



**TECHNO INDIA  
SILIGURI INSTITUTE  
OF TECHNOLOGY**  
A Satyam Roychowdhury Initiative



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**ABSTRACT PROCEEDINGS OF**

**INTERNATIONAL CONFERENCE ON**

# **DATA SCIENCE & COMMUNICATION**

March 23<sup>rd</sup> - 24<sup>th</sup> 2023 at **Siliguri Institute of Technology**, Sukna, Siliguri, WB - 734009

**CONFERENCE WEBSITE**  
<https://ictdsc.in>

**ORGANIZED BY**

Department of Electronics & Communication Engineering *and*  
Department of Engineering Science and Humanities,  
**Siliguri Institute of Technology**

# About

ICTDsC-2023 is designed to bring together the academics and other professionals' experts to discuss cutting-edge developments in respective fields.

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## **Message from the Chief Patron**

I am extremely delighted to know that the Department of Electronics & Communication Engineering in collaboration with the Department of Engineering Sciences & Humanities of Siliguri Institute of Technology is going to organise a two-day International Conference on “Data Science and Communication (ICTDsC-2023) during 23<sup>rd</sup> – 24<sup>th</sup> March 2023.

I also welcome the synergy and merit envisioned by the Departments to carry forward the vision and mission of the Institution. This initiative is really praiseworthy and deserves appreciation to all those associated with this endeavour which would keep flourishing in the realm of engineering to shine as ‘Quality Engineers with Morality’ and be an example for others to emulate and follow.

Come and be a part of the programme which would endorse a spirit of enterprise among the students and the faculties through effective as well as productive interactions. The prospect of the programme will explore the challenges in different avenues of Data Science, Communication, IoT, Cyber security and will also put forward practical solutions for the same.

We welcome all the brilliant minds from all over the world and I wish the grand success of the Conference and truly believe that the outcome would have an unprecedented platform for further growth of the institution.

Best Wishes

Satyam Roychowdhury  
Founder & Managing Director  
Techno India Group  
Chancellor, Sister Nivedita University

## **Message from Group CEO, Techno India Group**

It gives me great pleasure to note the continued popularity and success of the International Conference on Data Science and Communication, which has been organized with such care and dedication over the years by Siliguri Institute of Technology (SIT). Given SIT's premier position in cutting edge research in these disciplines, the institute is uniquely placed to hold such an event of international repute in this part of India.

At ICTDsC-2023, we have had the opportunity to hear and learn from some of the most prominent international minds in their respective fields. The five tracks of ICTDsC-2023 comprehensively covered the current high-focus research areas in Artificial Intelligence, Machine Learning, AR/VR, Networks and Cyber Security, IoT, Blockchain and Bioinformatics. The number and quality of papers received is a testament to the increasing interest among researchers in ICTDsC—not only in India, but all over the world.

My special thanks to all the keynote speakers and participants for taking time out of their busy schedules and travelling to Siliguri, from all over the world, to attend ICTDsC-2023. The ideas shared and discussed here—in the backdrop of these beautiful Himalayan foothills—will provide further impetus to cutting-edge research in the respective disciplines.

I shall also take this opportunity to send out an open invitation to all academics, researchers, enthusiasts and industry experts to attend the next session of ICTDsC. Our primary aim of organizing ICTDsC—to bring about a rapid convergence of research and practical applications—shall be substantially realized only when we have even more ideas to deliberate on.

Shall look forward to meeting you all at ICTDsC—2024!

Dr. Sanku Bose  
Group CEO  
Techno India Group

## Message from the Patron

On behalf of the Techno India group and Siliguri Institute of Technology let me take this opportunity to welcome you all at the two days international conference International Conference on Data Science and Communication, ICTDsC 2023 with its first edition, organized by Siliguri Institute of Technology partnering with Springer, Computer Society of India, Indian Society for technical education and Institution of Engineers. Siliguri Institute of Technology always encourages research and development of its faculty and students to achieve its vision. I am very much thankful to our honorable Managing Director Sri Satyam Roychowdhury Sir, Respected Group CEO Dr. Sanku Bose for the constant support and encouragement to take things forward in the aspect of overall growth of the Institute.

I must congratulate the Department of Electronics & Communication and Department of Science Engineering & Humanities for their initiative to jointly organize this conference which is the need of the days and providing the platform to researchers, faculty and student fraternity across the globe to discuss and share ideas and thoughts on the recent technological trends and support the societal challenges. I hope the stake holders must utilize this opportunity to present their frontier ideas to the famous and reputed academicians and experts of the conference and build a solid base to support the cause of future societal needs.

Once again I convey my heartfelt thanks to the organizers, Publication houses, Conference Chief Guest, keynote Speakers, Session chairs, authors, reviewers, advisors and all the participants and wish all the best to make ICTDsC a grand success.



Dr. Mithun Chakraborty,  
Principal, Siliguri Institute of Technology and Patron, ICTDsC 2023

## Message from the General Chair

ICTDsC-2023 is designed to bring together the academics and other professionals' experts to discuss cutting-edge developments in respective fields. The aim and objective of the international conference ICTDsC-2023 is to invite all from the academia and the industry under one umbrella to provide a fantastic opportunity for researchers, delegates, and academics to share with one another and exchange their technology, application, experience and expertise. We would like to express our warm welcome to all the attendees whose contributions and enthusiastic participation are essential for creating stimulating environment at the conference. I would like to take this opportunity to thank the Conveners and the members of the organizing committee who did an excellent job of putting this conference together. I am also indebted to our reviewers who reviewed the manuscripts, sometimes under extreme time constraints, and selected the best papers that befit this conference.

We hope that you will find the conference productive, informative, and enjoyable. We are deeply indebted to the esteemed reviewers who despite their busy schedule extended their support and expertise in reviewing research papers for maintaining high quality of this conference. We express our deep gratitude to the members of Advisory committee and

Technical program committee for their constant advice and support. We are grateful to the authors, keynote and invited speakers and others who have helped for making the publication possible. As a conference Chair, I acknowledge with due respect the wise advice and brilliant suggestions of the members of Advisory Committee and the Technical Committee in planning and organizing the Conference. I must admit that the success of the Conference depends on the participants for their gracious presence and contributions; reviewers for their kind cooperation in reviewing papers and the members of the local organizing committee who have put in a lot of hard labour.



Thanks & regards,  
Prof. (Dr.) Sudipta Chattapadhyaya  
General Chair

## Message from the General Chair

"Technology is a gift of God. After the gift of life, it is perhaps the greatest of God's gifts. It is the mother of civilizations, of arts and of sciences"

- Freeman Dyson

It gives me immense pleasure, honour and privilege to welcome all academicians, researchers, and corporates as General Chair to the INTERNATIONAL CONFERENCE ON DATA SCIENCE AND COMMUNICATION – 2023. The objective of the program is designed to bring together academics and other professional experts to discuss cutting-edge developments in respective fields. The venue of the conference is Siliguri Institute of Technology which lies in the foothills of the Himalayas, surrounded by the lush green tea garden which gives the most comfortable and enjoyable experience to all attendees. The history of the college dates back to 1999 and is at its threshold of completing 25 years of academic excellence. Throughout this year the college has been able to organize multiple seminars and webinars giving opportunity for the young mind to get exposure to next-generation technology. Total papers received: 176, total accepted paper: 60. Tracks: data science and data analytics, computational intelligence, network security & telecommunication, pattern recognition, information retrieval. The ICTDsC-2023 is adorned by eminent personalities recognized globally. The participants and keynote speakers hail from different nationalities and hence giving the conference a diversified outlook and proving that technology fills in the gap irrespective of their country of origin. On behalf of the organizing committee, I lay out my utmost gratitude to the management, all the working committee, and reviewers for making this event a success. The time given and the trust shown have helped organize the conference. The platform that has been set today will help develop, create, and add to the new technology which will help humans at large. I pray and hope that all members will have a pleasant stay.



Thanks and regards,  
Dr. Debashis De  
General Chair

## *Preface*

International Conference on Data Science and Communication (ICTDsC- 2023) is being organized by Siliguri Institute of Technology, Siliguri, West Bengal, India.

The conference aims at providing a platform to bring together the academicians and the researchers working in the areas of Computer Science, Communication, and Information Technology. This volume of abstract proceedings is a record of the accepted papers for this conference.

We received an overwhelming response to participate the conference from all over the country and abroad such as Australia, Tanzania, Georgia, Bangladesh, Czech Republic and Iran.

We have received nearly 200 research papers from diverse reputed organizations. After thoroughly reviewed by the eminent reviewers and experts 65 papers were finally accepted for oral presentation in these two days conference.

We are deeply indebted to the esteemed reviewers who despite their busy schedule extended their support and expertise in reviewing research papers for maintaining high quality of this conference. We express our deep gratitude to the members of Advisory committee and technical program committee for their constant advice and support. We are grateful to the authors, keynote and invited speakers and others who have helped for making the publication possible.

We sincerely acknowledge the constant inspiration received from our respected Managing Director Techno India Group, Mr. Satyam Roychowdhury; Group CEO, Dr. Sanku Bose; Principal Siliguri Institute of Technology, Dr. Mithun Chakraborty; and Administrator Siliguri Institute of Technology, Mr. Joydeep Guha.

The relentless effort taken by the members of the organizing committee is the key to make this event successful. The efforts given by all student members who were instrumental in running the event smoothly are also being acknowledged.

We believe that the paper presentation and consequent discussions among the academicians and researchers during the conference will create a deep impact on future research.



