional MPPT approaches do not work as intended. In the paper, a perturb and observe technique based MPPT algorithm is developed together with a radial basis function neural network (RBFNN). To specify and track the maximum power point (MPP), the proposed framework is implemented. Employing the RBFNN as the input-output training information set, the optimal duty cycle is computed while considering varied PV array current and voltage values. Further, an intelligent reconfiguration strategy is developed to enhance the MPP and array characteristics. The proposed hybrid RBFNN and intelligent reconfiguration methodology enhance the performance by 43.05%, 12.22%, 6.81%, 5.6% with the reduced convergence time of 0.06 sec under different shading conditions.

Keywords—convergence, maximum power point, neural network, partial shading condition, radial basis function

PAPER ID: 169

Building a Classification Model based on Feature Engineering for the Prediction of Wine Quality by Employing Supervised Machine Learning and Ensemble Learning Techniques

Mauparna Nandan[*1], Harsh Raj Gupta[2], Moutusi Mondal[2]

[1]*Department of Computer Applications, Techno Main Salt Lake, Kolkata, India*
[2]*Department of ECE, Dr. B. C. Roy Engineering College, Durgapur, India*
*Contact: mauparna2011@gmail.com

Abstract-In today's world, consumers are more concerned regarding the quality of any product. Different approaches are being deployed by various industries to guarantee the excellent quality of their products. Thus, quality certification serve as a vital authentication mechanism for majority of the industries for promoting their numerous products in the market. In the past, only human specialists were employed to evaluate and measure quality. But, nowadays, the majority of validation jobs are automated by software, which curtails the workload of human experts by assisting them to predict the quality of the product and thereby leading to a considerable amount of time saving. Over the past few decades, there has been a sharp rise in wine consumption due to its intrinsic health benefits, particularly for the human heart, as well as for recreational reasons. The main focus of this study is two-fold: the first objective is to predict the quality of wine based upon the correlation between the various physicochemical factors in order to determine the most prominent factors which play a significant role for determining the quality of wine by implementing several supervised machine learning and ensemble learning techniques and the final results being confirmed by employing a variety of quantitative indicators and the second objective is the classification of wine into 3 categories, namely, Best, Good and Poor in order to rank the quality of wine. However, during testing the models with the test dataset, it has been observed that the Random Forest classifier outperformed the other machine learning classifiers with an accuracy of 98%.

Keywords—Supervised machine learning, wine quality, classification, ensemble learning, feature engineering

Detection and Identification of Rice Pests Using Memory Efficient Convolutional Neural Network

Zihad Hossain Nayem[*1], Md. Iqbal Jahan[1], Abdul Aziz Rakib[1], Md. Solaiman Mia[1]

[1]*Department of Computer Science and Engineering, Green University of Bangladesh, Bangladesh*
*Contact:zihadhossainnayem@gmail.com

Abstract-Rice pest detection is a very important part for the development of our agriculture. Numerous farmers are impacted worldwide by rice pests that frequently endanger the sustainability of rice production. There are many types of machine learning techniques for detecting the rice pests. CNNs (Convolutional Neural Networks) are currently regarded as the state-of-the-art technology for image recognition. Most of the models in existing researches worked with datasets that have small number of images and classes. In this paper, We have performed the training of our proposed model with 10400 images, containing ten different classes including Bacterial Leaf Blight, Bacterial Leaf Streak, Bacterial Panicle Blight, Blast, Brown Spot, Dead Heart, Downy Mildew, Healthy, Hispa and Tungro. A custom CNN has been used in the proposed model for pest detection, which will detect different classes of rice pests. To implement our model, we have used the Keras framework with a TensorFlow backend. In addition, our proposed model gives 88.18% validation accuracy while having only 0.57 million parameters.

Keywords— Rice Pests, Pests Detection, Convolutional Neural Network, Machine Learning

An Autonomous Assistance Robot for Multi-Purpose Medical Applications Using ROS

Pawan Kadam[*1], Pratik Padalkar[1], Aniket Mohite[1], Shantanu Mirajgave[1], Santwana Gudadhe[1]

[1]*Pimpri Chinchwad College of Engineering, Savitribai Phule Pune University, Pune, India*
*Contact:pawankadam1107@gmail.com

Abstract-Over the years, the robotic industry has made significant growth in the manufacturing sector due to the need for collaborative and interactive robots. But it is not the case for service sectors, especially in the healthcare sector. A lack of emphasis is given to healthcare which has led to new opportunities for developing assistive robots which can aid patients with disabilities and illnesses. Furthermore, COVID-19 has acted as acatalyst for the development of assistive robots in the healthcare sector in an attempt to overcome the difficulties faced due to viruses and bacteria. This paper demonstrates the simulation of a multi-purpose medical assistive robot using ROS(Robot Operating System). This intelligent robot is successfully simulated and visualized in the ROS environment. To achieve real-time autonomous motion Google Cartographer SLAM(Simultaneous Localization And Mapping) is used to generate real-time maps of unknown environments. It usually focuses on how these robots can provide assistance to health workers, customers, and organizations in different sectors of the healthcare environment.

Keywords—SLAM, Gazebo, URDF, Navigation Stack, AMCL, Odometry, Google Cartographer, RViz.

Diabetic Retinopathy - An Ensemble Approach

Aditi Rastogi, Timsal Zehra Rizvi, Dr Deeba Kanan

Department of Computing Technology, SRM Institute of Science and Technology, Chennai, India
*Contact:ar5204@srmist.edu.in

Abstract- Diabetes is a metabolic disorder that affects many people all over the world. Its annual incidence rates are rising dramatically. Diabetes-related problems in several of the body's vital organs can be lethal if left untreated The most important organ in the human body is the eye. Any anomaly will impact the functioning of life in its operation. The main component of the eye's internal surface, the fundus, is checked to spot any anomalies. In this study, neural networks were used to classify retinal fundus images. Methods of transfer learning are used to put the image into a category based on how bad the diabetic retinopathy is. Diabetes mellitus frequently progresses to diabetic retinopathy (DR), which results in lesions on the retina that impair vision. In this paper, we propose an ensemble approach to diagnose diabetic retinopathy from digital fundus images and accurately classify its severity. We have trained this network on the publicly available APTOS-19[16] dataset using a high-end graphics processing unit (GPU), which shows impressive results, especially for a high-level classification task. Our proposed method worked more than 95% of the time. It has also been tested against the custom Messidor and EyePACS datasets.

