TECHNO INDIA
SILIGURI INSTITUTE
OF TECHNOLOGY
A Satyam Roychowdhury Initiative

ICTDsC - 2024

Abstract Proceedings of

International Conference on

Data Science & Communication

November 21st & 22nd 2024 at Siliguri Institute of Technology

www.ictdsc.in

ICTDsC - 2024

International Conference on Data Science & Communication (ICTDsC – 2024) is designed to bring together the academics and other professionals' expert to discuss cutting-edge developments in respective fields.

Message from the Chief Patron

I am extremely delighted to know that the Department of Electronics & Communication Engineering of Siliguri Institute of Technology is prepared to organize the 2nd edition of the two-day international conference on "Data Science and Communication (ICTDsC - 2024) during 21st - 22nd November 2024.

I also welcome the synergy and merit envisioned by the Department 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 technical event which would endorse a spirit of enterprise among the students and the faculties through effective as well as productive interactions and networking. The prospect of the event will different avenues of Data Science, explore the challenges in Communication, IoT, Cyber security and will also put forward practical solutions for the same.

I welcome all the brilliant minds across various universities and higher education institute of the world to participate and 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

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 - 2024, we have the opportunity to hear and learn from some of the most prominent international minds in their respective fields. The four tracks of ICTDsC - 2024 comprehensively covered the current high-focus research areas in Artificial Intelligence & Data Science, Electronics & Communication, Image, Video & Signal Processing, Computing Algorithm and Application. The number and quality of papers received is a testament to the increasing interest among researchers in ICTDsC - 2024 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 - 2024. 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 - 2025. Our primary aim of organizing ICTDsC to bring about a rapid convergence of research and practical application 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 on Data Science and Communication, ICTDsC - 2024 with its second edition, organized by Siliguri Institute of Technology partnering with Springer, Computer Society of India, Indian Society for Technical Education, IEEE Communication Society 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 for the initiative to 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 - 2024 a grand success.

Dr. Mithun Chakraborty
Principal, Siliguri Institute of Technology and Patron, ICTDsC - 2024

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. 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: 286, total accepted paper: 50. Tracks: Artificial Intelligence & Data Science, Electronics & Communication, Image, Video & Signal Processing, Computing Algorithm and Application. The ICTDsC - 2024 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.

Debashis De

Thanks and regards,
Dr. Debashis De
General Chair

Preface

International Conference on Data Science and Communication (ICTDsC- 2024) 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 USA, Australia, Bangladesh, Czech Republic, Morocco, Sri Lanka, Pakistan, Malaysia, UAE and Iraq.

We have received nearly 286 research papers from diverse reputed organizations. After thoroughly reviewed by the eminent reviewers and experts 50 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 Mr. Satyam Roychowdhury, our respected Managing Director, Techno India Group, Dr. Sanku Bose, Group CEO, Techno India Group, Dr. Mithun Chakraborty, Principal, Siliguri Institute of Technology, and Mr. Joydeep Guha, Administrator, Siliguri Institute of Technology.

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
Organizing Chair and Convener, ICTDsC - 2024
Siliguri Institute of Technology
West Bengal, India

Program schedule of ICTDsC - 2024 on 21st November 2024		
Time (ISI)	**Description**	**Venue**
9.00am – 10.00am	**Registration and Breakfast**	**Registration**: Ground floor, Centre Circle Main Building **Breakfast**: F & B Lab, Dept. of BHHA, Nursing Building
10.00am – 10.45am	**Inaugural session** ▪ Welcome speech by the organizing chair, ▪ Lighting the lamp, Welcome song, ▪ Patron speech, Speech by other distinguished personalities. ▪ Book of abstract publication	**Sir J C Bose Seminar Hall**
10.45am – 11.00am	**Tea Break**	
11.00 am – 11.30am	**KEYNOTE I** Prof. (Dr.) B. S. Daya Sagar *Head ISI Bangalore* *Bengaluru, karnataka*	**Sir J C Bose Seminar Hall** Joining link: https://meet.google.com/ekm-maef-xyo
11.30 am – 12.00pm	**KEYNOTE II** Prof. (Dr.) Jyotsna Kumar Mondal *Ex-Vice Chancellor, Raiganj University, Raiganj*	
12.00pm- 12.30pm	**KEYNOTE III** Prof. (Dr.) Debashish De *Maulana Abul Kalam Azad University of Technology, Kolkata*	
12.30pm - 01.00pm	**KEYNOTE IV** Prof. (Dr.) Bharat Bhusan *Sharda University, Greater Noida*	
1.00pm – 2.30pm	**Lunch break**	**F & B Lab,** **Dept. of BHHA, Nursing Building**

Program schedule of ICTDsC - 2024 on 21st November 2024		
Time (ISI)	**Description**	**Venue**
2.30pm – 4.30pm	**Session 1 (offline)** AI *Paper ID: 334, 506, 511, 516, 534, 537 and 551*	**T&P Cell (Offline)**
	Session 2 (online) AI/ECE *Paper ID: 448, 449, 502, 514, 341, 474 and 556*	**ECE Seminar Hall (Online)** Joining link: https://meet.google.com/kgx-dbxa-hvp
	Session 3 (online) AI/ECE/IP *Paper ID: 408, 412, 433, 441, 491 and 526*	**EE Seminar Hall (Online)** Joining link: https://meet.google.com/daa-cczp-vpi
	Session 4 (online) AI/CAA/IP *Paper ID: 324, 375, 379, 398, 463 and 352*	**CSE Seminar Hall (Online)** Joining link: https://meet.google.com/qxc-cdhh-kbk
4.30pm – 5.00pm	**Tea Break**	**Ground Floor**
5.00pm - 06.00pm	**Cultural Program & High Tea**	**Centre Circle**

Program Schedule of ICTDsC - 2024 on 22nd November 2024		
Time (ISI)	**Description**	**Venue**
9:00am - 10:00am	**Breakfast**	**F & B Lab,** **Dept. of BHHA, Nursing Building**
10.00am – 10.30am	**KEYNOTE V** Prof. (Dr.) Raj Kumar Buyya The University of Melbourne, Australia	**Sir J C Bose Seminar Hall** Joining link:

Program Schedule of ICTDsC - 2024 on 22nd November 2024		
Time (ISI)	**Description**	**Venue**
10.30am – 11.00am	**KEYNOTE VI** Prof. Jyoti Sekhar Banerjee Bengal Institute of Technology, Kolkata	https://meet.google.com/doa-swhb-sud **Sir J C Bose Seminar Hall** Joining link: https://meet.google.com/doa-swhb-sud
11.00am – 11.30am	**Tea Break**	
11.30am – 12.00pm	**KEYNOTE VII** Prof. (Dr.) Anghusuman Sarkar *Kalyani Govt. Engineering College, Kalyani*	
12.00pm – 12.30pm	**KEYNOTE VIII** Prof. (Dr.) Ajith Abraham *Vice Chancellor, Bennett University*	
12.30pm – 01.00pm	*Talk of Industry Personnel*	
01.00pm – 02.30pm	**Lunch Break**	**F & B Lab,** **Dept. of BHHA, Nursing Building**
02.30pm – 04.30pm	**Session 5** ECE/CAA/IP *Paper ID: 510, 557, 536, 349, 371, 558, 545 and 547*	**T & P Hall (Offline)**
	Session6 (Online) ECE *Paper ID: 531, 464, 473, 429 and 383*	**ECE Seminar Hall (Online)** Joining Link: https://meet.google.com/kgx-dbxa-hvp
	Session 7 (Online) CAA/IP *Paper ID: 515, 533, 541, 555 and 496*	**EE Seminar Hall (Online)** Joining link: https://meet.google.com/daa-cczp-vpi
	Session 8 (Online) AI/CAA *Paper ID: 548, 554, 454, 518, 465 and 446*	**CSE Seminar Hall (Online)** Joining link: https://meet.google.com/qxc-cdhh-kbk
04:30pm onwards	Best Paper Award and Valedictory Session	**Sir J C Bose Seminar Hall**