Dr. Debajyoti Misra  
Dr. Debasmriti Bhattacharjee  
Organizing Chair and Conveners, ICTDsC 2023  
Siliguri Institute of Technology  
West Bengal, India



## PROGRAM SCHEDULE OF ICTDSC 2023 ON 23<sup>RD</sup> MARCH 2023

| TIME (IST)          | DESCRIPTION   | LOCATION  |
|---------------------|---|---|
| 9.00 AM – 10.00 AM  | <b>REGISTRATION</b>   | Ground Floor,<br>Centre Circle Main Building  |
| 10.00 AM – 10.45 AM | <b>INAUGURAL SESSION</b><br>Welcome Speech by Organizing Chair,<br>Lighting the lamp,<br>Welcome Song,<br>Patron Speech,<br>Chief Guest Speech,<br>Speech of other Distinguished Personalities. | J C Bose Seminar Hall<br><br>Joining Link:<br><a href="https://meet.google.com/rqe-gkbw-ota">https://meet.google.com/rqe-gkbw-ota</a> |
| 10.45AM – 11.00AM   | <b>TEA BREAK</b>  |   |
| 11.00AM – 11.30 AM  | <b>KEY NOTE I</b><br>Prof. Jyotsna Kumar Mondal<br><i>Vice Chancellor, Raiganj University</i>   |   |
| 11.30 AM –12.00 PM  | <b>KEY NOTE II</b><br>Prof. Debashis De<br><i>Maulana Abul Kalam Azad<br/>University of Technology</i>  |   |
| 12.00 PM- 12.30 PM  | <b>KEY NOTE III</b><br>Prof. Anghusuman Sarkar<br><i>Kalyani Govt. Engineering College</i>  | J C Bose Seminar Hall<br><br>Joining Link:<br><a href="https://meet.google.com/rqe-gkbw-ota">https://meet.google.com/rqe-gkbw-ota</a> |
| 12.30 PM - 01.00 PM | <b>KEY NOTE IV</b><br>Prof Bharat Bhusan<br><i>Sharda University</i>  |   |
| 1.00 PM – 1.30 PM   | <b>KEYNOTE V</b><br>Prof. C. Y. Desmond<br><i>Sim Feng Chia University, Taichung, Taiwan</i>  |   |

|                   |   |   |
|-------------------|---|---|
| 1.30 PM – 2.30 PM | <b>LUNCH BREAK</b>  |   |
| 2.30 PM – 4.30 PM | <b>SESSION 1 (OFFLINE)</b><br>Information Retrieval /IOT<br><i>Paper Id: 8, 92, 100, 194, 197, 205, 227 and 255</i>               | T & P Cell (Physical)   |
|                   | <b>SESSION 2 (OFFLINE)</b><br>Network Security & Telecommunication<br><i>Paper Id: 98, 108, 141, 145, 155, 249, 264 and 265</i>   | ECE Seminar Hall (Physical)   |
|                   | <b>SESSION 3 (ONLINE)</b><br>Network Security and Tele Communication<br><i>Paper Id: 89, 109, 123, 131, 139, 204, 229 and 263</i> | EE Seminar Hall (Online)<br><br>Joining link:<br><a href="https://meet.google.com/evn-nmvj-eyy">https://meet.google.com/evn-nmvj-eyy</a>  |
|                   | <b>SESSION 4 (ONLINE)</b><br>Data Science and Data Analytics<br><i>Paper Id: 140, 158, 174, 177, 206, 232, 235 and 251</i>        | CSE Seminar Hall (Online)<br><br>Joining link:<br><a href="https://meet.google.com/zed-kcbj-czk">https://meet.google.com/zed-kcbj-czk</a> |
| 4.30 PM – 5.00 PM | <b>KEYNOTE VI</b><br>Prof. J. M. R da Silva Tavares<br><i>University of Porto, Portugal</i>                                       | (Online)<br>Joining Link:<br><a href="https://meet.google.com/rqe-gkbw-ota">https://meet.google.com/rqe-gkbw-ota</a>                      |
| 5.00 PM – 5.30 PM | <b>TEA BREAK</b>  | Ground Floor  |
| 05.30- 06.30 PM   | <b>CULTURAL PROGRAM &amp; HIGH TEA</b>  | Centre Circle   |

## PROGRAM SCHEDULE OF ICTDSC 2023 ON 24TH MARCH 2023

| TIME                | DESCRIPTION  | LOCATION  |
|---------------------|--|---|
| 09.30 AM-10.00 AM   | <b>KEYNOTE VII</b><br>Prof. Arun Majumder<br><i>The University of Texas California,<br/>United States</i>                  | <p>J C Bose Seminar Hall</p> <p>Joining Link:<br/><a href="https://meet.google.com/syr-tzcv-dyi">https://meet.google.com/syr-tzcv-dyi</a></p> |
| 10.00 PM – 10.30PM  | <b>KEYNOTE VIII</b><br>Prof. Nikhil Ranjan Das<br><i>Calcutta University</i>   |   |
| 10.30 AM – 11.00 AM | <b>TEA BREAK</b>   |   |
| 11.00 AM – 11.30 AM | <b>KEYNOTE IX</b><br>Prof. Maitreyee Nandy<br><i>Saha Institute of Nuclear Physics<br/>Kolkata</i>                         |   |
| 11:30 AM – 12.00 PM | <b>KEYNOTE X</b><br>Prof. Jyoti Sekhar Banerjee<br><i>Bengal Institute of Technology</i>                                   |   |
| 12.00 PM – 12.30 PM | <b>KEYNOTE XI</b><br>Prof. Celia Shahnaz<br><i>Bangladesh University of Engineering and<br/>Technology<br/>Bangladesh</i>  |   |
| 12.30PM – 01.00 PM  | <b>KEYNOTE XII</b><br>Prof. S. A. Fattah<br><i>Bangladesh University of Engineering and<br/>Technology,<br/>Bangladesh</i> |   |
| 01:00 PM – 01.30 PM | <b>KEYNOTE XIII</b><br>Prof Lalit Garg<br><i>University of Malta, Msida</i>  |   |

|                       |  |   |
|-----------------------|--|---|
| 01.30 Noon – 02.30 PM | <b>LUNCH BREAK</b>   |   |
|                       | <b>SESSION 5</b><br>Computational Intelligence and Pattern Recognition<br><i>Paper Id: 97, 119, 156 and 271</i>                                      | ECE Seminar Hall (Physical)   |
|                       | <b>SESSION 6</b><br>Data Science and Data Analytics<br><i>Paper ID: 133, 136, 153, 149 and 201</i>   | T & P Hall (Physical)   |
|                       | <b>SESSION 7 (ONLINE)</b><br>Computational Intelligence/ Pattern Recognition<br><i>Paper Id: 107, 110, 159, 162, 166, 186,191, 228, 257 and 272</i>  | EE Seminar Hall<br>Joining Link:<br><a href="https://meet.google.com/qpn-rgra-fhb">https://meet.google.com/qpn-rgra-fhb</a>         |
|                       | <b>SESSION 8 (ONLINE)</b><br>Computational Intelligence/IOT/ Information Retrieval<br><i>Paper Id : 95, 96, 121, 147, 169, 188, 193, 208 and 262</i> | Host: CSE Seminar Hall (Online)<br>link:<br><a href="https://meet.google.com/gfz-mgkw-zfa">https://meet.google.com/gfz-mgkw-zfa</a> |
|                       | <b>SESSION 9 (ONLINE)</b><br>Book of Abstract<br><i>Paper Id : 183, 196, 221, 237, 260, 273 and 274</i>  | Online<br><a href="https://meet.google.com/byi-tyns-amu">https://meet.google.com/byi-tyns-amu</a>                                   |
| 02.30 PM – 4.30 PM    |  |   |
| 04.30 Noon Onwards    | Best Paper awards,<br>Valedictory Session  | J C Bose Seminar Hall<br>Joining Link:<br><a href="https://meet.google.com/syr-tzcv-dyi">https://meet.google.com/syr-tzcv-dyi</a>   |

## Section -1A: INFORMATION RETRIEVAL

**ID 194**

### **Arduino Uno driven toxic gas monitoring and alert system within Sewage**

Sabyasachi Mukhopadhyay, Saloni Dora, Sakshi Rai, Mohit Sahni

Abstract— Air quality degradation due to the release of toxic gases in the drainage system and sewage areas or septic tanks has led to the number of accidents increasing day by day. The manual scavengers risk their lives every day and die due to infections and diseases like fibrosis, lung cancer, typhoid, hepatitis, asthma, etc. caused by more prolonged exposure to hazardous gases. Gases like hydrogen Sulphide( $H_2S$ ), Carbon Monoxide (CO), Methane ( $CH_4$ ), Ammonia ( $NH_3$ ), Sulphur Dioxide ( $SO_2$ ), etc. are released through the toxic waste produced due to the natural decomposition of the organic and inorganic wastes. These gases also lead to adverse effects on the central nervous system and immunity system. Some gases like hydrogen sulphide and methane are highly flammable and higher concentration of these gases can be explosive. Higher concentration of Carbon Monoxide in human body results in fatigue, headache, dizziness and sometimes led to suffocation. Therefore, monitoring of the released toxic gases is important in such vulnerable areas for safeguarding the lives of workers. In this work, efforts have been made to design a system which can monitor toxic gasses released in the sewage and can also give alert signal if the quantity of any such gases is found to be greater than the hazard limit.

**ID 96**

### **Compensation Effect in the Turbulent Collision Magnetized Plasma**

Giorgi Jandieri, Banmali Rawat, Nika Tugushi

Abstract: The oblique incidence of a small amplitude electromagnetic wave on a plane layer of the turbulent collision magnetized plasma is considered. Second-order statistical moments of the spatial (angular) power spectrum of scattered electromagnetic waves are derived in the geometrical optics approximation. It was found that in a certain direction, two asymmetric factors of the problem (oblique incidence and plasma anisotropy) compensated each other. In this case, the angular spectrum of scattered waves neither broadens nor reaches its maximum. The evaluation of this spectrum is analyzed numerically by increasing the thickness of a plasma layer, confirming the results obtained in the geometrical optics approximation.

**ID 8**

## **Portable Device Based Stress Level Estimation Using Biological Rhythms**

Imam Hossain , Md. Golam Rashed, Dipankar Das, Md. Julkarnain , Vaskar Deka

Abstract. Stress creates a major health-related issue in our society, because many health-related problems, such as a lot of economic losses, social disruptions, and human mental problems, are the consequences of it. In general, humans experience stress, especially those who are involved in work in developed capitalist countries and under huge mental workloads continuously and endless technological development. Stressors come across in our daily life (for instant, the difference of opinion among family members or hard work deadlines) may play a vital role in personal health and well-being. In this study, we introduce a model of health awareness system that incorporates two assessment strategies: questionnaire asking method and physical measurement method, to determine the stress level using the android application enabled portable device. The questionnaire asking method is useful for detecting psychological and behavioral scores of the stress level. These questionnaires were fixed based on the score of the subjective measure by surveying twenty (20) psychological questions related to the stressor. To estimate the stress level more precisely, we also used the measurement analysis method which includes the physical health-related fitness tests. The application has been developed using android studio IDE and smartphones. By identifying ongoing stress situations using the application, the users can modify physical or behavioral lifestyles to successfully avoid them. It is revealed that such an application can be applied effectively in research experiences and advances the research on stress level estimation.

**ID 153**

## **Maritime Surveillance Using Instance Segmentation Techniques**

Rabi Sharma<sup>1</sup>, Muhammad Saqib, and Michael Blumenstein

Abstract: A maritime surveillance system is vital in detecting objects threatening national security and violating the maritime border. Many small and non-cooperative objects, such as spyboats/refugees, take advantage of a dense marine environment to carry out illegal activities such as drug and human trafficking and being unnoticed. It broadly uses a combination of different sensor-based technologies, such as radar, visual sensors or cameras, etc., along with UAVs (drones) for aerial vision to accurately detect ships, but is unable to segment and obtain less detail information. However, the computer vision community lacks suitable datasets available publicly. To address the problem, we have constructed a new ship dataset, for instance segmentation task named ShipInsSeg, which contains more than 5k marine ship/boat images that were collected and labeled manually. In this paper, instance segmentation techniques using deep learning are explored to detect and segment boats/ships with clear and precise boundaries for our dataset. We have demonstrated real-time performance and accuracy in terms.