Keywords—Diabetes, Diabetic Retinopathy, Ensemble Approach, Transfer Learning, APTOS-19, Messidor, EyePACS

Predicting Gender from Human or Non-human Social Media Profile Photos by using Transfer Learning

Sadman Sakib*, Nur Mohammad Fahad, Mohaimenul Azam Khan Raiaan, Md. Anisur Rahman, Abdullah Al Mamun, Salekul Islam, Md. Saddam Hossain Mukta
Department of CSE, United International University (UIU), Dhaka, Bangladesh
*Contact: *ssakib191097@bscse.uiu.ac.bd*

Abstract- Social media profile photos can demonstrate a variety of information about a person, including her personality, behavior, preference, individuality, and gender. Prediction of gender from social media photos has a number of real life applications such as gender marketing and identification of camouflaged profile photos. Numerous techniques can be applied for determining gender from a user's profile photos. In this study, we predict a user's gender from her social media profile photos (i.e., Facebook, Twitter, and Instagram) by using multiple transfer learning models. While conventional methods are straightforward and can only determine gender based on human faces, we propose a novel model that determines gender based on both human faces and non-human pictures (i.e., a flower, animal, cartoon, doll, etc.). The model predicts the gender of a user based on the pattern of sharing profile photos with outstanding accuracy (95.75%).

Keywords—social media, Gender, Deep Learning, Convolutional Neural Network, Transfer Learning.

Analyzing and Addressing Data-driven Fairness Issues in Machine Learning Models used for Societal Problems

Vishnu S. Pendyala[1], Hyung Kyun Kim[2]
[1]Department of Applied Data Science, San Jose State University, San Jose, United States
[2]Department of Computer Science, San Jose State University, San Jose, United States
*Contact:vishnu.pendyala@sjsu.edu

Abstract- This work aims to systematically analyze and address fairness issues arising in machine learning models because of class imbalances present in data, specifically used for addressing societal problems and providing unique insights. Using a specific data set, spectral analysis is first performed to present evidence and characterize the fairness issues. Subsequently, a series of class imbalance correction techniques are applied before the data is used to generate various machine learning models. The models so generated are then evaluated using multiple metrics. The results are then analyzed to compare the various approaches to determine the relative merits of each. As the experiments described in this paper confirm, not all oversampling techniques help in correcting data-induced model biases. Based on the Kappa statistic, F-1 score, and accuracy measured by the area under the Receiver Operating Characteristic curve, among the approaches evaluated, the Majority Weighted Minority Oversampling Technique, MWMOTE oversampling technique addresses the fairness issues the best and also improves the performance of the models at least for the dataset in consideration. The experiments also demonstrate that some of the oversampling techniques can degrade the models both in terms of performance and fairness. The results are interpreted using the evaluation metrics.

Keywords—Machine Learning, Model Fairness, Bias, Fairness Metrics, Class Imbalance, Cohen's Kappa statistic, Majority Weighted Minority Oversampling Technique

COMPUTER SCIENCE
&
ENGINEERING

Prediction of Idiopathic Recurrent Spontaneous Miscarriage using Machine Learning

Dadoma Sherpa[1], Rajwade Dhruva Abhijit[2], Imon Mitra[1], Dhruba Dhar[1], Sunita Sharma[3],Pratip Chakraborty[3], Koel Chaudhury[*1]

[1]*School of Medical Science and Technology Indian Institute of Technology Kharagpur, Kharagpur, India*
[2]*Department of Biotechnology, Indian Institute of Technology Kharagpur, Kharagpur, India*
[3]*Institute of Reproductive Medicine, Kolkata*
*Contact: koel@smst.iitkgp.ac.in

Abstract- Recurrent spontaneous miscarriage (RSM) is defined as the spontaneous loss of two or more clinically

diagnosed pregnancies within 20 weeks of gestation. Despite extensive research, etiology remains undefined in 50% of RSM cases, and are classified as idiopathic. Thus, further study is warranted to understand molecular mechanism associated with the disease pathogenesis. In the present study, we aim to identify Raman fingerprints in endometrial/uterine tissues of women with history of idiopathic recurrent spontaneous miscarriage (IRSM) and controls by performing Raman spectroscopy with chemometric analysis and spectral classification models. Unsupervised analysis such as principal component analysis (PCA), hierarchical cluster analysis (HCA) and supervised analysis such as orthogonal projections to latent structures discriminant analysis (OPLS-DA) showed a distinct separation between IRSM and controls. The principal component loading plots indicated that proteins, amino acids, cholesterol and glutamate were responsible for the separation between the two groups. The pre-processed Raman spectral data were subjected to eight different machine learning (ML) classifiers with hyperparameter optimization to develop prediction models. Comparing the various algorithms, support vector machine (SVM), decision tree (DT), Extreme Gradient Boosting (XGBoost), convolutional neural network (CNN), and artificial neural network (ANN) outperform the other models based on accuracy ($< 85\%$). Next, grid search and Bayesian optimization was used for tuning the hyperparameters of all methods. Further, 10-fold cross-validation was done to validate the model performances.

The present findings confirm the feasibility of using Ramanspectroscopy combined with ML algorithm may facilitate a better understanding of this pathology.

Keywords—IRSM, Raman spectroscopy, machine learning, SVM, DT, XGBoost, CNN, AdaBoost, RF, GB, ANN, PCA, OPLS-DA

PAPER ID: 40

Ensemble Learning And its Application in Spam Detection

Arka Ghosh[*1], Raja Das[1], Shreyashi Dey[1], Gautam Mahapatra[1]
[1]*Department of Computer Science Asutosh College, Kolkata, India*
Contact: arkag30@gmail.com

Abstract- An individual model is not always sufficient enough to classify an email. Each spam mail has features that distinguish it from any other regular mail. A model might not always use that feature for classification and thus produce erroneous results. It is essential to cross-verify the output of one model, with that of another model. This can be done using the ensemble learning technique. Previously, this was done using the same model repeatedly, or different variants of the model. However, in this paper, we have used four completely different models and used them to perform max voting, to optimize the result. The models used are Support Vector Machine (SVM), Multinomial Naïve Bayes (MNB), Random Forest(RF), and Decision Tree(DT). After testing all the possible combinations, we were able to conclude that the combination of SVM, MNB, and DT gives
the optimal result.