Keynote Contribution

Mathematical Morphology in Spatial Data Science

Prof. B. S. Daya Sagar
Indian Statistical Institute, Bangalore

Abstract: Data available at multiple spatial/spectral/temporal scales pose numerous challenges to data scientists. Recently, researchers paid wide attention to handling such data acquired through various sensing mechanisms to address intertwined topics—like pattern retrieval, pattern analysis, quantitative reasoning, and simulation and modelling—to better understand spatiotemporal behaviours of several terrestrial phenomena and processes [1]. Georges Matheron and Jean Serra of the Centre of Mathematical Morphology, Fontainebleau, founded Mathematical Morphology (MM) [2]-[5]. Since the birth of MM in the mid-1960s, its applications in wide-ranging disciplines have illustrated that intuitive researchers can find varied application domains to extend the applications of MM. Mathematical Morphology is one of the better choices to deal with the aforementioned intertwined topics. Various original algorithms and techniques that are mainly based on mathematical morphology have been developed and demonstrated. This lecture presents an overview of mathematical morphology and its applications in geosciences, remotely sensed satellite data and Digital Elevation Model (DEM) processing and analysis, as well as geospatial data sciences, which would be helpful for those with research interests in image processing and analysis, remote sensing and geosciences, geographical information sciences, spatial statistics, and mathematical morphology, mapping of earth-like planetary surfaces, etc. The content of this broad overview of the lecture offers two parts. The first part covers fundamental morphological transformations. An overview of the applications of those transformations, covered in the first part, to understand the granulometries, morphological filtering, morphological interpolations and extrapolations would be given with several case studies in the second part.

The Internet of Music Things (IoMT)

Prof. Debashis De
Maulana Abul Kalam Azad University of Technology, West Bengal

Abstract: The Internet of Music Things (IoMT) is a digital ecosystem that integrates everyday music devices, instruments, and systems into a connected environment. Key aspects of IoMT include smart instruments embedded with sensors, smart audio interfaces and controllers, cloud-based music creation, smart home integration, AI and music creation, live performances, personalized music experiences, and smart music analytics. IoMT devices allow musicians to interact with software, other devices, and AI-driven tools, enabling seamless control over DAWs or external synthesizers. IoMT devices can also integrate with smart home systems, allowing for more immersive and responsive music environments. AI can automate tasks like mixing, mastering, and composing, and AI can analyze musical styles to create compositions that match specific genres or moods. IoMT also extends to live performances, allowing artists to perform with virtual musicians or modify their instruments dynamically during live sets.

Machine Learning Approach for Security and Authentication

Prof. (Dr.) Jyotsna Kumar Mandal
Department of Computer Science and Engineering, University of Kalyani

Abstract: In the present scenario, existing cryptographic technique depend on the exchange of keys through insecure public channel which are used to encrypt and decrypt the information. This is vulnerable in terms of security. Using these key sender and receiver perform reasonably complex mathematical operations on the data stream. This is also taking significant number of resources. So, it is essential to find some cryptographic techniques where session key can be generated at both end of transmission using mutual synchronization of both parties through neural synchronization and neural computations using machine learning approach. Encryption/decryption technique which takes less resources for computations but provides very high degree of security with respect to existing cryptographic techniques is very much needed in wireless communication. The objectives of this matter are to enhance the security of the wireless communication system in such a way that the instead of exchanging the whole session key, machine learning based synchronization technique is used to produce a cryptographic key at both end of transmission. This synchronized network can be used for message communication by encrypting the plaintext using encryption/decryption technique with the help of synchronized session key at both ends. As a result, this machine learning scheme eliminates the exchange of keys for public key cryptography system. Also grouped synchronization has been discussed to synchronize group of n party to form a synchronized grouped session key without exchanging the private-public key pair. All of these processes are associated with light weight encryption techniques.

Neoteric Frontiers in Cloud and Quantum Computing

Prof. Rajkumar Buyya
The University of Melbourne, Australia

Abstract: The twenty-first-century digital infrastructure and applications are driven by Cloud computing and Internet of Things (IoT) paradigms. The Cloud computing paradigm has been transforming computing into the 5th utility wherein "computing utilities" are commoditized and delivered to consumers like traditional utilities such as water, electricity, gas, and telephony. It offers infrastructure, platform, and software as services, which are made available to consumers as subscription-oriented services on a pay-as-you-go basis over the Internet. Its use is growing exponentially with the continued development of new classes of applications such as AI-powered models (e.g., ChatGPT) and the mining of crypto currencies such as Bitcoins. To make Clouds pervasive, Cloud application platforms need to offer (1) APIs and tools for rapid creation of scalable and elastic applications and (2) a runtime system for deployment of applications on geographically distributed Data Centre infrastructures (with Quantum computing nodes) in a seamless manner.

This keynote presentation will cover

a) 21st century vision of computing and identifies various emerging IT paradigms that make it easy to realize the vision of computing utilities,
b) Innovative architecture for creating elastic Clouds integrating edge resources and managed Clouds,
c) Aneka 6G, a 6th generation Cloud Application Platform, for rapid development of Big Data/AI applications and their deployment on private/public Clouds driven by user requirements,
d) experimental results on deploying Big Data/IoT applications in engineering, health care (e.g., COVID-19), deep learning/Artificial intelligence (AI), satellite image processing, and natural language processing (mining COVID-19 literature for new insights) on elastic Clouds,
e) QFaaS: A Serverless Function-as-a-Service Framework for Quantum Computing, and
f) New directions for emerging research in Cloud and Quantum computing.

Augmenting Equivalent scaling through performance improvement by incorporating Bottom-Up Approach in device-circuit co-interaction for novel Tunnel FET based low VDD heterogeneous IOT nodes

Prof. Angsuman Sarkar
Kalyani Government Engineering College, West Bengal

Abstract: The Tunnel FETs (TFETs) characterized by band-to-band quantum tunneling (BTBT) are often advocated as the "green transistors" among the beyond-CMOS devices, as they can theoretically overcome the Boltzmann Limit of 60mV/decade for Subthreshold swing (SS). TFETs have outperformed MOSFETs in the low V_{DD} regime in terms of current drive and subthreshold slope, thus being more energy efficient. TFETs however intrinsically suffer from 2 major issues – low maximum ON current and ambipolar conduction. Thus, applications employing low supply voltages can be implemented using TFETs or heterogeneous TFET-CMOS cores, thus leveraging the energy efficiency aspect of TFETs. Initially, we propose an analytical model for a novel Split Channel Gate-Overlap-Source Double Gate TFET (SC-GOS DGTFET) architecture which enhances the ON current by accounting for an additional tunneling component called Line Tunneling combined alongside the conventional Point Tunneling in p-i-n based DGTEFETs. We have also introduced the concept of approximate computing (AC) for low power error resilient computations and implemented the same in a novel TFET based AC static full adder. Further, a novel architecture all n-TFET based low power balanced accurate static mux-based adder with level restorer has been proposed. Dynamic timing analysis reveals that AC-based adders reduce power consumption by approximately 71% and achieve area savings of up to 75% as compared to accurate adders. The proposed balanced accurate adder occupies about 60% less area and consumes 85% lesser power over its regular counterparts. When benchmarked against 45nm CMOS technology, TFET-based accurate and approximate adders exhibit 25% and 40% greater energy efficiency, respectively, positioning TFETs as a leading candidate for future ultra-low-power applications.