**ID 92**

## **A Comparative Study on Speech Emotion Recognition using Deep Learning**

Sasank Nath, Ashutosh Kumar Shahi , Tekwo Martin, Nupur Choudhury, Rupesh Mandal

**Abstract:** Emotions can be detected from a person's speech during communication. The expression of emotions through voice is an ongoing field of research. In this study SAVEE and IEMOCAP datasets were used with regards to the task of Speech Emotion Recognition. There are seven emotions in the SAVEE datasets and four out of eleven emotions in the IEMOCAP dataset which are considered. Features are extracted from the raw audio files namely ZCR, F0, MFCC and RMS, and mean of the features are taken. The study shows a comparative analysis on detecting various emotions on both the datasets. The models used are RNN, LSTM, Bi-LSTM, RF, Rotation Forest and Fuzzy. On the SAVEE dataset, the RF had the maximum accuracy of 76%, followed by Bi-LSTM with 72%. On the IEMOCAP dataset, RF achieves the maximum accuracy of 68% and 67% on the male and female samples, respectively, followed by Bi-LSTM, which achieves 64% and 63% on the male and female samples, respectively. The fuzzy model improved from an accuracy of 38% to 47%, and Rotation Forest deteriorated from an accuracy of 66% to 53% on SAVEE to IEMOCAP dataset. A diagnostic User Interface is designed to classify the human emotions using the trained models.

**ID 260**

## **Smart Dustbin Using Sensor Technology**

Dr. T.M. Usha, A. Ramadevi, A. Prameela, A. Likhitha, A. JayaLakshmi,  
B. Hemasri, A. Swetha, G. Himasree

**Abstract:** A "smart dust bin" is a trash receptacle that is equipped with sensors and other technologies to improve waste management. These bins may include sensors to detect when they are full, or to track how much waste has been deposited in them. They may also include wireless connectivity, allowing them to communicate with a central system to alert waste management personnel when they need to be emptied. Some smart dust bins may even be able to sort different types of waste, such as recyclables and non-recyclables, automatically. Overall, the goal of a smart dust bin is to improve the efficiency and effectiveness of waste management by providing real-time data and reducing the need for manual inspections.

**ID 139**

## **Classification of Alzheimer Disease using Feature Segmentation and 3D CNN**

Komal Singh and Ashish Khare

**Abstract:** Alzheimer Disease is a type of neurodegeneration that is irreversible and leads to memory loss, generally seen in older people. Several machine learning and imaging techniques have been proposed to identify such type of neuro-degeneration which uses structural MRI. In this study, we investigate a deep learning model for AD diagnosis by using morphological features, specifically, gray matter volume and Jacobian determinant of MRI to train the 3D convolutional neural network model. The focus of this study is to make a less complex and computationally efficient solution by training of 3D CNN using extracted image features. The experiments were carried on ADNI1 dataset. The obtained result shows the accuracy of 96% for AD classification. Moreover, the sensitivity of the proposed method reveals that the model is less error prone in normal conditions.

**ID 107**

## **Role of pre-processing in gene selection using DNA microarray gene expression data**

Tanusri Ghosh , Sriyankar Acharyya

**Abstract:** Precision medicine is a boon to the medical field recently for early disease detection, monitoring disease progression, and developing new drugs. To successfully deploy precision medicine, biomarker identification is the first step and DNA microarray technology acts as a powerful tool in recent decades. Using DNA microarray data, one can analyse tens of thousands of genes simultaneously, but it also has some limitations. The data is quite noisy and contains irrelevant genes. Furthermore, it has a dimension imbalance problem which affects the overall performance of the gene selection process or disease classification accuracy. This paper has emphasized on the role of pre-processing approach using some widely used statistical methods (Signal-to-Noise Ratio (SNR), Pearson-Correlation-Co-efficient (PCC), f-Score and Fisher Score) to overcome these drawbacks. To show the importance of pre-processing, here, there are two different approaches: gene selection without pre-processing and with pre-processing on two real life datasets such as Breast Cancer and Leukemia. Gene selection is viewed here as an optimization problem and the optimization is done using the proposed PSO-SVM (PSO along with SVM as a fitness function) gene selection model. It can be observed that the second approach (with preprocessing) gives better results as compared to the former. After comparing the performance of the pre-processing methods, based on gene selection (maximum accuracy was achieved by choosing minimum genes) it can be inferred that SNR and Fisher score are competitive, and better than others.



**ID 169**

## **Application for Simulating OWASP Vulnerabilities**

P. Raghu Vams, Vivek Dwivedi, Aamir Ahmad

**Abstract:** This paper aims to pave the way for new learners to enter the realm of cyber security and web application penetration testing by providing them with a platform where they may practise new challenges and security breaches in the existing cyberspace in practical ways. The challenges we built are based on the Open Web Application Security Project's (OWASP) top 10 breaches of 2021, which were meticulously crafted to imitate real-world problems. The proposed application consists of several web pages which contain potential breach doors designed in such a way that they depict the real world website with a similar breach which may cause a financial or data loss to the website owner. We have designed and hosted these web pages in such a way that learning about these vulnerabilities seems to be like a competition. Furthermore, we have also introduced a ranking system, hosted the pages with proper scoring, and made the learning similar to Catch The Flag (CTF). So users learn and compete at the same time.

**ID 205**

## **Automated classification of Happy and Sad emotional states from PPG signal using time domain analysis**

Avishek Paul, Nantu Das, Saurabh Pal, Madhuchhanda Mitra

**Abstract:** Automated emotion detection and analysis has become one of the most important domains in recent years because of its applicability in health care, education, entertainment industry, robotics and marketing sectors. Emotion recognition gives an accurate estimation of the mental condition of a person and indicates the inherent activity or thinking state of the mind. In the field of emotion recognition, artificial intelligence based analysis has become an essential part of research along with the domains of medical science, cognitive science, computer science and neuro-science. Emotion of any person can be judged from the gesture, face recognition and body movements. But these are not conclusive enough because of the ability of a person to suppress these responses at will. The present paper present a computationally simple approach to estimate and classify the emotional states of happy and sad based on a single feature calculated from a single lead PPG signal available in DEAP dataset. Classification is carried out using a binary classification rule and does not require any complex classifier. Results show the justification of the proposed feature and the validity of the approach. The present method may be applied in real time systems for detection of sadness or mental state of any individual owing to its simplicity in operation and implementation.

ID 228

## Vehicle Detection in Aerial Images: A Survey

Digvijay Kumar, Dr. Bharti Sinha

**Abstract:** In a variety of computer vision-based applications, one of the most crucial jobs is the recognition of vehicles from unmanned aerial vehicle (UAV) imagery. High accuracy and speed were required to do this critical assignment. Aerial image properties and the technology being utilized, such as diverse automobile sizes and their orientations, densities, small datasets, and inference speed, make this a highly difficult assignment. Numerous approaches based on hand-crafted feature design and deep learning have been put out in the literature as solutions to these issues in recent years. Techniques based on hand-crafted features and shallow learning have limited applicability to other complicated scenarios. On the other hand, Due to deep learning's robust learning capability, vehicle detection algorithms produced superior outcomes. In this article, we reviewed the hand-crafted feature design-based and data-driven vehicle detection algorithms from UAV imagery. We start by presenting various hand-crafted design-based vehicle detection algorithms like Histogram of oriented gradients (HOG), Scale Invariant Feature Transform (SIFT), and Local Binary Pattern (LBP). After that, we reviewed one-stage and two-stage vehicle detection series based on deep learning. One-stage includes state-of-art algorithms like YOLO and SSD, and the two-stage series includes object detection models like R-CNN, Fast R-CNN, Faster-RCNN, etc. We also focused on investigating the various public aerial image datasets and their related work. In the end, we have also shed some insight into the conclusion of this paper.

ID 177

## A Comparative Study of Disease Detection in Potato Plants Using Machine Learning and Deep Learning Method

Amisha Gouda, Gautam Patnaik, Madhusmita Sahoo, Harshita Pattanaik, Mamatarani Das

**Abstract:** For the sustainability of human life, potato crop agriculture development is crucial. Potato plant disease, despite the hoopla, does substantial damage to potatoes. Early blight, late blight, and other diseases can spread in potato plants and display symptoms on leaves. If these epidemics are recognized early and preventative measures are followed, the cultivators will not suffer significant financial losses. During the comparison analysis paper, the intended model was able to accurately determine and detect diseases in potato leaf stands using CNN which includes ResNet algorithm and U-net model which comes under deep learning methods. We tried both machine learning (SVM) and deep learning model (ResNet, U-net). We found best result from ResNet algorithm over other models with an accuracy of 99.6%

**ID 197**

## **Design and Development of IoT-Based Smart Health Monitoring System for Greenhouse Cultivation**

Tapan Maity, Ayush Roy, Oisik Das, Rakshat Kashyap, Sourav Das, Raj Kumar Maity, Dr. Jagannath Samanta

**Abstract:** Greenhouse farming is a concept that claims to provide a substantial amount of assets for a specific period of time which helps to improve the yields of fruits, vegetables, crops, etc. Combination of smart farming and Internet of Things (IoT) will reduce the waste, improve the efficiency, and make better use of resources such as water, fertilizer, light, gas, and pesticides in Agriculture. This plan intelligently monitors and controls the environment, by eliminating the need for manual intervention. To enhance the continuous monitoring and quality of greenhouse cultivation the proposed work has been employed the advantages of IoT. The main concept is to record all the required parameters from the agricultural sector from the required sensors. These agricultural sensors parameters are soil moisture, temperature, relative humidity, light, sound, and image. In greenhouse cultivation sensing methods are very useful to provide the information for plant growth and health indicators. This work helps to integrate many sensors connected to microcomputers rather than microcontrollers. It can be done better and faster with the help of the Raspberry Pi microcomputer, which helps in real-time monitoring via sensors. The Raspberry Pi enables faster and more secure communication between cloud services and end users.

**ID 100**

## **Early Detection of Urban Flood Using ML and IoT**

Priyanka Chettri, Alby Tomy, Rupesh Mandal, Nupur Choudhury

**Abstract:** With rapid urbanization, urban areas have become more densely populated, leading to flooding during periods of heavy rainfall. India receives heavy rain, and many cities in India suffer from flooding every year because the water gets trapped in the cities without an outlet to flow because of waste accumulation and blockages in the drainage system, causing the city to shut down. Using IoT and machine learning, we present a truly connected flood alert and prediction system that would give early flood predictions and provide real-time updates to the public during floods. Additionally, we monitor the highly susceptible area using UAVs before floods occur to detect blockages in the pictures and provide early information to the authorities to resolve the garbage accumulation problems.

**ID 95**

## **Authentication Framework for an IoT Ecosystem**

Chilla Jagadeesh Ram and S. Sathyadevan

**Abstract.** The rapid development of the Internet of Things (IoT) in different industrial sectors and Medical filed. The growth of these devices also raises security issues in IoT devices. The problems are in terms of device authentication and static key storage. We can't implement any protocol directly in the IoT devices because of constrained devices and low computational power, which is a challenging task. We proposed the authentication framework based on Shamir Secret key sharing. We implemented this authentication between Gateway and Edge node. This scheme avoids static key storage. We implemented this scheme on ESP32 as edge node and Orange Pi and Calculated Gateway power and current consumption, showing that our scheme impacts the device minimally. Further, we analyzed the security analysis using the AVISPA tool and our proposed protocol resistant to Man in the Middle attack (MITM), Cloning attack, and Replay attacks; also, we conducted a comparative analysis and also security protocols with existing protocols, which proved that my proposed scheme highly secure and lightweight which is feasible for all IoT environments.