Keywords— spam detection, classification, support vector machine, random forest, decision tree, multinomial naïve bayes, ensemble learning

A New hybrid Feature Selection-Classification model to Improve Cancer Sample Classification Accuracy in Microarray Gene Expression Data

Ritaban Bandyopadhyay[1*], Arijt Das Sharma[1], Bidya Dasgupta[1], Ankita Ghosh[1], Chandra Das[1], Shilpi Bose[1]

[1]*Department of CSE Netaji Subhash Engineering College Kolkata, India*

[*]*Contact: ritabanbanerjee2510@gmail.com*

Abstract-Machine learning techniques are one kind of techniques of Artificial Intelligence that enables systems to learn and improve from data without being explicitly programmed. Machine learning techniques are widely used in medical applications since it has the property to detect inherent patterns from large and complex datasets. Cancer classification based on bio molecular gene expression data is a very crucial topic for medical science as it helps to improve the diagnostic accuracy of cancer samples and is very useful in cancer sample detection and prognosis. But the traditional classifiers performance vitiates due to presence of high feature dimensionality and class imbalance problem present in microarray data. So, in this research work, a new computer aided diagnostic tool is being proposed for cancer sample classification based on bio molecular gene expression data. This tool called MI-TLBO-EB operates in two phases. The first phase selects the best features from the dataset using mutual information and teaching learning-based optimization algorithm named MI-TLBO algorithm and the second phase classifies the cancer samples with the help of an extended version of bagging. The proposed model is advantageous in many ways. It helps to curb the curse of higher dimensionality and increases the classification accuracy via handling class imbalance problem with the help of bagging model. The model is applied on different high dimensional microarray gene expression datasets for cancer sample classification and from the experimental results , it has been found that the generalization performance/testing accuracy of the proposed hybrid model is significantly better compared to other well-known existing models.

Keywords—DNA Microarray Technology, Gene expression data, Feature selection, Mutual information, TLBO, Classification, Bagging.

PAPER ID: 252

Investigation on Efficient Machine Learning Algorithm for DDoS Attack Detection

R. Sahila Devi[*1], R. Bharathi[2], P. Krishna Kumar[3]

[1]*Department of Computer Science and Engineering, Rohini College of Engineering and Technology, Palkulam, India.*
[2]*Department of Electronics and Communication Engineering, University College of Engineering, Konam, India.*
[3]*Department of Computer Science and Engineering, Amrita College of Engineering and Technology, Erachakulam, India*
*Contact:sahiladevi6@gmail.com

Abstract-Internet of Things (IOT) is a general term for all interconnected devices as well as the technology that enables object-to-object and cloud-to-object communication. However, there are several regular and dangerous threats to the development of this technology. The Distributed DoS (DDOS) attacks are extremely innovative and complex, making them almost inevitable to detect by the existing technology or detection system. Due to their complexity and difficulty, novel types of DDoS attacks are practically impossible for intrusion detection systems to detect or mitigate. Effective DDoS traffic detection is made feasible by Machine Learning (ML) technologies. In this paper, the popular ML methods were tested on the CICDoS2019 dataset to determine the most effective one for DDoS detection. A hybrid ML DDoS detection approach using estimator functions is also proposed. The framework for multi-classifying different DDoS attack types can be improved in future research, and a hybrid algorithm can be tested using updated datasets for DDoS attacks.

Keywords— DoS, IOT, DDoS, K-Nearest Neighbour, Support Vector Machine (SVM).

Effectiveness of Feature Collaboration in Speaker Identification for Voice Biometrics

Arunima Das[*1], Lakshi Prosad Roy[1], Santos Kumar Das[1]

[1]*Department of Electronics and Communication Engineering,National Institute of Technology Rourkela, India*
*Contact:519EC1009@nitrkl.ac.in

*Abstract-*Voice biometrics is a promising solution to online banking that doesn't need one's physical presence, unlike fingerprint and retina scanners. Systems for identifying speakers are a crucial component of biometric technologies. Over the past few years, numerous speaker identification systems have been developed and used; these systems rely on various feature extraction methodologies. Due to its capacity to capture' the repeated nature and effectiveness of signals, short-time characteristics like perceptual linear predictive (PLP) and Mel frequency cepstral coefficients (MFCC) have been used in the majority of studies on speaker identification. The efficiency of MFCC characteristics in accurately identifying speakers has been demonstrated in various research. However, the' performance of these features degrades in noisy environments. To address this feature, a novel feature fusion of some spectral and time-domain features has been suggested in this paper. Moreover, this study evaluates the effectiveness of feature collaboration for speaker identification. The experimental results show that the suggested feature vector and classifying model can be widely applied to different types of voice biometric systems.

Keywords—Voice biometric, Speaker Identification, Feature Collaboration

Prediction of Recurrence in Non-Small Cell Lung Cancer Patients with Gene Expression Data Using Machine Learning Techniques

Sudipto Bhattacharjee[1], Banani Saha[1], Sudipto Saha[1]
[1]Department of Computer Science and Engineering, University of Calcutta, Kolkata, India
Contact: ttsudipto@gmail.com

Abstract- Lung cancer is the deadliest cancer and the non-small cell lung cancer (NSCLC) contributes to 80-85% of lung cancer cases. Cancer recurrence is defined as the resurgence of cancer despite the surgical resection of the tumor and occurs in more than 30% of NSCLC patients. It occurs due to several genomic factors, incomplete removal of the tumor, resistance to drugs and chemotherapy, and the presence of cancer stem cells. A preoperative assessment of the risk of recurrence can be crucial for clinicians. The aim of this work is to develop machine learning (ML) models to predict recurrence in NSCLC patients with gene expression data. The gene expression data of 130 NSCLC patients were obtained from a public dataset, named NSCLC-Radiogenomics. Monte-Carlo Feature Selection (MCFS), Boruta feature selection and a combination of MCFS and Boruta were used to identify significant genes which are to be used as input features. Supervised ML models were trained with 5-fold cross validation using Support Vector Machine (SVM), Multi-Layer Perceptron (MLP) and Random Forest (RF) algorithms. Synthetic Minority Oversampling Technique (SMOTE) was used to handle the class-imbalance in the input data. The models trained on SMOTE-applied data outperformed the models trained on original (imbalanced) data. The optimal performance with 5-fold cross validation was obtained by the SVM model with accuracy of 0.99 and MCC of 0.99. The SVM model also achieved an area under receiver operator characteristics curve of 0.98. The models also achieved good performance while validating on the held-out blind dataset. In summary, the ML-based prediction of recurrence in NSCLC patients can aid clinicians in finalizing postoperative treatment.