Applications of Explainable AI (XAI) in Healthcare

Jyoti Sekhar Banerjee
Bengal Institute of Technology, Kolkata

Abstract: The integration of Explainable Artificial Intelligence (XAI) in healthcare is transforming how clinicians, researchers, and patients understand and trust AI-driven insights for medical decision-making. XAI bridges the gap between advanced predictive models and actionable, human-interpretable outputs, offering transparency in critical areas like diagnostics, treatment recommendations, and patient management. This presentation explores XAI applications in healthcare, focusing on enhancing transparency in complex machine learning models and improving patient outcomes. This presentation is used to highlight the role of XAI in areas such as predictive diagnostics, where explainable models aid in understanding risk factors, as well as personalized treatment plans that adjust to individual patient profiles. Additionally, this presentation addresses the ethical implications, regulatory requirements, and technical challenges of implementing XAI in healthcare environments. By providing clinicians with interpretable AI models, XAI enhances diagnostic accuracy, reduces biases, and fosters trust, positioning it as a cornerstone for future advancements in AI-driven healthcare.

Research Contribution

Track 01: Artificial Intelligence and Data Science

ID 324

Diabetes Mellitus Recognition using Marine Predators Algorithm with Machine Learning Model

Indresh Kumar Gupta, Swati Srivastava, Awanish Kumar Mishra, Joel J. P. C. Rodrigues

Abstract: Diabetes mellitus (DM) is a chronic metabolic disease that is typically analyzed through various methods such as blood glucose tests, oral glucose tolerance tests, and HbA1c measurements. Early detection is crucial for proper management and prevention of complications associated with this disorder, including kidney problems, cardiovascular diseases, and nerve damage. Machine Learning (ML) and feature selection (FS) play a significant role in DM detection, employing data-driven techniques to leverage advanced models for identifying relevant features from datasets, including medical history, clinical measurements, and patient demographics. This paper presents the DM Recognition using Marine Predators Algorithm with Machine Learning (DMR-MPAML) model. The DMR-MPAML Model is developed to recognize DM by employing both FS and parameter tuning methodologies. Initially, the data undergoes Min-Max normalization to ensure uniformity. The model utilizes the Marine Predators Algorithm (MPA) for efficient feature selection, while Feed Forward Neural Network (FFNN) serves for DM detection. The parameter tuning approach, Particle Swarm Optimization (PSO), enhances DM recognition in FFNN. DMR-MPAML model improves detection rates, streamlines recognition, and aids in risk assessment, leading to better patient outcomes. Validation on the PIMA Indians Diabetes dataset confirms its superior performance in DM detection.

ID 408

Exploration of Security, Trust, and Robustness for Workflow Allocation in Cloud Computing Environment

Mahfooz Alam, Mohammad Shahid, Suhel Mustajab, Faisal Ahmad

Abstract: The workflow allocation among cloud resources has become critical due to the cloud's rapid expansion. Securing confidential information and ensuring reliable performance depends on robustness, security, and trust in the allocation process. This paper presents a paradigm that integrates security, trust, and robustness for workflow allocation and also provides the relationship between security, trust, and robustness. Further, it gives the role of trust and its impact on enhancing security and robustness for workflow allocation. This overview aims to raise awareness about the evolving landscape of secure and robust cloud workflow allocation by highlighting key trends and future directions.

ID 334

Applying TWECM and Weight Determination Technique Based on Regression

Susmita Bandyopadhyay, Mohima Mukherjee, Pintu Das

Abstract: This paper is an application of two recently proposed MCDA techniques and one method of comparison among MCDA techniques. The two MCDA techniques as applied are TWECM (Technique with Essential Characteristics of MCDA Techniques) and an objective method to determine the weights of criteria based on Regression. At first, the weight determining method based on Regression has been applied to determine the weights of the criteria based on a set of data on a case study. Then, TWECM has been applied on the data to rank the alternatives. The ranks as obtained from TWECM are then compared with three other benchmark MCDA techniques for consistency. These three techniques for comparison have been selected because of their diverse nature in their algorithms along with the fact that these MCDA techniques are benchmark techniques. The second method of comparison has been applied to find the most suitable MCDA technique among the four applied MCDA techniques. The results indicate the consistency of the ranking as obtained from TWECM along with its superiority over the other three techniques.

ID 448

Deep Learning Approach for Vibration based Disease Diagnosis

Samiksha Ninawe, Vedanti Raut, Akash Sharma, Monali Gulhane, Nitin Rakesh, Mohan Kumar, Saurav Dixit

Abstract: The title implies that vibration of body through which we can analyse any disease. There are different deep learning models through which we can analyse the vibration to know about disease. Prefabricated foot orthoses, IMUs, and vibratory stimulators are examples of modern biomechanical technology that may be integrated to provide individualized therapy and improve structural health monitoring. Furthermore, deep learning techniques greatly enhance data processing skills, allowing for more precise forecasts and the development of novel therapeutic approaches, especially for diseases like Parkinson's disease. The role of biomechanics based modern-day medical care will be analysed in this article. Those perspective techniques in constructing and assembling of foot orthoses, tapered vibrators are also indispensable. Therefore, the advent of these technologies are giving a rise to personalized treatments for varied conditions, best data analysis, and creating patient responsive therapeutic interventions. The main thing to know from the comparative analysis of the deep learning algorithms is about how to choose the more efficient algorithm. In short, these discoveries have cut the old age medicine to the bone of application. Those used for treatment and the one used for research too.

ID 375

Discovering the Secret of Biotic Diseases in Rice Leaves Using Hybrid Deep Learning

Pritha Singha Roy and Vinay Kukreja

Abstract: This paper assesses a deep learning model's capability in detecting rice leaves. Various metrics, including Certainty, Recall, F1-Score, and Accuracy, were employed to determine the model's effectiveness in identifying ten different types of leaves in rice: Rice Hispa, Rice Leaf Folder, Rice Mealybug, Rice Gall Midge, Rice Bug, Termite, Stem Borers, Case Worm, Froghopper, and Stalk-Eyed Flies. The model's findings show accurate detection of biotic factors at rates between 93% and 96% for different classes. Despite some classes' lower performance, the overall model still meets the necessary precision and recall levels, which are crucial for successful biotic factor management. Recall varies from 65% to 77.5%. Deep learning can potentially improve disease detection and control in farming, leading to better sustainability and food security. In the future, recent segmentation techniques and deep learning models can enhance the recognition of rice leaf biotic diseases in leaves.