**ID 183**

## **Image Captioning: Generating Textual Description using Modified Beam Search and Transformer Model**

Bagesh Kumar, Saransh Gupta, Shubham Panda, Pratiksh Kumar, Chandan Kumar, O.P. Vyas

**Abstract.** The fundamental problem that connects both computer vision and natural language processing is the generation of textual description of an image by describing it in words. There can be several entities like orientation, appearance, position as well as complex spatial interactions within a single image, thus leading to the possibility of multiple captions. Recurrent Neural Networks are popularly used for language modeling in natural language processing but the problem is their sequential nature. This problem is solved by the transformer model which uses an attention mechanism. There is another search strategy called Diverse M-Best which uses M beam searches (where M denotes the number of independent and diverse beam searches) from different starting statements and only keeps the best output from each of the beam search, removing the rest B-1 captions. Running Beam Search M times is computationally very expensive. With the above stated works in vision, we have devised and implemented two novel algorithms, Modified Beam Search(MBS) and Transformer Model, for generation of diverse and better captions and compared their results with beam search. The results have been obtained using Flickr8k, MS-COCO and Flickr30k datasets. Using Modified Beam Search, we have obtained improvement of 1-3% on BLEU-3 and BLEU-4 scores for the top-2 predicted captions from original beam search captions.

ID 147

## IOT based Equinox Cooling Chamber using Bolt IOT Module and Machine Learning

Om Prakash Suthar , Shilpa Singhal , Yuvraj Khatri

Abstract: Most pharmaceutical businesses use a digital cooling chamber, similar to a refrigerator, to preserve the tablets and maintain the temperature. Some companies use more advanced cooling chamber, but it's rare and expensive, and it doesn't have a way to check if the tablets are got damaged. We plan to improve the chamber by incorporating machine learning and IoT-based concepts, as we all know, these days everything is moving online, so why shouldn't the cooling chamber have a feature that monitors the quality of the tablet by determining whether or not the temperature in the cooling chamber is within the threshold temperature? If so, this will be a highly developed chamber that will aid businesses in reducing the financial loss they incur as a result of the medicines' spoilage. We have designed an equinox cooling chamber that will make monitoring simpler by sounding an alarm if the temperature inside the chamber ever drops below the lowest or rises above the maximum set points. A controlled environment indicates a product's safety and optimal storage temperature. Temperature variations affect delicate products. Due to the nature of commodities, inappropriate temperatures demand close monitoring. Pharmaceutical makers and distributors must follow regulations. A controlled environment indicates a product's safety and optimal storage temperature. Due to the nature of commodities, inappropriate temperatures demand close monitoring. Our equinox cooling chamber will ease monitoring by alerting us if the temperature is out of range.

## Section -1B: Pattern Recognition

ID 251

### Water Body Extraction From Aerial Image Using Clustering Based On Scdae Approach

S. Rajeswari, Dr.P. Rathika

Abstract: Extraction of water bodies from aerial image is essential in a variety of disciplines, including lake coastal zone management, monitoring of erosion and coastal change, flood prediction, and resource evaluation. In this paper, a novel Machine learning technique called Clustering based SCDAE method has been proposed, which is used to the extract the water bodies in the input aerial images. The aerial images are given as input to the Preprocessing stage where pre-processing is done by using Scalable Range Adaptive Bilateral Filter (SCRAB) and CLAHE filter. SCRAB filter is used to reduce the noise from the input aerial images. Then, the CLAHE technique used to enhance the various changes in the images. The Stacked Convolutional Denoising Auto-Encoder (SCDAE) is used to extract the features form the aerial images. Finally, Fuzzy K-means clustering is used to segment the water bodies in the images. The performance of the proposed method has been evaluated in terms of specific parameters such as accuracy, precision, recall, specificity and F1-score and the proposed method shows better results than existing techniques. The proposed Clustering based SCDAE method achieves overall accuracy of 98.54% and the existing methods such as SVM, C Means clustering, Decision tree and RFA achieves 92.45%, 93.56%, 91.37% and 94.38% respectively.

ID 191

### Improved Fractal Features For Texture Analysis

S.Vidivelli, S.Sathiya devi

Abstract: A In image processing and texture image analysis, fractal geometry plays an significant role. An essential component that gauges the degree of roughness at various scales is called fractal dimension (FD). For the computation of FD for grey scale images, differential box counting is used. This study discusses the DBC technique's shortcomings in terms of box overcounting and undercounting, and it suggests a new approach to fix the issues with greater accuracy. Using simulated images, Brodatz texture images, and medical images from the Mini-MIAS database, the suggested method is compared with DBC and Improved DBC techniques and produces good results with minimal computing error.

**ID 272**

## **A survey on the Application of Encryption Techniques on COVID-19 Images**

Sujata Ghatak, Snehashish Bhattacharjee, Debasmriti Bhattacharjee, Debajyoti Misra

**Abstract:** The security requirements for radiological images, which are now transferred across numerous networks, are very high. During this COVID-19 days, clinicians are solely dependent on these radiological images. Transmission of these medical records is becoming more common due to an increase in patients, and keeping them confidential, along with availability and integrity, emerges as one of the most crucial security considerations. Numerous algorithms are employed to safeguard data against unauthorized access since picture data has a variety of properties. This paper focuses primarily on the specific cryptographic methods utilized for the picture encryption and decryption of the COVID-19 medical image data within the field of information security. In addition, a comparative survey is carried out among the parameters used to measure security of the existing literatures.

**ID 257**

## **A Framework for Biometric Authentication based on Decision Level Fusion**

Suvarna Josh

**Abstract:** Unimodal system are still facing challenges in authentication though there are considerable advances in recent years. Some of the challenges can be handled by designing a multimodal biometric system. A decision fusion framework for selected biometrics has been proposed and developed. The basic idea here is to fuse the decisions obtained from the individual matchers for face, iris, and fingerprint and signature. Each biometric decision was evaluated using hamming classifiers. The individual decisions from the all modalities were further combined with straightforward the AND logic rule to obtain the final decision. Proposed methodology employs AND logic for a satisfactory level of security. Person is authenticated as a genuine if and only if all biometrics modalities result into positive authentication. An evaluation of decision fusion method based on AND rule based approach has been presented in this work. To evaluate the performance of the proposed system, we have performed combination of casia database, FVC2004 database with signature databases as ucoer, Caltech database and face databases as ORL, Yale, IIT Female database. The experimental results indicate that the decision level fusion outperforms unimodal biometrics system in terms of different error rates and GAR. We have reported better results as FAR=0% with FRR=0.0110% with GAR=99.89%. Experimental results proves that proposed fusion algorithm excels in performance than other decision approaches in literature.

**ID 159**

## **Performance Based Comparative Analysis of Naive Bayes Variations For Text Classification**

Ali Abbas, Manish Jaiswal, Prajna Jha, Shreya Agarwa, Tanveer J. Siddiqui

**Abstract:** With the high consumption of digital data, the problem of unorganized textual data created major challenges in today's scenario. To overcome this issue of unorganized textual information we perform document classification which is divided into four major phases i.e., pre-processing, feature selection, model training, and model testing. In this paper, we have selected four types of feature vectors, three with weighting techniques and one without weighting. Performance has been tested on these four feature vectors with five variances of naïve bayes classifiers out of which two were not able to perform training due to the sparseness in the dataset and the rest three performed well. In the reported result of the experiment, F1-macro score and the accuracy of Complement Naïve Bayes using term frequency weighting scheme is 0.807901362 and 0.821163038 which outperform all the other feature sets with all the variance of naïve bayes classifiers. In terms of time consumption for training and testing again, the performance of Complement Naïve Bayes using term frequency weighting scheme found best.

**ID 119**

## **A Comprehensive Analysis of Watershed Image Segmentation Based On Various Edge Detection Approach**

Jayashree Singha, Dr. Tapan Chowdhury

**Abstract:** Edge detection is a critical problem in computer vision and image processing. The issue with picture segmentation has been quite concerning for the researchers. A spike in intensity from one pixel to the next can significantly alter the picture quality and image segmentation since edges in digital images are places with substantial intensity contrasts. The objective of image segmentation is to divide an image into useful parts with respect to a certain application. There are many edge detection operators available for digital picture object boundary extraction and image segmentation. Each operator is designed to have a particular type of edges sensitivity. Entropy, which is the main concerting operator, is among them, along with Sobel, Roberts, Prewitt, Laplacian of Gaussian (LoG), and Canny. In this study, the peak signal to noise ratio (PSNR), mean square ratio (MSE), and execution times are also explored along with entropy, a statistical measure of unpredictability that may be utilized to define the texture of the input picture. The goal of the current study is to evaluate the performance of several edge detection operators and compare their results. This is done for a picture using the PYTHON programming language. A thorough study of numerous edge detection methods, including Sobel, Prewitt, Roberts, LoG, and Canny, is conducted in this work. Experimental findings show that the clever edge detector performs better than others.



## Section -1C: Computational Intelligence

ID 97

### Upper bounds of worldwide infected cases due to COVID-19 from the perspective of bitopology

Santanu Acharjee

Abstract: The outbreak of coronavirus disease (COVID-19) is now the concern of worldwide public health emergency. Epidemic modelling is found to be the most useful tool in case of any epidemic. Most of the epidemic models use generalizations of classical SIR (susceptibility-infection-recovery) model or time series models to determine factors like infection rate, recovery rate, etc. In most of the cases, predictions are found to be approximately correct. Psychology says that people behave with risk-taking strategy in mortality frame. Thus, this chapter contributes the methodologies to find the upper bounds for worldwide newly reported COVID-19 infected cases with the help of bitopological ideas. The data of WHO on infected cases of COVID-19 are considered to prove the theoretical claims of this paper in terms of real scenarios of COVID-19.

ID 131

### Design of Ultra Low Power Operational Amplifier for Biomedical Circuits

Mariam Jabali Laskar, Manali Bhupendra Barsagade, Vikash Prasad, Debaprasad Das

Abstract: This paper presents, an ultra low power operational amplifier designed using 180nm CMOS technology for analog front ends of biomedical devices. The low power is achieved by operating the transistors in the subthreshold region. The designed opamp operates at 0.8 V single power supply voltage with a maximum power consumption of 23.47 nW and provides a DC gain of about 64.63 dB along with a unity gain bandwidth up to about 14.61 kHz. The layout of the proposed opamp design is also measured which is  $0.7\mu\text{m}^2$ . The obtained results of the proposed design are compared with the previous design and our design shows significant improvement in the performance parameters.

**ID 156**

## **Symbiosis of predator-prey: harvest of predators concomitant to negative repercussions of immatures' predation**

Tapasvini Roy, Debasish Bhattacharjee

Abstract: Owing to the importance of predators in an ecosystem because of their dominion over various aspects of it, the dynamics of a mathematical model with the predator species structured into two stages in tandem with predators' harvesting is analyzed. Synchronically, the mortal peril of immature predators whilst hunting of dangerous prey too is envisioned. For understanding the dynamics of thus envisioned scenario, various stability and bifurcation analysis are executed through both analytical and graphical modus operandi. Through numerical simulation, low harvesting rate is illustrated to cause transient oscillation before the extinction of both the species, in addition to various other dynamical scenarios.