Keywords— lung cancer, cancer recurrence, gene expression, feature selection, machine learning, support vector machine, multi-layer perceptron, random forest

PAPER ID: 181

Early Screening of Valvular Heart Disease Prediction using CNN-based Mobile Network

Tanmay Sinha Roy*[1], Joyanta Kumar Roy[2], Nirupama Mandal[3]

[1]*Haldia Institute of Technology, Department of Electrical Engineering, West Bengal, India*
[2]*Eureka Scientech Research Foundation, Kolkata, West Bengal, India*
[3]*Department of Electronics Engineering, IIT (ISM), West Bengal, India Kolkata, India Dhanbad, India*
*Contact: tanmoysinha.roy@gmail.com

Abstract- The rapid emergence of technology and big data science opened up a significant amount of work that has been carried out in the field of feature extraction and classification techniques of heart sound using various deep learning methods. Practically, medical practitioners use the same old scientific method and practice to seek out any cardiac disorders and predict any abnormality in the human heart. Heart sound normalization, denoising, segmentation, feature extraction, and classification techniques provide a suitable way of study of phonocardiography (PCG) signal analysis which eventually reduces the cost, makes the system compact, and simultaneously, can work with extensive training data. This paper mainly indulges in two parts feature extraction and classification. The proposed deep learning study for PCG signal used online available heart disease datasets, and time domain features like average energy, power, root mean square (RMS), total harmonic distortion, and zero Crossing rates are used. Statistical features used are kurtosis and skewness. The acoustic features used are Mel-frequency cepstrum coefficients (MFCCs), mel, chroma, contrast, and tonnetz. For the classification of heart sound, the proposed modified CNN-based mobile network is used. The modified CNN-based mobile network is very effective in heart sound analysis as it requires very less computation time and storage. The proposed CNN-based modified Mobile Network model attained an accuracy of 99.04 + 0.07% on the test dataset with a sensitivity of 96.8 + 0.03 % and specificity of 97.2 + 0.09%.

Keywords— Deep Learning, Mobile Network, Feature Extraction, Classification, Acoustic Stethoscope, PCG Signal.

PAPER ID: 126

Real-Time Emotional Analysis

Andreas Savva[*1], Vasso Stylianou[1]

[1]*Department of Computer Science School of Sciences and Engineering University of Nicosia Nicosia, Cyprus*
*Contact:savva.a@unic.ac.cy

Abstract- This paper describes the development of a system which captures students' facial expressions during a lecture and by using machine learning methods it produces a timeline of their emotions. Examples of such emotions are: happiness, surprise, fear, neutral and sadness. This can assist an educator to identify aspects for improving a lecture, such as, at which periods of time students were confused, or, in a 3-hour lecture when a break is needed, etc.

Keywords— Machine learning, Emotion analysis, Facial expressions

PAPER ID: 14

Human Interaction-Free Object Localization in a Scene

Sabyasachi Moitra*[1], Sambhunath Biswas[1]
[1]Department of Computer Science & Engineering, Techno India University, West Bengal Kolkata, India
*Contact:moitrasabyasachi@gmail.com

Abstract- Object detection methods use NMS (Non-Maximum Suppression) to remove multiple detections for a particular object for its localization. To perform this task, NMS requires a confidence threshold and an IoU (Intersection-over-Union) threshold which need to be supplied by an user. Thresholds are fixed and different for different object detection methods, e.g., R-CNN, Faster R-CNN, YOLO, etc. In this paper, we propose a method that uses a suitable regression model to find the threshold values which is adaptive in nature, eliminating the need for human interaction for localization of objects in the scene. The order of the model is determined through bias-variance trade-off and its goodness-of-fit is justified by R2 (R-squared) score and 2 (Chi-squared) test. Results are impressive and attractive.

Keywords—Object localization, Non-Maximum Suppression, Confidence threshold, IoU threshold, Regression, Bias-Variance Trade-Off, R2 score, Chi-squared test

Effect of barrier variabilities on the strain propagation and 2DEG profile of GaN/AlGaN HEMT heterostructures

Priyesh Kumar*[1], Jhuma Saha[1]

[1]*Department of Electrical Engineering, Indian Institute of Technology Gandhinagar, Gujarat, India*
*Contact:kumarpriyesh@iitgn.ac.in

*Abstract-*This work presents an analysis of strain distribution and depth of 2DEG (2-Dimensional Electron Gas) in AlGaN/GaN HEMT (high electron mobility transistor) heterostructures for different variabilities. In this, we have simulated both single and double-channel HEMT heterostructures. We studied two types of barrier variability: Al mole fraction in the $Al_xGa_{1-x}N$ barrier and thickness of barrier on both single and double-channel. It was observed that strain decreases, and the depth of 2DEG increases when mole fraction x in $Al_xGa_{1-x}N$ barrier increases for both single and double-channel. Barrier thickness also follows the same trend for both single and double channel. It was found that the performance of the double-channel heterostructure was better than the single-channel heterostructure in terms of strain distribution and depth of 2DEG formation. We believe that study of the strain distribution of such structures would help the scientific community to design high-performance HEMT-based devices.

Keywords—GaN, Heterostructure, HEMT, Strain, 2DEG, AlGaN double channel

PAPER ID: 113

Detection and Identification of Rice Pests Using Memory Efficient Convolutional Neural Network

Zihad Hossain Nayem[*1], Md. Iqbal Jahan[1], Abdul Aziz Rakib[1], Md. Solaiman Mia[1]

[1]*Department of Computer Science and Engineering, Green University of Bangladesh, Bangladesh*

*Contact:zihadhossainnayem@gmail.com

*Abstract-*Rice pest detection is a very important part for the development of our agriculture. Numerous farmers are impacted worldwide by rice pests that frequently endanger the sustainability of rice production. There are many types of machine learning techniques for detecting the rice pests. CNNs (Convolutional Neural Networks) are currently regarded as the state-of-the-art technology for image recognition. Most of the models in existing researches worked with datasets that have small number of images and classes. In this paper, We have performed the training of our proposed model with 10400 images, containing ten different classes including Bacterial Leaf Blight, Bacterial Leaf Streak, Bacterial Panicle Blight, Blast, Brown Spot, Dead Heart, Downy Mildew, Healthy, Hispa and Tungro. A custom CNN has been used in the proposed model for pest detection, which will detect different classes of rice pests. To implement our model, we have used the Keras framework with a TensorFlow backend. In addition, our proposed model gives 88.18% validation accuracy while having only 0.57 million parameters.