ID 449

Machine Learning Approach for Vibration based Enhanced Security

Soham Pathak, Shreyash Rodge, Om Kuhikar, Nitin Rakesh, Monali Gulhane, Saurav Dixit

Abstract: These Vibro security frameworks depict a novel method of security that is based on the higher specifications of vibrations. Such systems excel in discerning and analyzing various subtle signals related to vibrations; hence, they find uses in various security-related areas. Vibro sensors are installed along perimeter of the secured area or property; they are sensitive to footfalls or a cutting tool, raising an alarm to the security. In the inner sanctuary, such as contemporary safe houses or vaults, Vibro technology prevents unauthorized intrusion by studying oscillations from drillings, prying or manipulation of shortcuts. In our research, we use the highly effective approaches that were mentioned in the survey, where we fit decision trees, random forests, and logistic regression to discover useful patterns in the Vibro data that can be considered as large scale. This helps improve on the probability of early detection and response to security threats. Our study also included a comparison of different applications of the vibration analysis that ranges from the foot condition assessment up to the indoor localization and intrusion detection to establish the versatility and possibilities of the vibration-based security solutions. With further development on the way, Vibro security has the potential of altering regional practices of security through natural signals for identification, detection, and verification of the security threats that will foster smarter, more portable, and responsive security systems.

ID 379

TopicMapper: Geotagged URL Topic Extraction and Categorization

Vijay Kumar

Abstract: The paper presents TopicMapper, a tool designed to extract and categorize topics from geotagged URLs, focusing on web pages within specific geographical regions. The tool utilizes Apache Spark for largescale data processing and employs the Latent Dirichlet Allocation (LDA) algorithm to identify topics within web pages. The system's architecture involves parallelization and a multistep pipeline, enabling efficient data handling and workload optimization. The study demonstrates the tool's scalability through experiments on datasets of varying sizes. The results reveal that TopicMapper exhibits promising calability, maintaining quasi-linear performance as dataset sizes increase. The paper also introduces a method for avoiding unnecessary recomputation by considering common areas between previously computed and new regions. Future work may involve GUI development for user-friendly interaction and refining the recomputation avoidance technique.

ID 454

Alzheimer's Disease Prediction and Classification using Deep learning Algorithms

Reniya Shajahan, Dr.Fousia M Shamsudeen

Abstract: Alzheimer's disease (AD) is a progressive neurodegenerative disorder that affects millions of people worldwide. Early diagnosis and classification of AD are crucial for effective treatment and care. Here we explore the application of Convolutional Neural Networks (CNN) and the VGG16 architecture for the prediction and classification of Alzheimer's disease. Our study demonstrates remarkable accuracy rates, with CNN achieving an accuracy of 97% and VGG16 achieving an even higher accuracy of 98%. These results were obtained through the analysis of medical imaging data, specifically magnetic resonance images (MRI), which contain valuable information about brain structural changes associated with AD.The proposed models offer promising capabilities for automated AD diagnosis, which can greatly aid healthcare professionals in early intervention and personalized patient care. This project showcases the potential of deep learning techniques in addressing critical healthcare challenges and highlights the significance of advanced image analysis in the field of neurodegenerative disease diagnosis.

ID 398

Integrated Approach for Tomato Leaf Disease Detection, Fertilizer Application, and Precautionary Measures

Komal Jadhav, Rutuja Sonawane, Pranjal Pandit, Komal Patankar, Anuradha Yenkikar, Pallavi Ahire

Abstract: Plant diseases are one of the primary brakes to agricultural productivity, as they both lower crop yield and quality. The use of ML techniques allows diseases to be identified and diagnosed through image analysis. Predictive analytics can also be used to determine the breakout of disease, saving resources through precision agriculture. In this work, we propose to compare CNN, AlexNet, and InceptionV3 for detection of plant disease based on the leaf images. The dataset involved in the paper is obtained from Kaggle, and all the models are tested rigorously based mainly out of accuracy as primary metric. Apart from disease detection, the paper postulates an integrated system with the capability to not only detect plant diseases but also provide practical recommendations for fertilizer application along with precautions for the disease's mitigation. The study attempts to empower agricultural practitioners with tools for informed decision-making by integrating the techniques of machine learning with actionable insights. Our research is a critical bridge that integrates comparative analysis of the different architectures in neural networks with a holistic approach to disease management in agriculture. In so doing, we incorporated practical recommendations into our study, and our researches go beyond theoretical analysis to directly influence agricultural practices, thereby improving crop health and productivity. Promising results were also obtained, showing classification accuracy from 97% to 100% across classes The proposed model records an with nine classes of diseases and one class of a healthy plant, the proposed model achieved average accuracy of 99.21%. As such, these findings provide knowledge to indicate the performance. its application to disease diagnosis and classification in plants and also improving the feasibility of our approach in the field of agriculture.

ID 433

An Intelligent Approach for Web Search Personalization Using Machine Learning and Big Data Analytics

Dheeraj Malhotra, Midhun Chakkrarvarthy

Abstract: Traditional search engines usually provide same set of output links to different users in response to same search query, despite, personalized search requirements vary among users. Moreover, gigantic and ever-growing nature of web leads to incomplete indexing even by most of popular search engines. In this paper, we address the issues of personalized search requirements by proposing a cloud architecture of a Meta search tool implemented through Hadoop framework. The extensive experimental evaluation clearly shows that the proposed Meta search framework can easily outperform popular search engines in terms of personalized search precision.

ID 412

An AI based non-invasive algorithm for abnormal oral lesions classification

Shyamalendu Paul, Shivnath Ghosh, Sourajit Maity, Minakshi Bedi

Abstract: Digital imaging and artificial intelligence (AI) have had a major influence in the health sector and show great potential as tools for cancer diagnosis. The objective of this analysis was to train a deep learning model and its validation for automatically classifying oral lesion images. Here, we introduced a deep learning model named RID_Net, which combines three CNN models: ResNet152V2, InceptionV3, and DenseNet201. Additionally, we have used the lips and tongue image dataset for the evaluation of the model's performance. The classification gained an accuracy of 96% on an average in the dataset. The deep learning model development has been studied in detail for automatic classification of abnormal oral lesions from oral clinical images to achieve satisfactory performance. Moreover, future directions involve investigating the addition of trained layers to identify patterns which distinguish the potentially malignant and malignant lesions from the benign ones.

ID 526

Path Planning in Robotics Using Hybrid Q-Learning Approach

Sachin John Thomas, Imthias Ahamed T.P.

Abstract: Reinforcement learning enables agents to learn optimal behaviors through rewards and penalties, shaping their actions based on interactions with their environment. This work addresses the challenge of enabling a mobile robot to navigate environments like factory layouts or hospital settings while avoiding collisions with static and dynamic obstacles. The robot uses three proximity sensors to detect obstacles and employs a combination of Q-learning, a value-based reinforcement learning technique, and the A* algorithm, a heuristic-based search algorithm. Q-learning is effective for various state and action spaces and is widely used in robotics, game playing, and autonomous systems. However, it struggles with large state spaces. To overcome this, we use a hybrid approach that combines Q-learning with A*, facilitating faster learning and reduced computational time. The robot is trained in a grid-based environment, taking in Q-learning's policy learning capabilities and A*'s efficient pathfinding through heuristic search. This ensures the robot can navigate dynamic environments more effectively.

ID 502

Congestion trajectories Modeling based on bottleneck identification

EL Mandri Douae and Karim Lamia

Abstract: Urban congestion refers to the situation where traffic flow in urban areas is impeded due to various factors such as high vehicle density, limited road capacity, incidents, adverse weather, and special events. This paper presents a novel approach to urban congestion modeling through the identification and mitigation of bottlenecks, with a particular focus on understanding the causal relationships between congestion events. The principal contribution of this research is the development of a trajectory metamodel based on semantic events, which effectively captures and highlights the causal correlations between consecutive congestion events. By modeling these correlations, the metamodel enables the anticipation and avoidance of bottlenecks, which are recognized as critical congestion patterns. The findings provide valuable insights for urban planners and traffic management systems in developing more efficient and proactive solutions to urban traffic congestion.