**ID 186**

## **An Enhancement in Accuracy for Breast Cancer Prediction Using Machine Learning And Deep Learning Model**

Subham Panda, Bagesh Kumar, Chandan Kumar, Vaidik Sharma,  
Akash Bhardwaj, Shubhendra Gautam, Vishal Kumar, O.P. Vyas

Abstract. As we are all aware, the population is growing rapidly in this modern period, placing a demand on the healthcare system to identify illnesses in the populace. This creates a major issue for eradicating large scale chronic diseases. Breast cancer is one of them. After lung cancer, breast cancer is listed as one of the most widespread cancers. A efficient, and fast response are provided by an automated illness detection system using different machine learning models, which also lowers the chance of fatalities while helping medical professionals in disease identification. Here, we have compared six machine learning approaches named KNN(K-nearest neighbors),SVM(support vector machine ),ANNs( artificial neural networks) ,RF( random forests),PALH( Parallel Adaptive local hyperplane) and LR(logistic regression). The overall performance is evaluated with reference to precision, accuracy, specificity, sensitivity, negative predictive value, false-positivity rate, false-negativity rate, Matthews Correlation Coefficient and F1 score. The results reveal that the Parallel Adaptive local hyperplane(PALH) obtained the highest score in accuracy, specificity, precision, and F1 score of 98.68%, 96.34%,99.10%, and 0.9919, respectively, whereas 98.57 %,96%, 97.82%, and 0.9890 accuracy, specificity, precision, and F1 score are obtained by ANN, respectively. We have tested the algorithms on Breast Cancer Wisconsin (Original) Data Set. The PALH has advantages over deep learning models (ANN) like it requires less computational power, is easily optimizable, easy to interpret and deploy. Thus, PALH has overcome the limitations of ANN while achieving a better accuracy, precision and F1 score.

**ID 166**

## **A study on the dynamical behaviour of a two predator one prey model incorporating a non-infectious disease in prey**

Dipam Das, Debasish Bhattacharjee

Abstract: A mathematical model of two predators hunting on a single type of prey is constructed in this study. We also include the fact that the two predator species fight for food and shelter both within and between species. Prey confronts biomass loss in predator-prey interactions, which is well documented in literature, but predators also face risks of contracting an infection from prey, which is less well investigated. We have thus taken this into consideration in this paper. The two predators' predation functions are assumed to be the same and follow the Holling Type-I functional response. All ecologically possible equilibrium points are found analytically and numerically. Stability and bifurcation analyses are performed thereafter. Numerical simulations are carried out to demonstrate and validate the analytical conclusions.

**ID 227**

## **Pre-heating Characterization of Semiconductor Gas Sensors for Pollution Monitoring**

Dipanjan Bhattacharjee, Subhanjana Ghosh, Asmita Mukherjee, Nirzor Choudhury

Abstract: An inexpensive and effective solution of gas detection is a highly desirable and relevant aspect for monitoring atmospheric pollution. A pre-conditioned, cost-effective and responsive semiconductor gas sensor may help in the early detection of sensitive and hazardous gasses. This work presents the characterization and response analysis of semiconductor gas sensors. MQ and TGS sensor arrays based on Figaro and Winsen have been used for the analysis. The pre-heating sensor analysis and dynamic characterization have been done on the customized sensor arrays. A customized, real-time gas chamber has been developed to expose the sensors to isobutene gas for their characterization. ATMEGA-2560 microcontroller-based embedded platform has been developed to make an interface circuit between the sensor array and personal computer for data acquisition. Few mathematical tools have been used for data extraction from the sensor response. Experimental results show that the initial time and the initial standby response differ with different sensor selection resulting in significant changes in settling times and settling levels. Experimental results reveal that the sensor performance of preheated sensors is superior to the non-pre-heated ones. Correlation between pre-heated and non-pre-heated sensors has also been done. The hardware platform provides a flexible system to facilitate further research on semiconductor gas sensors.

**ID 110**

## **Automated Detection of Myocardial Infarction with Scalogram Technique and Deep Convolutional Neural Network**

Saurav Mandal, Pulak Mondal, Anisha Halder Roy

Abstract Electrocardiogram (ECG) is a transthoracic interpretation of the heart's electrical activity over time. It is used to diagnose myocardial infarction (MI), coronary artery disorders, and other heart disorders. MI results from coronary artery blockage due to the death of cardiac muscle tissue. The early stage of diagnosis and prompt treatment can save lives. This paper presents a MI detection model based on deep learning method using scalogram technique. The proposed method uses a scalogram to transform 1D ECG data into 2D scalogram images. Last layer of the proposed model uses pre-train DenseNet to classify six types of MI with 98.63% accuracy. The model developed in this paper is less complex because it doesn't need additional noise filtering and handcrafted feature extraction steps. According to the study, a portable device might be developed using chest leads to serve as an automated diagnosis tool.

**ID 193**

## **Gallant Ant Colony Optimized Machine Learning Framework (Gaco-Mlf) For Quality Of Service Enhancement In Internet Of Things-Based Public Cloud Networking**

J. Ramkumar, R. Vadivel, B. Narasimhan

Abstract: Load management is a crucial aspect of allocating resources inside a data center for use by the Internet of Things-based Public Cloud Networking (IoT-PCN). It's a significant pain in the IoT-PCN when queries become bogged down due to the complexity of internet computing. All virtual machines (VM) must have evenly distributed workloads for load balancing to be effective. Scheduling tasks is a huge step toward improving cloud computing's overall efficiency. Both are crucial to minimizing resource consumption and increasing service providers' output by speeding up the processing time. This research proposes a Gallant Ant Colony Optimized Machine Learning Framework (GACO-MLF) to balance the load in IoT-PCN that arises rapidly. Machine learning strategy is applied to identify the imbalanced load across IoT-PCN precisely. Ant Colony Optimization is enhanced to optimize and schedule the imbalanced loads across all data centers. GACO-MLF is evaluated using cloudsims simulator with standard performance metrics and the results indicate that GACO-MLF has superior performance than the current strategies.

ID 237

## Image Segmentation Techniques for Tomato Leaf Disease Detection

Ledbin Vini S, Dr. Rathika P, Dr. Manimala K

**Abstract**-An abnormal appearance in tomato leaf image as an influence of disease, may spread all over the plant depending upon the nature of disease. Each disease generates their own pattern of abnormal appearance on the leaf. On analyzing the pattern, the diseases can be easily recognized from one another. Image segmentation is the primary tool which helps to analyze the abnormal pattern by segmenting it from the surroundings. The usage of clustering algorithm under image segmentation helps to group the similar characteristics of pixel under one group. Due to its grouping nature, the abnormal pattern which is the indication of disease infection can be easily segmented from the healthy region. This paper considered three types of clustering techniques for the segmentation of disease signs, which is helpful in analyzing the healthy and non-healthy status of tomato leaf images. The clustering techniques includes k means clustering, fuzzy c means clustering and particle swarm optimization(pso) based k means clustering. The result section includes the visualization of segmented region along with the comparison of its performance measures for different techniques.

ID 273

## A bioinformatics approach in the search for potential phyto compound based efflux pump inhibitor against a mycobacterial efflux pump

Santasree Sarma Biswas

**Abstract:** In the modern day, the use of computers in biological sciences is a relatively new and extremely effective technique. This is primarily advantageous in terms of cost efficiency and time saving in medical research and development. The incidence of infections and deaths caused by multidrug-resistant tuberculosis MDR TB is increasing worldwide. The presence of numerous efflux pumps in the membrane of *Mycobacterium tuberculosis* is one of the key reasons for this. Inhibitors known as efflux pump inhibitors can be used to block these pumps. We have utilised a variety of computer servers and applications to identify inhibitors derived from plant components in order to design a potential efflux pump inhibitor. We have constructed the structure of an essential mycobacterial efflux pump using the MODELLER 9.24 programme. In addition, a number of plant chemicals were utilised in docking tests against the pump using the AutoDock Vina software. Several internet servers, including Molinspiration, pkCSM, and SwissADME, were used to conduct pharmacological similarity investigations on the possible compounds. Using softwares such as, ProTox II and AdmetSar2.0, the ADMET characteristics of the compounds were also investigated. On the basis of the aforementioned experiments, we have identified few phyto compounds with promising features for a potential efflux pump inhibitor.

ID 196

## Design and Performance Analysis of CMOS Ring Oscillator using 45nm Technology

Ruqaiya Khanam, Piyush Sisodia, Shaina Gangadharan

Abstract: While designing oscillator circuits, they primarily focus on stable steady state sinusoidal signal. In order to get the stable steady state sinusoidal signal, the existing oscillators have been working on the same phenomena. In this paper, we discussed various oscillators based on their working and performance like Crystal Oscillator, RC Oscillator, LC oscillators and Ring oscillator. Oscillators are used for all the electronic systems. Reliability is the main key factor of any oscillators circuit. In this proposed work, we discussed all the performance and challenges of all the existing oscillators, after studying all the oscillator circuits, we found Class-E oscillator is much better than other class of oscillator in terms of its phase noise parameter. We design 3,5 and 7-stage ring oscillator by using CMOS of 45nm channel length and using capacitive load of 1pF, we also obtain the result that is power, gain and oscillating frequency of different stages using Cadence virtuoso tool. We present experimental results at 10us. From area and frequency stability perspective CMOS ring Oscillators are more efficient than other oscillators in terms of power and gain.

ID 271

## On the Critical Behaviour of the N-SmA Phase Transition in an Induced System: An Exploration from High-Resolution Calorimetric and Optical Studies

Apsari Parvin, Malay Kumar Das

Abstract: In this work, a systematic high-resolution specific heat capacity and optical birefringence measurements were performed near the N-SmA phase transition for a series of binary mixtures of 4-n-pentyl 4'-cyanobiphenyl (5CB) and 4-n-pentyl phenyl 4-n'-hexyloxy benzoate (ME6O.5) mesogen which shows the presence of an induced smectic A phase where the pure compounds show only nematic phase. The heat capacity peaks in the vicinity of the N-SmA phase transition for all the studied binary mixtures could be well fitted below the N-SmA transition temperature using an extended Landau mean-field model. The fitted heat-capacity data show that the transition is first order over the entire range of composition and moves quite close to tricritical point when the nematic range is sufficiently increased. The latent heat decreases as the nematic range increases and for sufficiently large nematic range it reduces to zero, at the same time the heat capacity peak associated with that N-SmA phase transition literally disappears. Precision birefringence measurement also agrees well with the heat capacity data.

**ID 208**

## **Analysis of breakdown voltage and analogue properties for various innovative gate field plate structures of AlGaIn/GaN HEMT**

Pichingla Kharei, Achinta Baidya, Niladri Pratap Maity

Abstract: AlGaIn/GaN HEMT with different innovative structures of gate field plates have been designed to study and compare the analog and breakdown characteristics. Addition of field plates improves the breakdown voltage but raises the capacitance which degrades the device's frequency performance. TCAD simulator has been used to study different gate field plate structures for AlGaIn/GaN HEMTs. T-gate field plate structure acquires the highest breakdown voltage of 760 V.