Keywords— Rice Pests, Pests Detection, Convolutional Neural Network, Machine Learning

Analysis and Processing of Spatial Remote Sensing Multispectral Imagery using Deep Learning Techniques

Omar Soufi[*1], Fatima Zahra Belouadha[1]

[1]*Mohammadia School of Engineers Mohammed V University in Rabat AMIPS research team, Rabat,Morocco.*
*Contact:soufiomario@gmail.com

*Abstract-*The use of machine learning models, particularly deep learning models, for the analysis of remote sensing products, especially multispectral satellite images, has recently experienced exponential development. Therefore, this article will present a protocol for processing multispectral satellite images by deep learning through the latest methods used in neural networks for computer vision, exploring all the methods used and proposed. In this study, we present the main methods of deep learning adapted to the processing of multispectral satellite images in the form of an efficient processing protocol. Our methodology proceeds with a systematic analysis of all the deep learning concepts by testing the applicability of multispectral satellite images and the contribution of the concept to the accuracy and performance of the model. In addition, each method introduced in this study has been tested in a real use case of remote sensing products especially satellite imagery for spatial analysis tasks such as semantic segmentation, object and pixel classification, object detection, image fusion, and land use and land cover classification (LULC). Thus, a discussion of the use of this protocol and some open challenges in this technological field are presented.

Keywords—Deep learning, multispectral satellite images, spatial remote sensing, segmentation, classification, object detection.

Envy Prediction from Users' Photos using Convolutional Neural Networks

Mohaimenul Azam Khan Raiaan[1], Abdullah Al Mamun[1], Md. Adnanul Islam[2], Mohammed Eunus Ali[3], Md. Saddam Hossain Mukta[1]

[1]*Department of CSE, United International University (UIU),* Dhaka, Bangladesh
[2]*Department of CSE, Monash University,* Australia
[3]*Department of CSE, Bangladesh University of Engineering and Technology (BUET),* Dhaka, Bangladesh
*Contact:*mraiaan191228@bscse.uiu.ac.bd*

Abstract- Envy is often considered a negative trait in human behavior. However, envy also has a positive insight that can motivate a person to accomplish her desired goals. In this paper, we propose a novel method to identify a user's state of envy (i.e., benign or malicious) based on features from her photos. Specifically, we build a fine-tuned Convolutional Neural Network (CNN) model that takes the user's photo as input and predicts whether the user has benign or malicious envy characteristics in the given photo. For this study, we create a new dataset containing photos of 255 users of different gender and ages. We conduct ablation studies to build an optimal CNN model to obtain a commendable test accuracy of 97.9%.

Keywords—Envy, BeMaS, Deep Learning, Convolutional Neural Network

TiO$_2$ Thick film Gas sensor for Detection H$_2$S Gas Using ANN and Machine Learning Technique

Amit Gupta*[1], Shashi Kant Dargar[2], Abha Dargar[2]

[1]School of Engineering, Department of Cyber Security, Malla Reddy University, Telangana, India
[2]Department of ECE, Kalasalingam Academy of Research Education, Tamil Nādu, India
*Contact:dramitguptacv@gmail.com

*Abstract-*Undoped CuO doped thick film gas sensor have been developed for H2S toxic gas detection to review the sensitivity and sensor response using ANN technique at 150°C. TiO2 based thick film sensor was untrue on a 1" x 1" alumina substrate. It incorporate of a gas sensitive layer TiO2 based thick film sensor with doped of undoped CuO, a couple of electrodes in radical to gas sensing layer serving as a channel pad for sensor. The sensitivity of sensor has been investigated at undoped CuO-doped concentration at constant temperature of 150°C upon liability of H2S toxic gas .An advanced approach is made to measure the sensitivity of undoped CuO-doped TiO2 based thick film sensor by using ANN algorithm.
The training algorithm of feed –forward algorithm namely with learning heuristic was used. The performance of ANN models with specific algorithm is evaluated on reasonable sensitivity of sensor with different network transfer function. Empirically, we found that ANN model with training algorithm is more advisable for simulation of sensor and predict the sensitivity. Simulation results demonstrated in the paper shown ANN as an effective tool in the area of TiO2 based thick film sensor design.

Keywords—ANN, Thick film gas sensor, sensitivity

Employee attrition prediction for imbalanced data using genetic algorithm-based parameter optimization of XGB Classifier

Karabi Konar*, Saptarshi Das, Samiran Das

*Centre for Data Science, JIS Institute of Advanced Studies and Research,*JIS University

*Contact: *konar.karabi@gmail.com*

Abstract- Attrition of employees is vital for any organization as it significantly influences productivity and hampers the longterm growth strategies of the organization. Since employee attrition leads to loss of skills and experiences any organization always try to find a way to retain their employees to reduce training and recruiting cost as well as to achieve their business goal smoothly. Machine learning approaches, which predict the possibility of attrition based on the employee attributes avoid the tedious, and biased manual prediction, and help the organization take preventive measures. This paper presents a framework for attrition prediction that emphasizes imbalance classification and the adoption of genetic algorithms to optimize the model. First, we have adopted different oversampling methods like Synthetic Minority Over-sampling Technique (SMOTE), Adaptive Synthetic (ADASYN), and Borderline Synthetic Minority Over-sampling Technique to balance our data set. We have used XGBoost classifiers for classification with the data that are obtained from different over-sampling techniques. As the XGBoost classifier has many hyperparameter a genetic algorithm is used to optimize our model where the accuracy is chosen as the fitness function. The comparative performance analysis of different over-sampling methods as well as hyper-parameter tuning (Amongst Genetic algorithm, GridSearchCV, and with the default value of different hyper-parameter) on the real dataset suggests that SMOTE for oversampling techniques and genetic algorithm for optimization attains improved performance.

Keywords—Machine learning, Imbalanced classification, XGBoost, Genetic Algorithm

ELECTRONICS
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A Review of Multi-Band Reflectarray Antenna Designs with Mutual Coupling Considerations

Venkatraman S[*1], and Komathi B J[2]

[1]*Department of Electronics Dolcera Information Technology Services (P) Ltd., Telangana, India*

[2]*Department of Electronics and Communication Engineering RMKCET, Thiruvallur, India*

[*]*Contact:* svenkatcnjp@gmail.com

Abstract- The paper reviews some of the relatively recent, and older reflectarray antenna designs in the literature, that comprised a single layer of substrate and unit cell, as well as multiple layers of substrate and unit cell, with considerations on suppressing the mutual coupling between the different bands for which the designs were carried out. A general and comprehensive review on the key performance indicators of a reflectarray unit cell is also presented.

Keywords—Linear polarization, mutual coupling, polygon, reflectarray, single layer, unit cell.

PAPER ID: 07

Investigation of Hybrid Power Performance with Solar Module & Wind Turbine in MATLAB

Md. Shajedul Islam[*1], Sharifur Rahman[1], Suman Chowdhury[1]

[1]*Department of Electrical and Electronic Engineering (DEEE) International University of Business Agriculture and Technology (IUBAT) Dhaka-1230, Bangladesh*
Contact:shajedulislam726@gmail.com

Abstract- This paper represents the investigation of hybrid power performance of solar & wind energy with a battery storage system. This extension is created into MATLAB Simulink environment. This paper tries to investigate the output power using Simulink and improve model design to get higher efficiency. It's performed to achieve maximum power in any weather condition we design such as MPPT code that improves solar PV module and wind turbine energy performance. This MATLAB prototype model can implement any area by producing hybrid power generation. From the hybrid power generation system, difference in power generation with the wind turbine pitch angle and solar irradiance is less than 5%. This software implementation can be hypothetical if the large-scale hybrid power implementation is possible in Bangladesh.