ID 516

Penalty based on neighbour's degree: A new centrality measure to find influential nodes in complex networks

Anil Tudu, Ardhendu Mandal, and Debaditya Barman

Abstract: Identifying influential nodes in complex networks is a very challenging task in network science with paramount importance. It has many applications, including preventing and controlling rumours in social networks, preventing contagious disease spread, political and marketing campaigns etc. Solutions to this problem typically rely on the ranking of individual nodes based on some centrality measures. It is assumed that nodes having higher centrality values are more influential. Influence maximization (IM) is another form of this problem, where a set of influential nodes (seed nodes) are selected that maximizes the total influence spread in the network. Popular centrality measures like degree, betweenness centrality, closeness centrality, PageRank are also used to select top-ranked nodes as seed nodes, but this type of approach suffers from the overlapping of influences between the selected seed nodes. In this work, we propose a new type of centrality measure called Penalty based on Neighbour's Degree i.e., PND that uses a penalty mechanism to calculate the centrality values. A node is penalized by each of its neighbours. The penalty amount is determined by the degree of the node and the degree of its neighbour. The total penalty paid by a node determines its influencing capability. Although the proposed approach is designed to address the issue of overlapping influence in the Influence Maximization (IM) problem, experimental results demonstrate its effectiveness not only for the IM problem but also for ranking individual nodes.

ID 441

Moving towards Robust and Reliable AI: Vulnerability Detection Framework through Red Teaming

Vishwanathan Raman, Anindita Desarkar and Aritra Sen

Abstract: Ensuring the reliability of AI based systems is a crucial challenge in today's AI driven environment. However, robustness is a key component of reliable AI, as the failure of these systems could have severe consequences in the critical domains such as in healthcare, transportation and finance. Eventually, the systems in these domains are largely dependent on various language models. Hence, measuring the robustness of those language models ultimately determines the end success though no such holistic framework is available for the same. Hence the current researchers are proposing a vulnerability detection framework which can be used to measure various vulnerabilities like jailbreak, prompt injection, biasness, data leakage and sensitive information disclosure through red teaming technique and ultimately publish a detailed report so that appropriate measures can be taken to address the same.

ID 514

Enhancing Arabic Sentiment Analysis with Stacked Ensemble Deep Learning Models

Abdulrahman Alharbi and Nabin Sharma

Abstract: The rapid proliferation of social media platforms has generated vast amounts of user-generated content, offering valuable data for sentiment analysis. While significant progress has been made in English sentiment analysis, Arabic sentiment analysis remains challenging due to linguistic complexities and dialectal variations. This study addresses these challenges by employing a novel approach that combines multiple deep learning models with stacking ensemble learning to analyze sentiment in Modern Standard Arabic (MSA) and Saudi dialects. The proposed methodology involves deep learning models, including Convolutional Neural Networks (CNN), Bidirectional Long Short-Term Memory (Bi-STM), and Recurrent Neural Networks (RNN), utilizing AraVec pretrained word embeddings. To further enhance performance, we propose stacking ensemble learning, combining the strengths of these base models with meta-models. We investigated the effectiveness of three metamodels (Logistic Regression, Random Forest, and Gradient Boosting) to determine the optimal combination for Arabic sentiment analysis. Experiments demonstrated that individual models achieved strong baseline performances, with RNN achieving the highest accuracy of 91.83%. Stacking ensemble models significantly outperformed individual models, with the Logistic Regression meta-model achieving the highest accuracy of 97.22%, representing an improvement of 5.39%. The results highlight the effectiveness of our proposed model in understanding Arabic sentiment, demonstrating that stacking ensemble learning can leverage the unique strengths of different deep learning models to improve predictive performance.

ID 506

Comparative Analysis of Anomaly Detection Techniques in Satellite Telemetry Data

Kruteeka Samal, Divyanshu Saxena, Deepan M, Amit Kumar Singh, Leo Jackson John, Nandini Harinath, Ramakrishna B N

Abstract: Ensuring the health and longevity of satellites is paramount for modern communication, navigation, and earth observation. This study explores the application of advanced time series models—SARIMAX, Long Short-Term Memory (LSTM) networks, and Transformers—for anomaly detection in satellite telemetry data, specifically focusing on temperature readings. Anomalies in temperature data can be early indicators of potential malfunctions, making robust detection methods critical. In this regard, the effectiveness of both the SARIMAX and Transformer models was evaluated using the Satellite Monitoring and Analysis Platform dataset with over 105,400 temperature readings taken within 20 days. The LSTM autoencoder model was further assessed on univariate datasets containing 14,836 readings within 10 days. The SARIMAX model was then fitted with a percentile thresholding method for catching deviations, taking into consideration seasonal and trend components of data. Later, this model turned out to be comparable in performance with a Transformer model that has already shown really good results on sequential data by catching complex temporal dependencies and can perform anomaly detection leveraging the attention mechanism. In contrast, the LSTM autoencoder model detected anomalies using two methods: percentile- based thresholding and moving average methods. The results showed that the LSTM autoencoder model works well using the running average method; it is more accurate for some types of data. In this respect, the present research shows that integrating a machine learning approach with one statistical model can enhance the detection of satellite time series data anomalies. This will be followed in future work, dedicated to modifying such models and investigating transformer-based model applicability in multivariate datasets

ID 511

Automated Short Answer grading using Fasttext

Sampa Das, Udit Kumar Chakraborty

Abstract: Automated short answer grading (ASAG) is a crucial task in educational technology, aimed at providing timely and consistent evaluations of students' responses. This paper presents an ASAG system utilizing Fasttext word embeddings to enhance the accuracy and efficiency of grading short answers. This paper presents a state-of art approach for automated short answer grading (ASAG) using word representation in Fasttext. Compute the learner grade based on threshold value and compare the vector representation of each student's answer to a model answer using similarity metrics. Also explained the accuracy of the model with precision, recall, F1-score and highlighting how well it captures the entire context of the answers.

ID 518

Risk Prioritization in Distributed Agile Software Development using Artificial Neural Networks

Esha Khanna, Rashmi Popli, Naresh Chauhan

Abstract: Distributed agile software development is the most popular and trending software development life cycle model in IT industry. Distributed agile software development (DASD) integrates the principles of agile software development (ASD) and distributed software development (DSD). Although many benefits are achieved through the adoption of DASD in software development, numerous risk factors emerge due to contrary properties of ASD and DSD. However, all these risk factors are not equally important. This calls for a need to prioritize these risks based on their severity. This paper proposes a novel risk prioritization technique based on Artificial Neural Network to prioritize the risks for Distributed agile software development. The proposed work has been validated on the dataset of 110 risks. The reported results are then compared with the existing risk assessment techniques.