**ID 262**

## **Design and Analysis Delay of FinFET and CMOS 6T SRAM Using 22nm Technology**

Shamim Imtiaz, Ruqaiya Khanam

Abstract: Now-a-days, in the digital technology era, SRAM (Static Random Access Memory) plays an important role to provide memory capacity for electronic devices. FinFET has claimed many challenges and problems related through the modifying of traditional CMOS transistor devices. Because of its many leading characteristic, particularly in the zone of low voltage, low power and higher speed for SRAM cell, in this way FinFETs are replacing CMOS (conventional) circuit as the superior choice. By the designing of Static RAM (SRAM) cell which is motivation to reduce delay and increase its performance. Hence, it is providing to be a favorable alternate to solve difficulties because of its undersized area in between source and drain region played in MOSFETs (conventional) semiconductor. In this paper, we have studied and obtained the performance of FinFET based 6T SRAM cell circuits applied and these FinFET cell's work functions are paralleled to CMOS (conventional) transistors by the way of propagation delay and operation sustained in Static RAM. In other ways, the estimation of traditional 6T SRAM cell crosstalk line voltage, values are retained for both bit lines wire (BLs), word line wire (WL) and outputs are analyzed according to the circuits. In this way by using right nanometer technology of the semiconductor transistor these values can be achieved and managed. In the industry, it is very important for the SRAM cell to have minimum propagation delay. Thus, the delay of proposed 6T Static RAM circuit has been designed and calculated.

**ID 221**

## **Machine Learning Based Approach for Depression Detection among Indian Students**

Anal Rauth, Aneesh Bose, Anumita Nandi, Anjali Gupta, Deblina Pal, Debmitra Ghosh

**Abstract:** Depression is a prevalent issue among young generations, but it often goes untreated due to a lack of symptoms or being overlooked as not being a serious problem. In order to address this issue and help individuals who may be suffering from depression, we developed a solution based on a decision tree. We conducted a survey in which we asked students a series of questions that they had to answer using a yes or no format. The responses were collected in a CSV file, which we used to create a decision tree. This decision tree is able to predict if an individual is suffering from depression or not. This solution can assist in identifying individuals who may be in need of help, and ensure they receive the proper treatment. We hope that this decision tree will be a useful tool in addressing the issue of depression and improving the mental health of individuals.

**ID 188**

## **Optimization on Yolov5 To Improve Accuracy For Classification Of White Blood Cells**

Vaidik Sharma, Akash Bhardwaj, Rashi Mishra, Bagesh Kumar, Yuvraj Shivam,  
Gaurav Nimrani1, Dr. Chandra Kant Upadhyay, Prakhar Shukla

**Abstract:** In order to solve the problem of proper classification and identification of white blood cells with an improved efficiency, this paper proposes a framework for its classification and identification based on the YOLOv5 network. Presently, determining a subtype of blood cells takes a longer time with frequent errors. The data present in the blood cell picture sets are often quite unreliable, and there are just a few publicly available datasets. The identification and analysis of WBC by a computer generally avoids human errors and cuts the time to separate the WBC to half. For the past few years, a number of in-depth research strategies for the differentiation of WBC in the image of a blood cell have been developed. The proposed research suggests that the YOLOv5 capture method can be used to find and separate white blood cells using bounding boxes. The proposed task resulted in an extraction of a WBC with a 96.3 percent accuracy while dividing it to 88 percent accuracy for a thorough diagnostic test.



ID 255

## **Underwater Image Quality Enhancement using Unsharp Masking (USM) and Bacteria Colony Optimization (BCO)**

Saorabh Kumar Mondal, Arpitam Chatterjee, Bipan Tudu

Abstract: Image quality enhancement is the vital part in image processing area. Not only the capturing devices or low light are responsible for low quality image but sometimes different medium, where the image is captured is a prime challenge. In case of underwater images, most of the times the images are suffer from low contrast and low sharpness problem due to presence of water. Unsharp masking (USM) is an efficient technique to improve the high frequency components originated from discrete cosine transform (DCT) process of input image as well as enhance the edge contrast to enhance the sharpness of the image for better clarity. On the other hand, classical histogram equalization (CHE) and its modified versions are very much common practice to improve the image contrast. But these techniques are suitable for air medium as well as sometimes it suffers from under enhancement, over whitening, false contouring etc. To overcome these problem, optimization based techniques may be applied. An optimal solution can be achieved using these optimization techniques to improve the image contrast and preserve other image characteristics. Bacteria colony optimization (BCO) is one of such techniques in the field of computational intelligence (CI) for solving such problems. An application of histogram equalization (HE) based bacteria colony optimization (BCO) to enhance contrast of an image has been proposed in this paper. Three different image quality assessments (IQA) metrics have been used to formulate an objective function to optimize the said problem. All the underwater images have been considered to verify the potential of proposed technique. The results have been compared with different conventional and popular optimization based techniques. The objective results have also been compared by considering various IQA metrics. The objective and visual comparison vouch the potential of proposed technique for underwater image enhancement.

**Section -1D: Data Science and Data Analytics**

**ID 174**

## **Mobile Money Response to COVID-19 in Africa: What Can We Learn?**

Mramba Nasibu

**Abstract:** As a result of the COVID-19 pandemic, countries, individuals, and enterprises must adjust their everyday life practices. Life has changed a lot since the COVID-19 eruption, from how we buy, spend, work, interact, communicate, and everything. Mobile Money is considered an essential tool to reduce the spread of COVID-19. Mobile money services facilitate making and receiving payments, paying utilities, money transfers, and cash transfers to affected communities. Some Countries have adjusted their mobile money policies, laws, tariff, and procedures to respond to COVID-19. This paper reviews mobile money responses containing COVID-19 to draw lessons for future pandemics. We believe that through these lessons, countries could position themselves in strategic options in future pandemics.

**ID 158**

## **Challenges and Approaches in Arabic Sentiment Analysis: A Review**

Abdulrahman Alharbi, Nabin Sharma

**Abstract:** A wide range of social media platforms has been established lately and has become an integral aspect of modern life in the digital age. Numerous social networking sites' vast volumes of user-generated data provide new perspectives to corporations and governments. However, it has become more challenging to properly glean relevant information from the huge volume of data. In order to solve this issue, sentiment analysis techniques has been used to extract and assess the emotion, opinion, and sentiment polarity in written language. Numerous researches have been undertaken in the field of sentiment analysis, particularly on text written in English, whereas, other languages such as Arabic have received limited attention. This paper aims to review sentiment analysis approaches in the Arabic language and discusses the challenges, processing pipeline, evaluation metrics, and levels of Arabic sentiment analysis (ASA). It also provides a summary of various cutting-edge techniques, studies, and datasets available for Arabic Sentiment Analysis in different domains.

**ID 121**

## **3S: a fast and exhaustive STR search algorithm**

Uddalak Mitra, Sayani Ghosh, Suvaditya Gupta

Abstract: Short tandem repeats (STRs) are contiguous repetitions of motifs (1 and 6nts) over DNA sequence and considered as important genetic markers. The design of a computational method for accurately and efficiently identifying STRs across whole genome sequences will be useful. We observe that atomic motifs, which we refer to as seeds, are the fundamental building blocks of STRs. We develop an algorithm that determines whether a motif is atomic as it moves through a sequence, and examines its non-cyclic redundancy and non-enclosing qualities to determine whether it can continue to repeat as a tandem pattern. The method is known as STR Seed Selection (3S) since its goal is to locate the seeds of STRs and track their sustainability. The approach extracts all the non-redundant STRs in linear time and using only a single scan of the sequence. Experiments show that 3S outperforms state-of-the-art exhaustive approaches in extracting STRs from genome-wide sequences

**ID 136**

## **Vegetable yield prediction: a review and experimental evaluation of algorithms**

Tumpa Banerjee, Bikramaditya Bagchi

Abstract: Predicting yield at the regional level is crucial for developing agricultural policies and identifying effective strategies of marketing. Forecasting vegetable supply in a market helps sellers to set prices for the vegetables and decide which vegetable will be more profitable for them. Vegetable yield prediction, along with crops, is the center of attention of the researchers as agriculture is a significant part of the country's GDP. In this paper, we have analyzed a few states of model of yield prediction and tried to experiment with these for predicting vegetable yields for some regions of India. We have studied the forecasting of vegetable supply based on rainfall amount, average temperature and month of harvesting using these models. This analysis demonstrates that we need to contemplate this matter to improve efficiency in the agri-food supply chain.

**ID 133**

## **Facial Expression Recognition using Ensemble Learning of Transfer Learning Models**

Surya Petluru, Pradeep Singh

Abstract: Facial expressions are very important for community-based interactions and are very often used to perform human emotion based behavioral analysis. The task of recognizing facial expression automatically from a face image is very challenging task in computer vision applications. Facial Expression Recognition (FER) is used in large set of applications like human-computer interaction, health and behavioral sciences. In this paper, the concept of ensemble learning for facial expression recognition is used for development of stackingbased ensemble and weight average ensemble. These ensemble models use one or more base learner on which the training is performed and then combines in a way that classification is performed better than individual base learners. Three pre-trained base learners ResNet50, VGG16 and InceptionV3 are used. The accuracy obtained by three base learner is 91%, 94% and 93% respectively. The accuracy of FER increase to 95% in stacking ensemble and to 97% in weight average ensemble. The obtained results shows that the ensemble learning performs FER better than the individual base learners when combined together.

**ID 149**

## **Vegetable Price Forecasting using ARIMA and VAR Modelling**

Tumpa Banerjee, Deepshika Gurung

Abstract: Price forecasting of agricultural products has gained the attention of researchers to help farmers, policymakers, and insurance companies. Price forecasting has been studied by time series analysis over a long decade. Time series models like ARIMA, and VAR provides signicant accuracy for forecasting sequence data. Modern researchers rely on machine learning models to predict the future based on past observations. This paper studies the performance of traditional time series models over machine learning models for forecasting vegetable prices for some Indian APMC markets. It has been shown that traditional time series models outperform the widely used machine learning models.

**ID 162**

## **Coreference Resolution in the Assamese Language: A Pioneering Attempt**

Mridusmita Das, Apurbalal Senapati

**Abstract:** Coreference resolution is the process of identifying all expressions in a text that refer to the same entities. It is an essential task in several Natural Language Processing (NLP) tasks to interpret the text properly. This is used in many sophisticated NLP tasks like machine translation, information extraction, document summarization, question answering, etc. It is a complex problem with numerous challenges and ramifications for both linguistics and computation. There is limited work in Indic languages and it is hardly found in Assamese languages. Our effort is one of the pioneering attempts in the Assamese co-reference resolution that is reported in this paper.