Keywords—Solar, Wind Turbine, MPPT, Converter.

Optimal Design of (α + β)-Order Butterworth Filter and Its Realization Using RL$_\beta$C$_\alpha$ Circuit

Shibendu Mahata[*1], Ritu Rani De (Maity)[1]

[1]*Department of Electrical Engineering, Dr. B. C. Roy Engineering College, Durgapur, India*

[*]*Contact: shibendu.mahata@bcrec.ac.in*

Abstract-This paper presents the implementation of an optimal fractional-order Butterworth filter (FBF) using the RL$_\beta$C$_\alpha$, where $0 < \alpha, \beta < 1$, series circuit. Improved Particle Swarm Optimization algorithm is used to determine the coefficients of three s-domain based fractional-order transfer functions that approximate the FBF characteristics, such that the condition of 0 dB gain at DC is satisfied. Stability, roll-off, accuracy, and algorithm convergence for the proposed FBFs are evaluated. The proposed designs achieve significantly lower error as compared to the recent literature. The Bruton transformation, generalized to the fractional domain, is employed to realize inductor-less FBF circuits. Simulations are carried out in OrCAD PSPICE to verify the design feasibility.

Keywords—fractional Bruton transformation, fractional order Butterworth filter, fractional order circuits, generalized impedance converter, improved particle swarm optimization.

Design And Development of Cost-Effective Automatic Solar Panel Cleaning System

Abdullah Mohammed Zaki Khayyat[1], Abdulrahman Hamad Alharthi[1], Faisal Lafi Almohammadi[1], Ziyad Saad Almarwani[1], Tawfeeq Ahmed[1], Mohammed Alshahat[1], Youssef Mobarak[1], Nithiyananthan Kannan[*1]

[1]*Electrical Engineering Department, Faculty of Engineering, Rabigh, King Abdulaziz University, Jeddah, Saudi Arabia*
*Contact: nmajak@kau.edu.sa

Abstract- The main aim of this work is to design and develop an automatic solar cleaning system for preventing the soiling effect on PV panels. This soiling effect hinders sunlight from reaching PV panels, and it also shortens the life of solar panels in the long run. To optimize the overall function of the PV panel system, the constant soiling effect must be cleaned at regular intervals. To clean the natural dust the solar panel cleaner has been designed and implemented. The cleaning system consists motor-controlled wiper and a water pump controlled by a microcontroller circuit. It has been proved that the performance of the solar panel with a cleaning system has been improved.

Keywords—Solar Panel, Soiling Effect, Temperature, I-V curve, P-V curve, Natural dust

Comparative Analysis of MIMO Multiuser Signal Detection

Subhrajit Dey[*1], and, Soumitra Bhowmick[1]

[1]*Department of Electronics and Communication Engineering, Techno India University West Bengal, Kolkata, India*

[*]*Contact: deysubhrajit3@gmail.com*

Abstract- The advancements in wireless communication have been incredibly helpful to our modern way of life. The MIMO (multiple-input, multiple-output) technology, which involves using several broadcasts and receive antennas, will improve this. The high SNR system makes use of MIMO to boost capacity. Supporting point-to-point high-rate transmission within the single-user MIMO system is possible through the use of spatial multiplexing, which also provides spatial diversity gain. There are typically several users of a communication system all using the same radio bandwidth. Here, each user can send their own data stream from many to one at once, or the base station can send out its own data stream for all users to decode from one to many, all thanks to the system's many antennas. In the case of a single-user MIMO system, this is typically attributed to the system's increased flexibility as a result of using many antennas.

Keywords—Multi-user MIMO, Channel Inversion, Block Diagonalization, Dirty Paper Coding (DPC), Tomlinson-Harashima Precoding (THP).

Multiplexing of Infrared Images Using Periodic with Dynamic Stabilization of Sampling Frequency

Sayantan Banerjee[*1], Biswajit Bhattacharyya[1], Sugata Munshi[1]

[1]*Department of Electrial Engineering, Jadavpur University, Kolkata, India.*

*Contact:sbim6065@gmail.com

Abstract-A real time FIR filter has been implemented using an ATmega2560 based microcontroller. The digital filter designed theoretically cannot be implemented in practice until the sampling frequency remains constant on different boards, using different versions of compilers and the order of the filter, therefore, can be assessed accurately. Present work is a solution of such inter-linked problems.

Keywords—Real-time FIR filter, Dynamic stabilization, Hamming window, ATmega2560, Microcontroller.

PAPER ID: 164

Network Throughput Improvement in Wi-Fi 6 over Wi-Fi 5: A Comparative Performance Analysis

Dwaipayan Bandyopadhyay*[1], Sammilita De[2], Sinjini Hom Roy[1], Deepshikha Biswas[1], Madhura Bhose[1], Raja Karmakar[1]

[1]*Department of Computer Science and Engineering, Techno International New Town, Kolkata, INDIA 700156*
[2]*Department of Electrical Engineering, Techno International New Town, Kolkata, INDIA 700156*
*Contact:dwaipayanofficial2001@gmail.com

Abstract-Novel Wi-Fi version 6 is the youngest generation of Wi-Fi standard, which supports better throughput than its successful predecessor Wi-Fi 5. Both standards have several physical (PHY) layer enhancements, such as higher channel bandwidths (40/80/160 MHz), also the improved Multiuser-Multiple Input and Multiple Output (MU-MIMO). The novel IEEE 802.11ax protocol now supports MU-MIMO in case of both uplink transmission and downlink transmission, whereas Wi-Fi 5 can support only downlink MU-MIMO. In addition, Wi-Fi 6 practices Orthogonal Frequency-Division Multiple Access technology which is popularly known as OFDMA technology and a higher spectral efficiency, and as a result, Wi-Fi 6 can upsurge the average throughput/area in dense networks. Moreover, modulation and coding scheme (MCS) 10 and 11 are introduced in Wi-Fi 6, which further help improve the network throughput. To this end, in this research paper, we present a proportional network throughput analysis of Wi-Fi version 5 and Wi-Fi version 6 and discuss the key features of these two WLAN standards. For the simulation, we use NS3, where it has been observed that Wi-Fi 6 can drastically improve the network throughput compared to Wi-Fi 5.