ID 548

Augmented eBusiness Intelligence Model in Machine Learning

Dr. Mohammad Rabiul Islam, Dr. Mohammad Ashikur Rahman, Junia Ahmed Noshin

Abstract: Augmented analysis in the digital marketing field becomes the next disruption in the e-commerce sectors due to its enhancement capabilities within AI tools. Traditional business models were suitable to build with emerging technology, making it superimpose to the next generation via virtual platforms. This article analyzes business intelligence with machine learning where business models improve through AI augmentation in the data science field. Needless to mention, AI already has updated various business concepts that boost advanced models within new platforms where combined tools are generalized as augmentation approaches. In such cases, Machine Learning tools figure out the individual model. This paper represents a typical model mechanism as if unfolding AI technology that promotes to innovation in digital marketing. Automation tools in Machine communication can play vital roles in business analysis and are important for making decisions that represent in this paper with difference between traditional and modern business models. General experiment with Neural Network model applied with augmentation features analysis. Futuristic data augmentation method as elaborated in this research article from its business perspective.

ID 534

Enhancing DNA Classification with Machine Learning Model's

Sultanul Arifeen Hamim, Dr. Mohammad Rabiul Islam, Mubasshar U. I. Tamim, Prottoy Prodhan Joy, Soily Ghosh Sneha and Sumaiya Malik.

Abstract: The field of DNA sequencing was discovered with rapid advance technology and as a result, the significant number of genetic data increases requiring robust computational methods. This study delves into utilizing machine learning (ML) models to enhance the classification of DNA sequences. DNA classification is crucial in genomics for species identification, understanding evolutionary relationships, and studying gene functions. We examine machine learning techniques such as Nearest Neighbours, Gaussian Process Classification, Decision Trees, Random Forests, Neural Networks, AdaBoost, and Support Vector Machines, highlighting their specific advantages in genomic analysis. Our research focuses on how these models can effectively handle large genomic datasets, improve computational efficiency, and enhance predictive accuracy in various fields, from biomedicine to agriculture and forensics. We critically evaluate each model's strengths and limitations and provide insights into their practical applications, ultimately guiding future enhancements in DNA classification methodologies.

ID 537

Orbital Decay Prediction of LEO Satellites Using AIML

Bijoy Kumar Dai, Debashish Paul, Nagaraju K, Leo Jackson, Nandini Harinath, BN Ramakrishna

Abstract: Estimating and predicting orbital decay of low Earth orbiting satellites is a challenging task. Orbital decay occurs due to various factors such as solar flux, geomagnetic flux variations, atmospheric drag, spacecraft height, spacecraft mass, the material of the spacecraft, its size and shape, spacecraft attitude, and spacecraft altitude. Some of these parameters are known, while others are not accurately known or cannot be predicted with high precision. Thus, analytically accurate decay prediction is always challenging. On the other hand, accurate orbital decay prediction is crucial to keeping the spacecraft close to a reference orbit so that it remains within its defined ground track. This paper analyzes the problem and explores the possibility of estimating orbital decay using machine learning algorithms to achieve better results. To predict decay more accurately, the onboard GPS receiver data has been taken. This data is highly accurate as they are derived after receiving at least four or more numbers of signals from Global Positioning System (GPS) satellites. This satellite's orbital data, along with associated Variables are used to train the machine for future position predictions. Many deep learning algorithms like Long Short-Term Memory (LSTM), Dense learning Network are considered based on suitability and implemented. This paper deals with actual satellite data and the results are presented have been compared with the actual results. The results are discussed in the conclusion section and the best algorithm is chosen for implementation.

ID 551

Satellite Data Stability Analysis and Command to PID correlation using Hybrid ML Techniques

Amit Kumar Singh, Shaik Mohammed Muzammil Ali, Deepanshu Garg, Priyanshu Jain, Sujit Menon, Leo John Jackson, and Nandini Harinath

Abstract: Satellite telemetry data management and analysis present unique challenges due to the high volume and complexity of data. This project aims to develop an efficient system to correlate satellite command to PID (Parametric Identification) using hybrid machine learning (ML) techniques, including the Auto ARIMA model for change detection. By integrating Auto ARIMA, the system can automatically detect shifts in command-to-PID correlations, enhancing satellite health monitoring, anomaly detection, and command verification. The study utilizes advanced data processing techniques, multiprocessing and multithreading to handle large datasets and develop robust ML models for real-time monitoring and command-PID correlation. This approach ultimately improves operational efficiency and reduces the manual workload.

ID 554

Hand Gesture Recognition Based on Surface Electromyography Signals with Wavelet Packet Transform Using ANN and LDA

Yousif M. Al-Muslim, Alaa Abdulhady Jaber

Surface electromyography (sEMG) signals capture electrical activity caused by muscle contractions and, therefore, have huge potential for applications in hand gesture recognition systems in prosthetics and human-computer interaction. Nevertheless, low-channel sEMG-based efficient classification of various hand gestures within a low-dimensional feature space remains challenging due to the complexity and variability of sEMG signals. In this work, the WPT is used in decomposing the sEMG signals and extracting both time-domain and frequency-domain features in an attempt to address these challenges. Moreover, this study involves the application of LDA for the purpose of selecting related features with the aim of optimizing the classification. The study applies ANN and SVM in the classification of eight different hand gestures, achieving an accuracy of 98.14% with the ANN model and 93.86% with SVM. The results indicate the effectiveness of the proposed method in improving the accuracy and reliability of the sEMG-based hand gesture recognition system.

Track 04: Computing, Algorithms, and Applications

ID 465

BIST Architecture Using Different Pattern Generators

Aman Kotagi , Suhas B Shirol, Amith, Prajwal Angadi ,Vimalnath A.S, Saroja V S , Vijay H M, Rajeshwari M

Abstract: In the proposed paper, a comparison of BIST with different PRPGs (Pseudo Random Pattern Generators) is implemented. This architecture contains a PRPG, arithmetic logic unit (ALU), read-only memory (ROM), and a comparator. Some PRPGs are examined, including Linear Feedback Shift Registers (LFSR), Complete Feedback Shift Registers (CFSR), Bit Swapped-LFSR (BS-LFSR), and Bit Swapped-CFSR (BS-CFSR). These BIST implementations are evaluated in detail concerning power, area, gate count, and timing analyses. In this paper, the effectiveness of methods to reduce transitions, reduce power, and improve fault coverage is demonstrated. The extensive simulations and comparison schematics for an 8-bit variant designed across a 90 nm technology node are performed. The findings emphasize the benefits of advanced LFSR and CFSR architectures and demonstrate how they may provide more affordable, efficient, and dependable testing solutions for contemporary integrated circuits.

ID 515

Temporal Feature Extraction and Gradient Boosting for Binary Cardiac Acoustic Classification

Ahmed Ali Farhan Ogaili,Noor T. Al-sharify, Zainab T. Al-Sharify,Mushtaq Talib Al-Sharify, Alaa Abdulhady Jaber and Emad Zuhair Gheni

Abstract: This study presents a novel approach to heart sound classification utilizing time domain feature extraction and the CatBoost algorithm. In this study analyzed 3,153 phonocardiogram recordings from the PhysioNet/Computing in Cardiology Challenge 2016 dataset. Method used first extracts statistical, entropy-based, and temporal features without relying on heart sound segmentation. The CatBoost classifier was employed for binary classification of normal and abnormal heart sounds. The approach achieved 91.2% accuracy, 88.7% sensitivity, and 92.4% specificity. The area under the ROC curve was 0.937 (95% CI: [0.921, 0.953]). Feature importance analysis revealed Shannon Energy and Sample Entropy as the most influential factors. These results demonstrate that time domain features, combined with advanced ensemble learning, can match or exceed the performance of more complex models. The interpretability of our method, coupled with its competitive performance, suggests potential for clinical applications in various settings. This research contributes to automated cardiac auscultation by demonstrating the efficacy of a segmentation-free, time domain analysis approach. Future work should investigate the model's generalizability across diverse patient populations and recording conditions