**ID 201**

## **Predictive Breast Cancer Learning Model for Selected Features: Comparative Analysis**

Himanshu Prasand Saha, Ankita Sinha

**Abstract:** Former predictions of any disease can be curable with doctors' attention. Most of the time, early diagnosis fails due to lack of people and doctor attention. According to WHO, early diagnosis of disease can be cured before it becomes chronic. Breast Cancer is a disease that can be cured if it gets identified at an early stage of cancer or before it starts spreading throughout the body parts. In this paper, implemented different feature selection methods with different machine learning classifiers. Breast Cancer dataset from UCI repository partitioned into different train-test split ratio. Further learning models are measured based on statistical parameters like accuracy, sensitivity, specificity, precision, recall and f1-score. Backward Elimination and Lasso Regression with SVM at 80:20 train-test split ratio produces best results and Information Gain with Naive Bayes at 70:30 split ratio gives third best result.

**ID 232**

## **Detection of ADHD and explaining the factors**

Sandip Das, Gairik Sajjan, Arkajyoti Poddar, Tamojit Dasgupta, Sayani Patty, Atrayee Gupta, Debmitra Ghosh

**Abstract.** In today's world ADHD is one of the most unnoticed problems in society. This is often undetected and as a result, left undiagnosed. But, this should not be the case, as it has some serious effects on our lives. Not only in the life of the individual carrying the disorder but people surrounding them can also get affected by them, as lack of attention is there and as a result, the individual faces anger issues and may be harmful to the society. Firstly, we tried to detect ADHD with EEG brain recording data of ADHD and non-ADHD individuals using a machine learning classification algorithm. In addition we tried to explain the reason of a prediction. Which means, how a prediction is made in the way it is made. What attributes contributed in the prediction, and in what manner is explained in this work. This study was successful in the prediction task of ADHD with an accuracy of 97% and also getting some insights to the prediction by the use of Explainable AI algorithms like LIME and SHAP.

**ID 206**

## **A comparison of the several speech tagging models used in NLP**

Anindya Nag, Dishari Mandal, Gulfishan Mobin

**Abstract:** Natural Language Processing (NLP) has vast applications in computer science to detect and change human-spoken or written natural language for valuable purposes. Many aspects of language are studied mathematically and modelled computationally in the discipline of NLP, which also involves the creation of new systems. This class of systems includes those that bridge the gap between written and spoken language, which has resulted in the proliferation of many NLP resources. However, many obstacles must be overcome before the author could develop NLP systems that reliably analyze natural languages. One such method is called part-of-speech (POS) tagging, and it labels words and phrases inside a paragraph depending on where the researcher is in the text. A comparative analysis is done between several models such as Multinomial Naive Bayes, Logistic Regression, Support Vector Machine, NLP, Recurrent Neural Network (RNN), deep learning techniques like Bidirectional Long Short-Term Memory (BiLSTM), Convolutional Neural Networks (CNN), and a Hybrid model based on their accuracy. The findings indicate that NLP is significantly more effective than conventional methods, with an accuracy rate of 98%.

**ID 140**

## **Prediction Model for Precision Agriculture using Machine Learning**

P. Raghu Vamsi, Pawan Kumar Upadhyay

Abstract. Precision farming has drawn a lot of interest because it provides farmers with technology that enables them to make the best decisions possible using accurate data from IoT-enabled sensors, actuators, robot drones, satellite photos, meteorological data, and other real-time data feeds. By using artificial intelligence and machine learning to the gathered data, governments and farming agencies can make better decisions on important aspects of agriculture, such as soil characteristics, weather, and crop yield forecast. To this end, this work study various supervised learning models such as Linear Regression (LR), Logistic Regression (LGR), Decision Tree (DT), Support Vector Machines (SVM), Support Vector Regression (SVR), Naive Bayes (NB), Stochastic Gradient Descendent (SGD), and Random Forest (RF) for classification and regression on the agriculture datasets downloaded from Kaggle website. The performance of the classification algorithms evaluated using metrics such as accuracy, precision, recall, and F1-score, where as the regression algorithms are evaluated using metrics such as R2 score, and Root Mean Square Error (RMSE) for selecting the best model. In comparison to other supervised learning algorithms, it has been found that RF has the best accuracy (99%) and the lowest RMSE. A web application built with the Python Flask framework and integrated with the recommendation system allows users to interact with the RF model for decision support.

**ID 249**

## **Enhanced Mutli-Criteria Recommender System TNCRecS for selection of smart phone**

Manish Jaiswal, Ali Abbas , Prashant Srivastava, Tanveer J. Siddiqui

Abstract: Now a day, purchasing of any product via online e-commerce or offline showroom is very challenging task for a customer due to availability of many options. In such situation, recommender systems play a vital role. This paper aims to propose an enhanced recommender system, “Top-N Common Recommender System” (TNCRecS) based on multiple-attributes by integrating top two state-of-the-art multi-criteria decision making (MCDM) algorithms, TOPSIS and AHP. The results of these algorithms have been used to provide final Top-N common recommendation. Experiment performed on four different brands latest smart phones and five criteria (RAM, memory, display, battery and price). Reported result shows that Redmi Note 12 Pro and Samsung Galaxy A 23 smart phones are the top 2 recommendation among the 4 smart phones, Redmi Note 12 Pro, Vivo T1X, Realme 9 and Samsung Galaxy A 23.

**ID 235**

## **Analysis and Mining of Sentiments in Public Health and Social Measures Related Corpus**

Subhankar Guha, Brojo Kishore Mishra , Anirban Mitra

Abstract. Sentiment Analysis is a rich research topic, and since the COVID-19 outbreak there has been a high rate of research on identifying different the sentiment of opinions expressed online. Government Declarations, Vaccination Drives, Crypto-currency prices, etc. are some of the many contexts that have gathered user attention during the pandemic, and consequently the relevant social media posts have been researched. In most of the state-of-the-art works, it is noted that the data is acquired from online social media platforms such as Twitter, etc. However, in this work, we have utilized a dataset provided online by the World Health Organization (WHO) based on the different public health and social measures taken by the local authorities around the globe in response to the spread of COVID-19. On analyzing the different texts pertaining to the enlisted events, we have identified that about 40% of the different posts and articles that have been presented in this dataset convey a negative sense. It is also observed that highest negativity of 46.4% exists in the articles related to the African Region (AFR), and the maximum positivity of more than 30% is observed in the articles related to the American Region (AMR).



**Section -1E: Network Security & Telecommunication**

**ID 109**

## **Improved Analog Costas Loop with Fuzzy Logic Controller**

F Sinhababu, A Mukherjee, S Sarkar, B Chatterjee, A Sarkar

**Abstract:** Costas Loop is a widely used PLL-based circuit for carrier tracking in modern telecommunication. In this paper, a modification in the Classical Costas Loop is proposed where voltage-controlled oscillator is incorporated with an additional phase control along with its traditional frequency control. It can be seen that this modification can lock the Costas Loop much faster. The simulation result further corroborates the enhancement in the lock-in range of this modified loop. It is also further shown that with the use of Fuzzy Logic Controller (FLC), this Modified Classical Costas Loop again get locked much faster.

**ID 263**

## **XRFLWID: XG-Boost and Random Forrest-based Lightweight Intrusion Detection Model for IoT attack detection**

Shahbaz Ahmad Khanday, Dr. Hoor Fatima, Dr. Nitin Rakesh

**Abstract:** Due to the IoT's rapid growth, it is projected that billions of IoT devices will be linked to the Internet. While IoT security flaws make it simple for attackers to take advantage of the devices and transform them into a botnet. However, systems for detecting intrusions can be quite important in solving IoT security loopholes and enhancing the IoT metasystem's well-being. Modish machine-learning approaches have been succeeding and are mostly used in designing and developing network intrusion detection systems to tackle the modern cyber assaults toward the IoT infrastructure. In this manuscript, we are proposing a lightweight anomaly-based intrusion detection system with novel pre-processing steps. The proposed Intrusion detection model uses XG-Boost-based feature selection and a Random Forrest classifier for binary classification. The BOT-IoT dataset by New South Wales University Sydney, which contains several attack types incorporating DDoS strike categories, is being used in the perusal. Normal and attack labels of the dataset are heavily imbalanced and Synthetic Memory Oversampling Technique (SMOTE) is used to balance the classes.

ID 89

## **Development of Low power and Area Efficient Multi-Core Memory Controller Using AXI4-Lite Interface Protocol**

Santhi Chebiyyam, M. Gurunadha Babu, M. Ajay Kumar, L. Radhika Rani1

**Abstract:** In multi-core SoC systems, memory latency is turning out to be a crucial bottleneck in recent times. The overall performance of the system depends on the latency present in both the memories namely on-chip memory and off-chip memory. These latencies occur during the memory read and write operations. In conventional multi-core SoCs, individual memory controllers were employed to execute the read and write operations in on-chip and off-chip memories. This paper proposes an integrated memory controller for multi-core SoC using Advanced eXtensible Interface (AXI4Lite) protocol. The proposed model improves the overall speed of the multi-core SoC by utilizing the burst mode capabilities existing in the AXI protocol. The proposed architecture is implemented in System Verilog HDL using Vivado tool. The experimental results prove that the proposed approach exhibits better results in terms of power consumption and area compared to the conventional approaches reported in the literature. The numerical metrics presented show a significance power reduction of 90% by using the proposed model.

ID 229

## **Routing and Data Aggregation Techniques in Wireless Sensor Networks: Previous Research and Future Scope**

Navjyot Kaur, Dr. Vetrithangam D

**Abstract:** Wireless Sensor Networks (WSNs) consists of tiny sized large number of sensor nodes. The primary task of these sensor nodes is to sense the required event in a specific area of interest. The sensor nodes can be installed in the areas where it is difficult for the human beings to reach easily. WSNs have huge number of applications such as agriculture monitoring, habitat monitoring, healthcare monitoring, volcanic erupted areas, security, battlefield etc. As the sensor nodes are very small in size, so they come up with very limited capability for processing the data. The power backup for the sensor nodes is very less due to which the sensors drain out at very high speed. Draining of sensor nodes decreases the lifetime of the sensor network so the network failure rate is very high in WSNs. The sensor nodes are generally in close proximity of each other, because of that they sense redundant data from the environment. To avoid forwarding redundant data to the base station, various routing and data aggregation techniques are used. Data aggregation is one of the very effective energy efficient techniques used in WSNs. This technique helps in removing the redundant data from the sensed data. This research paper will discuss various data aggregation techniques used in WSNs.

**ID 145**

## **Design of Wideband Microstrip Patch Antenna at 38GHz for 5G Network**

Samrat Sadhu, Bhaskar Acharjee, Sudip Mandal

**Abstract:** The 5G (fifth-generation) communication networks are an emerging technology with a very faster data transmitting rate. Designing a suitable antenna especially microstrip patch antenna for 5G system is a fascinating task for researchers. This paper reveals design and analysis of a 38 GHz patch antenna with wideband property. The foundation of this research is a simple rectangular patch antenna with dual rectangular slots. RT5880 with a thickness of 1mm dielectric-constant of 2.2 with co-axial feed is used as substrate. The simulated results using Matlab of the patch antenna are satisfactory. Return loss of -26.97dB and VSWR of 1.094 are quite acceptable concerning the required characteristics of 5G patch antennas. Moreover, a wide bandwidth of 3.25 GHz and directivity above 6.69 db are very much suitable for high-speed connectivity. The proposed patch antenna surpasses some existing 5G patch antenna designs at 38 GHz.