Keywords—Network throughput; Wi-Fi 5; Wi-Fi 6; IEEE 802.11ax; IEEE 802.11ac

Performance Analysis of Three-Phase Cascaded H-Bridge Multi-Level Inverters

Rudra Pratap Singh*[1], Dharmbir Prasad[2], Azizul Islam[3], Aritra Roy[4], Ranadip Roy[5], Sushri Mukherjee[6]

[1,2,3,4]*Asansol Engineering College, Asansol, WB, India.*
[5]*Sanaka Educational Trust's Group of Institutions, Durgapur, West Bengal, 713212, India*
[6]*Indian Institute of Technology Delhi, New Delhi, India*
*Contact: rudra.ee@aecwb.edu.in

Abstract- Power generation from renewable energy sources is environment friendly. These are being integrated into the grid to enhance green power generation. It is necessary to enhance system performance by attaining improved output power quality, decreased losses, and fewer filtering components and transformers in order to effectively utilize these resources. There are many energy sources in nature that can be turned into either ac or dc power. The user should be receiving high quality electricity from this converter. Due to their superior harmonic profile and higher power ratings, multilevel inverters are becoming more and more used in high-power applications. Inverters with many levels take precedence over those with just two levels. In this study, a cascaded H-bridge multilevel inverter with a single hardware topology, based on sinusoidal pulse width modulation-phase disposition (SPWM-PD) modulation techniques, has been assessed. This study uses FFT techniques to demonstrate the total harmonic distortion (THD) performance of the suggested inverter.

Keywords—Energy conversion, Inverter, Multi-level, THD Performance, Renewable energy

Optimized Novel DC to DC Converter for PV Fed Grid Tied EV Charging Station

Tharwin Kumar[*1], Christober Asir Rajan[1]

[1]*Department of Electrical and Electronics Engineering, Puducherry Technological University, Puducherry, India*
Contact:tharwin.eee@gmail.com

Abstract-The use of Electric Vehicles (EVs) has been increasing in a wider range owing to the increase in population and energy demand. Nowadays, the Solar, which is one of the RES (Renewable Energy sources), assists in EV charging and is gaining higher importance. Moreover, the main function involved in an EV system is the battery charging, and many different types of issues like battery life time, interruptible power supply and poor energy management occur in conventional types of charging. Hence, in the proposed paper, a novel EV charging station is introduced and it involves an optimized DC-DC Bi-directional Boost-Zeta converter. In this work, the EV battery attains energy directly from the PV panel and the additional energy produced by PV is transferred to the grid. The proposed converter functions in boost mode and aids in improving the PV output; the resulting DC-link voltage is regulated and maintained constant using an optimization algorithm known as Firefly Algorithm (FFA). Further, through a single phase VSI, the DC link voltage is given to the grid. In order to attain grid synchronization, a PI controller is employed. Whenever, there is less sunshine, the energy from the grid is fed to the EV battery, thereby supplies continuous power to the EV, even in the absence of solar energy and during this condition, the DC-DC converter functions in Zeta mode. Then, for analysing the performance of the proposed work, it is implemented in MATLAB/Simulink and from an analysis, it is identified that the proposed EV charging station possess a less THD of 3.1%, better switching losses and reactive power compensation.

Keywords—Electric Vehicles (EVs), RES (Renewable Energy sources), DC-DC Bi-directional Boost-Zeta converter, Firefly Algorithm (FFA) and PI controller.

Flop Resistance Controlled Circulating Current Minimization of Parallel Quadratic Step-Up Converter in DC Micro grid Applications

S. Hema[*1], Dr.Y. Sukhi[2], R. Suguna[1]

[1]*Department of Electrical and Electronics Engineering Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology, Chennai-62, India.*
[2]*R.M.K Engineering College, RSM Nagar, Kavaraipettai– 601 206, India.*
*Contact: hema35589@gmail.com

Abstract-In many situations high Current is required in high demand applications like all automized industries, DC Microgrid etc., Same converter modules connected in parallel combination results in generation of higher output current, but when connecting two converters in parallel creates the problem of uneven distribution of current in each converter module due to Mismatch component Parameter tolerances, similarly in existing methods of all parallel converter used buck converter and boost converters to minimize the circulating current and percentage error. This study proposes two quadratic step-up converters (QSC) in parallel connection called parallel Quadratic Step-up Converter (PQSC) with even distribution of current in both QSC by implementing passive flop resistance control method (FRC). By using this flop resistance control of QSC method adaptively adjust the reference voltage and also controls the converter duty ratio to achieve equal sharing of current in both Quadratic step-up converters. The adjustment of converter switch on time depends on output current, output voltage of each converter, overall output current, output voltage, Flop Resistance, Cable Resistance of both the converters. The MATLAB simulation model verify the usefulness of the proposed control technique. This effort of proposed control method achieve equal current sharing, reduces circulating current and percentage error of current sharing difference even though para-meters of two converter modules are different.

Keywords—Quadratic Step-up converter, Parallel Quadratic step up converter, Circulating Current Minimization, PI Controller, Flop Resistance Control

Seven Level CHB Multilevel Inverter based STATCOM using Decoupled Control & DC Voltage Balancing

Vineet Bharadwaj[*1], Samudra Panda[1], Sourabh Kundu[1], Subrata Banerjee[1]

[1]*Department of Electrical Engineering NIT, Durgapur Durgapur, India*
*Contact: vineetbharadwaj6@gmail.com

Abstract- In order to increase the overall power factor of the grid, this study suggests the operation of a seven-level Cascaded H-Bridge (CHB) based Static Synchronous Compensator (STATCOM) with decoupling control algorithm. This control method also exhibits the voltage balancing of dc-link capacitors connected with the STATCOM, using lesser number of voltage sensing devices. The phase-shifted sinusoidal-pulse-width-modulation (PSPWM) technique is utilised to generate gate pulses required for the semiconducting switches of the CHB inverter. Functionality of the CHB based STATCOM has also been tested under varieties of linear and nonlinear loading situations. The applicability of the CHB based STATCOM using the proposed control strategy is verified by simulation study in the MATLAB-Simulink platform.