ID 545

Geospatial Landslide Susceptibility Zonation in Darjeeling-Kalimpong Hills through Stacked- Averaging-based Data-Driven Ensemble

Sumon Dey, Swarup Das, Deepanjan Sen

Abstract: The Eastern Himalayas is one of the most adversely affected areas by landslides as every year there happens to be a considerable amount of human lives lost along with economic infrastructural damage. This study was performed with a quest to analyze the landslide susceptibility of Darjeeling-Kalimpong hills, which is a crucial part of the Eastern Himalayas, through heterogeneous data-driven modeling techniques. The researchers utilized twenty geo-environmental factors, and a total of 1888 landslide points to prepare the landslide susceptibility map. The data-driven models taken into consideration were the multivariate additive regression spline (MARS), Bayesian generalized linear model (BGLM), Boosted Decision Tree (BDT), and their ensemble as MARS-BGLM-BDT which possessed good performance as measured by receiver operation characteristics (ROC) curve value of 0.862, 0.797, 0.881 and 0.867 respectively with training data. With testing data, the ROC curve values were found to be 0.864, 0.814, 0.860, and 0.865 for MARS, BGLM, BDT, and MARS-BGLM-BDT models respectively. With the testing dataset, the ensembled MARS-BGLM-BDT model clearly outperformed the rest of the standalone models with a promising ROC value of 0.865. The outcomes from the susceptibility maps can be utilized as a ready reference to the policy and decision-makers at the regional level so that the unanticipated loss of human lives and economic infrastructures can be decreased. The outcome from the susceptibility analysis can be considered a prominent input to develop an early warning system for the catastrophic scenario due to landslides.

ID 446

Low Earth Orbit Satellite Competition: Challenge or Opportunity?

Arav Gupta, Purnasha Chakrabarty, Malini Mittal Bishnoi, and Swamynathan Ramakrishnan

Abstract: The fierce rivalry for Low Earth Orbit (LEO) satellites is a two-edged sword that is both spurring innovation and bringing up important issues. In order to better understand the complex effects of increased competition in the low-orbit satellite market, this conceptual research study examines a number of issues, including environmental sustainability, economic effects, system resilience, technical improvements, geopolitical dynamics, and regulatory frameworks. The research seeks to provide solutions for attaining the sector's long-term coherence and preservation by addressing these issues.

In order to minimize space debris and other environmental dangers, the study first examines the environmental sustainability of low-Earth orbit (LEO) satellites by assessing their ecological footprint

and making recommendations for improvement. Subsequently, it assesses the financial consequences of heightened rivalry, pinpointing possible advantages like expense savings and inventiveness, in addition to hazards like market saturation and unstable financial conditions for relevant parties. In order to provide a strong worldwide communication infrastructure, the durability of satellite communication systems is evaluated, revealing weaknesses brought on by competitive pressures and suggesting mitigating techniques.

Technological advancements caused by competition are analyzed, revealing fresh perspectives and forecasting trends that may impact the LEO satellite industry in the future. The geopolitical dynamics arising from the race for LEO supremacy are studied, with a focus on security challenges and recommendations for peaceful coexistence. Finally, an evaluation of the evolving legal environment is carried out to identify regulatory gaps and offer comprehensive frameworks that will safeguard stakeholders' interests.

A thorough picture of the future of the LEO satellite sector is provided by this research paper's unique holistic approach, which integrates economic, geopolitical, technological, environmental, and legal views. The goal of the research is to ensure sustainable and fair growth in the developing space economy by informing industry plans, international cooperation initiatives, and policy decisions.

ID 547

Flood Susceptibility in the Teesta River Basin: Unraveling the Potential of Standalone vs. Hybrid Stacking Ensembles with Spatial Data Augmentation

Deepanjan Sen and Swarup Das

Abstract: Flood susceptibility assessment is a critical aspect of flood management, particularly in regions highly prone to flooding, such as the Teesta River Basin in the Indian subcontinent. This study investigates the effectiveness of standalone advanced machine learning ensemble models—LogitBoost (LB), Extreme Gradient Boosting (XGBoost), and Gradient Boosting Machine (GBM)—in predicting flood susceptibility, and introduces a novel hybrid stacking ensemble model, the Hybrid Tri-Boost Stack (LB-XGBoost-GBM). The research leverages spatial data augmentation, utilizing Cartosat-1 satellite imagery to enhance the predictive accuracy of flood susceptibility models. Feature selection was rigorously per-formed using the Boruta algorithm to identify the most influential flood predictors. The models are evaluated using performance metrics, including confusion matrices and Area under the Receiver Operating Characteristic Curve (AUC ROC) curves, to validate their predictive capabilities. The findings underscore the superior performance of hybrid ensemble method (accuracy of 99.30%, 91.50%, and 91.40% on training, testing, and validation datasets respectively), which integrates the strengths of the standalone models and highlight the importance of spatial data augmentation in improving model performance, resulting in more accurate and robust flood susceptibility predictions. The outcomes of this study are expected to significantly contribute to the development of effective flood risk mitigation strategies, offering valuable insights for policymakers and disaster management authorities in flood-prone areas.

ID 352

Object detection over the surface of solar panel using Yolov8

Bisheshwar Dev Sharma, Dipta Banik , Paramartha Banerjee , Progyajyoti Paul , Rangonath Banik , Chiradeep Mukherjee , Sudipta Basu Pal

Abstract: The use of artificial intelligence has significantly improved object detection in today's world. It has become a valuable tool for efficiently solving real-world problems. However, there is an area that has not received much attention yet – detecting objects on solar panels and finding effective solutions for the removal of them. In this research paper, the Yolov8 methodology has been used to train an algorithm to identify such objects on the solar panel surface. The Roboflow Object Detection algorithm was employed for annotating the dataset and classifying multiple objects. After that, we rigorously trained, validated, and tested the model using Yolov8s, Yolov8l, and Yolov8n.

.ID 533

Quantum Teleportation – Mathematical Foundations and ryptographic Applications Beyond the Speed of Light

Siddharth Rana, Dr Hari Mohan Raiand, Munis Khamidov

Abstract – Teleportation involves making an object disappear from one location in space and reappear at a different location in space at the same instant, retaining its original configuration. However, physical teleportation, particularly of mass, remains unfeasible due to the challenges associated with mass teleportation. The quantum realm offers a subtle and mathematically acceptable method for teleporting the quantum state of a particle to its entangled counterpart, even when separated by significant distances. This phenomenon, known as quantum teleportation, occurs irrespective of the distance between the entangled particles, as it relies on quantum entanglement, which is not constrained by spatial distance. Quantum teleportation holds promising applications in quantum cryptography, enabling the instantaneous transfer of quantum data (qubits) from one location to another without allowing any scope for intervention from potential eavesdroppers. It is important to note that quantum teleportation does not involve the teleportation of the entire particle, causing it to disappear and reappear at another location in space. Instead, it involves the transfer of the quantum state of a particle to its entangled counterpart, effectively teleporting the particle and leaving the original particle in a maximally disordered state, indicating successful teleportation to the other particle. The quantum realm introduces the concept of superposition, implying that a particle does not truly exist in a definite state until measured, allowing for the manipulation of its quantum state and giving rise to quantum teleportation. This paper offers insights into the mathematical foundations of quantum teleportation and explores its implementation in quantum cryptography through illustrative examples, thus providing communications beyond the speed barrier of the observable universe – the speed of light.