**ID 141**

## **Analysis and Implementation of Resonative Tuning Fork Sensor in Ash Hopper for Economical Ash Air Compressor Operation with Integrated IoT System**

Debyendu Chakroborty, Bikas Mondal, Subhankar Singha

**Abstract:** A compressed air system is vital for pneumatic equipment operation in any process plant, where ash handling is concerned. The current paper discusses the reduction of pneumatic air utilization and loading time of ash air compressors.

A piezo sensor-based tuning fork resonator is used in the ash denseveyor is used, which senses the volume of the ash on it and accordingly vibrates in its natural frequency, denser the ash the resonance will be low, and vice-versa. The conveying cycle of ash will be decided by the volume of the ash, the more transfer cycle, the more compressor loading, and consequently, it consumes more energy. The implemented system is then compared with the standard cycle time operated system and found more appropriate for energy conservation. Further, the output of the sensor is fed to the microcontroller module for IOT-based communication, to the remote control station for monitoring; a parallel voltage signal from the resonating sensor is catered to the voltage booster for compressor control circuit operation for loading and unloading of the equipment as per volume of the ash inside denseveyor.

**ID 123**

## **On the stability of Vander Pol Oscillator**

Bikkina Lasya Sivani, Ayush Kumar, Biswarup Dey,  
Rupsikha Kalita, Barasha Rani Das, Bharbee Bora, Arindum Mukherjee

Abstract: Amplitude perturbation and its effect on the injection locking characteristics of the oscillator with the external signal is explored analytically with small amplitude perturbation. Injecting a very minute periodic signal of frequency near the free running frequency of the oscillator completely changes the oscillator dynamics. Interesting locking phenomena are observed, describing the way every oscillatory system in nature responds to the external stimuli. The side-mode suppression ratio (SMSR) is presented along with numerical simulations. The stability of the oscillator is audited using the Lyapunov stability criterion. Hysteresis and frequency jump phenomenon are observed for the oscillator.

**ID 108**

## **Determination of Suitable Frequency for Underground Electromagnetic wave propagation**

Sarath Kumar Annavarapu, L. Lolit Kumar Singh, Sudipta Chattopadhyay, Abhijyoti Ghosh

Abstract: Electromagnetic waves may travel across all media, including air, water, mines, and underground. As the Electromagnetic wave propagates across different media, the transmitting and receiving qualities vary as the medium's relative permittivity changes. Determining the variation in the quantities such as received power plays an important role in the application such as mining, agriculture, defence and subsurface applications. In this study, simulation is performed by sandwiching layer between two basic antennae. By varying the permittivity values of the layer, different soil environments are attained, and in each case received signal S12 is noted. This work focuses on creating an underground environment between the antennas and to observe the variation in the received signal properties. This paves a path to determine the frequency that is suitable for underground propagation. The simulations are performed with Electromagnetic simulator HFSS.

**ID 155**

## **Planar Branch Line Coupler for 5G Communication**

Susmita Samanta, Jaydeep Chakravorty, Anindya Bose, Tanmoy Sarkar

**Abstract:** One of the essential components of many microwave circuits is the branch-line coupler (BLC). In this work, a BLC using apertures and shorting post is investigated to obtain a broad band response characteristic. A delay line has also been introduced to maintain its phase response. The structure operates for a frequency range from 3.3 GHz to 3.67 GHz having 370 MHz bandwidth which is suitable for upcoming n78 5G communications. In this dedicated frequency band, the BLC shows good matching with lower reflection and isolation, stable coupling and phase difference. The simulation has been carried out using HFSS simulation software.

**ID 98**

## **Design and Analysis of 28 GHz Microstrip Patch Antenna for 5G Network**

Tanmoy Dey, Sudip Mandal

**Abstract:** The 5G (fifth-generation) communication systems are a fastest evolving technology with a higher data transmitting rate. Designing a bite-sized 5G antenna is an adventurous task for researchers. This paper demonstrates a 28 GHz 5G antenna design and analysis. The foundation of this research is a rectangular patch antenna with a single rectangular slot. Rogers RT5880 with a thickness of 0.33 mm dielectric-constant of 2.2 is used as substrate. The simulated values of the patch antenna are good enough for implementation of 5G. Return loss of -54.60 db and VSWR of 1.001 with are quite acceptable concerning the required characteristics of 5G patch antennas. Moreover, bandwidth is greater than 1 GHz and directivity above 6 dBi are suitable for high-speed connectivity and efficient radiation. Comparing these results with existing designs in the literature, the proposed patch antenna surpasses some of the existing 5G patch antenna that operate in 28 GHz.

ID 204

## **An Efficient Data Privacy Protection System based on Differential Privacy**

D. Vetrithangam

**Abstract:** The daily services we use, such as search engines, mobile services, and online social activity, all have vast sensitive personal information in today's information realm. The question of how to aggregate sensitive user data without compromising individual privacy is a fundamental obstacle to increasing data accessibility. Differential privacy has become a widely accepted method for disclosing sensitive information while ensuring statistical privacy. There are numerous algorithms that can be used to address various target functions. However, we have identified the research gap in some research paper is that the noise-added data used in the existing algorithm is in decimal values, and in some cases, it is negative as well. In general, count or frequency can neither be negative nor decimal, but should rather be a whole number. As a consequence, a good mechanism for differential privacy core count is required in order to achieve better and reliable data privacy. In this paper, we focus on developing a unique mechanism to protect the sensitive information with the use of differential privacy. Laplace noise addition is frequently advanced as a method for satisfying differential privacy. We curate a dataset by collecting user responses by a survey form and stored as an actual dataset to which the random noise is added to produce the noise added dataset using the Differential privacy algorithm that is Laplace algorithm. The randomized response algorithm is used to create the noise added dataset. Implementation of Laplace Mechanism Algorithm is implemented by C++ and Rust and the result is compared with the existing algorithms. Our algorithm only produces whole number that is integers as the count values and produced results with better accuracy than the existing Laplace algorithm.

**Section -1F: Smart Materials, Nano Materials**

**ID 264**

## **Appearance of Liquid Crystalline Smectic-A-Crystal-G Critical Point in a binary system of 7.O9O.7 dimer and 12OCB monomer**

Prabir Sarkar, Malay Kumar Das, Parameswara Rao Alapati

**Abstract:** We report the phase diagram of a binary system composed of a dimeric 7.O9O.7 and a monomeric 12OCB compound exhibiting Isotropic-Nematic-Smectic A-Soft Crystal G phase sequence. High-resolution modulated DSC measurement have been performed to characterize the nature of a rare smectic A (SmA) - soft crystal G (Cr-G) phase transition. Polarizing optical microscopy measurement was performed for identification of different mesophases and to construct phase diagram. The temperature variations of specific heat capacity and phase shift were measured. High-resolution heat capacity measurements in the vicinity of the Sm-A-Cr-G phase transition clearly indicate a first order phase transition for most of the investigated mixtures, the strength of which decreases when the SmA range increases. The latent heat released during the SmA-Cr-G transition also decreases linearly with increasing 12OCB concentration and vanishes near  $x_{12OCB} = 0.6$ , with a simultaneous disappearance of the phase shift ( $d$ ) peak. The present mixture system presents a novel opportunity to explore the critical behavior concerning the SmA-Cr-G phase transition in soft condensed matter systems.

**ID 265**

## **On the Structure - Property Correlations of a new class of Chiral Liquid Crystalline Materials: A perspective from Electro-optic and Dielectric Measurements**

Priyanta Barman, Malay Kumar Das, Banani Das, Vera Hamplova, Alexej Bubnov

**Abstract:** The results of electro-optic and dielectric measurements have been discussed in the light of molecular structure-property correlations on two chiral liquid crystalline materials possessing paraelectric SmA\* phase, ferroelectric SmC\* phase and antiferroelectric SmCA\* phase, which differ in their linkage groups (keto or ether) and an additional chiral unit in the terminal chain. The phase transition temperatures and transition enthalpies were precisely determined from Polarising Optical Microscopy (POM) and Modulated Differential Scanning Calorimetry (MDSC) measurements. The compounds exhibit negative dielectric anisotropy ( $\Delta\epsilon$ ) of around -5 in the SmC\* phase and moderately high spontaneous polarization of around 130 nC/cm<sup>2</sup>. The temperature dependence of the response time,  $\tau$ , bulk viscosity,  $\eta$  and the activation energies in the SmC\* phase have been determined, from which interesting structure property correlations have been elucidated specially in terms of the molecular geometry arising due to the presence of an additional chiral unit in the terminal chain. These results shed important light on the emergence of these materials as a smart alternative for their application in electro optic and photonic devices.

ID 274

## Smart Orthoconic Antiferroelectric Liquid Crystalline Mixtures: Dielectric Parameters and Electrical Conductivity measurements

Shantiram Nepal, Banani Das, Malay Kumar Das, Madhumita Das Sarkar

Abstract: Dielectric spectroscopic analysis of two orthoconic antiferroelectric liquid crystalline systems, namely Compound A + Compound B mixture system and Compound C + Compound B mixture system, have been performed in the frequency range of 40 Hz-25 MHz and the temperature dependent parameters such as relaxation frequency, dielectric strength, Cole-Cole plot, AC and DC conductivity were examined for application requiring fast switching devices. Phase transition temperatures and sequence of mesophases for the mixtures were obtained by carefully observing the characteristic textures using the Polarising Optical Microscope. Three types of phase sequences were detected: (i) Cr-SmCA\*-SmC\*-SmA\*-Iso; (ii) Cr-SmCA\*-SmC\*-Iso; (iii) Cr-SmCA\*-Iso with stabilized SmCA\* phase in a broad temperature range. In both the mixtures systems, SmCA\* has two dielectric relaxation mode (low frequency PL Mode and high frequency PH Mode), the Goldstone Mode (GM) in the SmC\* phase, and the Soft Mode (SM) in the SmA\* phase. The strength of PL and PH modes is below 2.5, whereas GM Mode has high dielectric strength of ~200 in Compound C + Compound B mixture system (at  $x_C = 0.4$ ). Similar behaviour has been observed in Compound A + Compound B system. From the Cole-Cole plot, the relaxation modes in the SmCA\* phase are found to be much weaker than those in the SmC\* phase. The value of the AC conductivity of  $\sim 2.193 \times 10^{-4}$  ohm<sup>-1</sup>m<sup>-1</sup> and DC conductivity of  $\sim 2 \times 10^{-5}$  ohm<sup>-1</sup>m<sup>-1</sup> in the SmC\* phase for  $x_C = 0.4$  at 103 °C. We could effectively increase the temperature range of the SmCA\* phase by about  $\sim 11.5$  °C to reach 92 °C (at  $x_A = 0.6$ ) from 80.5 °C for Compound A + Compound B system. Mixtures with concentration  $x_A = 0.2, 0.3, 0.6$  and  $x_C = 0.2, 0.4$  have optimal values of the parameters as supported by wide range stable antiferroelectric phase and low switching times, making them potential candidates for applications in fast switching opto electronic and photonic devices.



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