Keywords— CHB multilevel inverter, DC voltage control, decoupling control, PSPWM, STATCOM

Relative Study on Performance analysis of DMFET and DMTFET based Transducers

Shayantika Dhar[1], Bishal Maji[1], Sunai Das[1], Munai Das[1], Sangeeta Jana Mukhopadhyay[1]

[1]Electronics & Communication Department Dr. Sudhir Chandra Sur Institute and Sports Complex, Dum Dum, West Bengal, India
*Contact:shayanatikadhar123@gmail.com

Abstract- The key contribution of current paper involves optimization of transducer electrical response for dielectrically modulated electrochemical biosensing applications. In order to optimize the performance of transducer element of dielectrically modulated biosensors a comprehensive physical understanding on the working principle of dielectric modulation is necessary for analysing the comparative electrical response of FET & TFET based transducer elements. The analysis is then extended for estimating the relative electrical responses of DMFET and DMTFET. The overall contributions of this paper eventually lead to the identification of principle structural/material parameters influencing the transduction efficiencies of DMFET & DMTFET and thereby find the path for improvising performance improvement strategies in the near future.

*Keywords—*Dielectric modulation; FET; TFET; Drain current Sensitivity

Analysis of a Hysteresis Current Control DC–DC Buck Converter Suitable for Wide Range of Operating Conditions

Roshan Ghosh[*1], Koustav Dasgupta[2], Sakti Prasad Ghoshal[2]

[1]*Department of Electrical Engineering, Budge Budge Institute of Technology Kolkata, India*
[2]*Department of Electrical Engineering Techno India University Kolkata, India*
*Contact: ghosh.roshan@gmail.com

Abstract- It is very crucial to maintain high efficiency in a dc–dc converter over an extensive load current range in order to extend the battery-life in advanced fast switching applications. In order to improve the performance of DC-DC buck converters hysteresis current control technique is adopted here in this paper. This paper presents the mathematical modelling and performance analysis of a buck converter with hysteresis current control scheme. This paper examines the performance of the current control hysteresis buck converter under both low and high duty ratios along with load and supply transients. Performance of hysteresis current control buck converter is compared with other fixed frequency control and variable frequency control methods, which shows better dynamic performance; lower voltage ripples are obtained in simulated results using MATLAB 18 version software.

Keywords— Hysteresis current control; dc–dc converters; buck power converter; energy optimization; light load.

A Novel Low-Complexity Power-Efficient Design of Standard Ternary Logic Gates using CNTFET

Anisha Paul[1], Buddhadev Pradhan[1]

[1]*Department of Electronics and Communication Engineering, Techno India University, Kolkata, India*
Contact:anip26@gmail.com

Abstract-This paper introduces novel low-complexity and power-efficient designs of standard ternary (ST) logic gates like the standard ternary inverter (STI), NAND (STNAND), NOR (STNOR), and XOR (STXOR) gates, along with the ternary minimum (TMIN) and ternary maximum (TMAX) operators using the CNTFET. The proposed designs use pass transistor logic (PTL), which reduces the complexity and increases the power efficiency of the designs. The proposed circuits are simulated in Synopsys HSPICE simulation tool using 32 nm CNTFET model provided by Stanford University. In each case, average power values and propagation delays are duly noted and power-delay-product (PDP) values are calculated. Simulation results prove that the proposed designs are more power-efficient and energy-efficient than the existing designs.

Keywords—Ternary Logic, PTL, STI, STNAND, STNOR, STXOR, CNTFET

Development of a Laboratory Prototype of a Three Phase Three Bus Transmission System Emulator

Jayanta Piri[*1], Gautam Bandyopadhyay[1], Mainak Sengupta[1]

[1]*Department of Electrical Engineering, Indian Institute of Engineering Science and Technology, Shibpur, Howrah – 711103*
*Contact: jayanta.piri@gmail.com

Abstract- In this paper an analog emulator of a three phase three bus transmission system has been developed. A practical transmission line data of a 100km ACSR based conductor at 230kV(L-L) and at 100MVA(3-Φ) has been scaled down at 415V(L-L) and 10kVA(3-Φ). Thorough calculation of individual line-parameters has been presented. Two constraints, namely the no-load constraint of keeping the per-unit charging current per phase, as of 230kV(L-L) & 100MVA(3-ϕ) base system, unchanged and full-load constraint of keeping the percentage (%) voltage regulation within some specific limits when connected in as a single π-block, two π-blocks in cascade and two π-blocks in shunt, have been considered when modelling such scaled version of the transmission system. Results obtained from theoretically derived models have been validated with the same as obtained from simulation & from experimental set-up.

Keywords—Transmission System Emulator, Charging VAR, Voltage Regulation, π-Modelling, ABCD parameters.

Improvement of Transient Stability in Power System Using Rotating Disc Type Passive Magnetic Fault Current Limiter

Asit Kumar Mondal*[1],Tapan Santra[2]
[1]*Department of Electrical Engineering, Haldia Institute of Technology, Haldia, WB, India*
[2]*Department of Electrical Engineering, Kalyani Government Engineering College, Kalyani, Nadia, WB, India*
*Contact:asitmondal969@gmail.com

*Abstract-*A revolving disc-type Permanent Magnet fault Current Limiter (PMFCL) is proposed as a means of improving the transient stability of a Single Machine Infinite Bus (SMIB) with double circuit transmission lines. This new configuration of the PMFCL can restrict the fault current without affecting the normal condition of the system. The impedance offered by the device can be regulated by changing the rotation of the disc. The stability limit of the power system can be also controlled by regulating the impedance of the PMFCL. The PMFCL design and Finite-element analysis (FEA) was carried out using ANSYS MAXWELL software and the stability analysis on Single Machine Infinite Bus (SMIB) systems including the proposed PMFCL unit is carried out in MATLAB SIMULINK.

Keywords—PMFCL, Transient Stability, SMIB, Variable Impedance.

Satellite Wi-Fi Terminal for Post-Disaster Emergency Communication Management

Leena Kohli Kapoor[1] ,Sunkara Ashish[2]

[1]*Satellite Communication Technology Division Space Application Centre(ISRO)* Ahmedabad-380015, India
[2]*Baseband Systems DivisionNational Remote Sensing Centre (ISRO)Hyderabad-509216, Indiaashishrao_s@nrsc.gov.in*
*Contact: leena@sac.isro.gov.in

Abstract-Post disaster Emergency communication in partly functional or completely isolated scenarios requires a solution that is autonomous and resilient to network vulnerabilities due to both man-made and natural disasters. This paper presents the design of Wi-Fi based Mobile Satellite Service (MSS) terminal and the application developed to provide GSM connectivity for audio calls and text messaging for smartphone users in remote areas with intermittent and/or weak GSM signals or even with completely disrupted terrestrial connectivity. The operational features that incorporate automatic beam selection and enable rerouting of traffic from terrestrial through satellite network for inter-networking of technologies have been highlighted. The terminal can be used as a hot-spot by agencies coordinating relief measures for the trapped population.

Keywords—Mobile Satellite Services, Disaster Management, Emergency Communication

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