Track 02: Electronics and Communications

ID 341

A Comparative Study of 16-bit Vedic Multipliers using Individual and Hybrid Adders

Neelesh Biswas

Abstract: Multipliers are the basic building blocks of Digital Signal Processors (DSPs) and Vedic Multipliers are one of them. This paper deals with the design of 16-bit Vedic Multipliers that are implemented on an Artix-7 FPGA. For designing a Vedic Multiplier, three adders have been selected. The adders are first used individually and then by conceptualizing Hybrid Adders by combining any two or all the three of them distributed bit-wise. This paper compares the performance of all the adders used for checking the reliability of the Multiplier design. Hybrid Adders show better performance than adders when used as individual while designing the multipliers.

ID 429

Reduction of Dispersion Loss in Multimode Photonic Crystal Fiber

Sabikun Nahar, Akash Kumar Mondol, Md. Firoz Ahmed, M. Hasnat Kabir

Abstract: Photonic crystal fiber (PCF) is an example for two-dimensional photonic crystal structures. It obtains waveguide properties which can be varied not only materials with different refractive index but also geometrical size and number of cores or air holes in cladding region. Dispersion, one of the remarkable characteristics of PCF, plays a significant role in propagation of light. During propagation, time difference occurs between light pulses for their different paths, causing dispersion. Therefore, dispersion should be reduced for effective transmission of light. However, in multimode fiber, the dispersion is usually high. In this paper, a multi-mode circular-elliptical hexagonal photonic crystal fiber is proposed. The cladding of the proposed PCF have circular air-holes arranged in four hexagonal rings and four elliptical air holes in orthogonal whereas core is a single circular ring. This structure of fiber is designed and simulated using COMSOL Multiphysics, which is based on finite element method. The used material is pure silica. The performance parameters such as chromatic dispersion, confinement loss, V-number and effective area are determined by wavelength interrogation method and are optimized with respect to size of core and number of elliptical air-holes in the inner ring of the cladding. The result shows that V-number is greater than 2.50416 over wide range of spectrum which confirms the multimode operation in the fiber. The obtained value of performance parameters for the pitch 3μm are dispersion of $1\times\mathbf{10}-\mathbf{10}$ps nm−1 km−1, confinement loss of $\mathbf{2.11}\times\mathbf{10}-\mathbf{23}$dB km−1, effective area of $2.23\times\mathbf{10}-\mathbf{10}\mu\boldsymbol{m}\mathbf{2}$. The flat dispersion is found at the wavelength range 1.2μm to 1.6μm of main communication window along with very low confinement loss.

ID 464

A Secure Blockchain-based Food Recommendation Framework Using QR Mechanism

Puja Das, Chitra Jain, Ansul, Moutushi Singh

Abstract: Recent food scandals in India have heightened concerns regarding food safety and trust in food establishments. As current distribution channels struggle to meet market demands, there's a pressing need for a robust food traceability system. This paper proposes such a system, utilizing blockchain technology and QR codes to track food items throughout the supply chain. It examines the advantages and disadvantages of decentralized systems, highlighting their role in ensuring traceability, transparency, efficiency, reliability, and security. The proposed system aims to provide comprehensive traceability, leveraging features like distributed ledgers and decentralized systems, which offer immutability, transparency, consensus, disintermediation, and smart contracts. Food security, encompassing both availability and access to food, is vital. A key aspect of food security is ensuring the safety and quality of goods within the supply chain. Promoting organic and wholesome foods can enhance the supply chain. Despite regulatory approval of packaged goods, there's a lack of regular testing and assessment of the available supply in the market. This paper underscores the urgency for a secure and reliable food traceability system to safeguard consumer health and restore trust in the food market emphasizing its capacity to mitigate risks, optimize operations, and bolster consumer confidence in the food supply chain.

ID 474

Risk Prioritization in Distributed Agile Software Development using Artificial Neural Networks

Esha Khanna, Rashmi Popli, Naresh Chauhan

Abstract: Distributed agile software development is the most popular and trending software development life cycle model in IT industry. Distributed agile software development (DASD) integrates the principles of agile software development (ASD) and distributed software development (DSD). Although many benefits are achieved through the adoption of DASD in software development, numerous risk factors emerge due to contrary properties of ASD and DSD. However, all these risk factors are not equally important. This calls for a need to prioritize these risks based on their severity. This paper proposes a novel risk prioritization technique based on Artificial Neural Network to prioritize the risks for Distributed agile software development. The proposed work has been validated on the dataset of 110 risks. The reported results are then compared with the existing risk assessment techniques.

ID 491

Implementation of Hamming Code Technique in High- Capacity Memory Module

Shashidhar S. Neelakanthmath , Ramakrishna S, Suhas B. Shirol, Sujata S. Kotabagi

Abstract: This work outlines the application of the Hamming Code Technique to a high-capacity memory module, specifically a 128GB NAND Flash memory interfaced with Spartan 6 FPGA. The enhanced memory module is designed for integration in the cockpit voice recorders (CVR) and flight data recorders (FDR) used in aircraft black boxes. By implementing the Hamming Code, this design aims to significantly improve data integrity and error resilience, which is crucial for the accurate analysis of recordings to determine the causes of aviation accidents.

ID 531

Distributed Communication Services Programming Interface for Adaptive Trust-Oriented Automotive Services for Smart Homes

Noman Sohaib Qureshi, Divya Midhun Chakkaravarthy, Nasir Jamal, Muhammad Naveed Akhtar

Abstract: Intelligent Communication application programming interface (API) in a distributed system has become an integral part for developing smart home apps to connect intelligent computing hosts. The integration of intelligence into daily life of humans infusing smart behavior in machines without human intervention or explicit knowledge is the dream of father of computing Alan Mathison Turing which he presented during the first half of twentieth century times and again. Turing test for a computer used to be a benchmark in this context. This smart connectivity within a home may assist humans to facilitate numerous varieties of connected appliances and may provide the efficient utilization of various apps to facilitate the end users. Intelligent homes with smart computing nodes may increase our productivity like machines did at the start of industrial revolution. The primary challenge for an API for intelligent homes is to make sure that the functionalities are provided in a trust-based network over the API which needs to be dependable, vigorous, and adaptive with the knowledge of the context around the distributed network so that the trust factor that comply to the specific needs of the inhabitants. In this research, the derivation and formal testing of trust computational model for Distributed Communication Services Programming Interface (DCSPI) for Smart Homes is presented. This computation is performed by developing actions through labelled transition system, behavior and abstraction for each of the distributed components of the DCSPI. Each behavioral model component has intelligence of its context thus making it context-aware in terms of inter-process communication (IPC). Each Labelled Transition System (LTS) takes IPC equivalence computation from its concurrent LTS which reside in same state space to compute the trust weights between these. This IPC weighted-trust computation mechanism creates immunity in the DCSPI for external threats over the communication channel.

ID 383

A Heuristic to Solve the TSPS Using Multiple Perturbation Techniques: An Application to Emergency Medical Service

Prasanta Dutta, Indadul Khan, Krishnendu Basuli, Manas Kumar Maiti

Abstract: In this study a model for emergency medical services (EMS) in a smart city is proposed to enhance the EMS efficiency by coordinating IoT, Bluetooth technology, GIS (geographic information system), and the scheduling strategy of travelling salesman problem (TSP). The system collects real-time patient data from IoT-enabled medical devices attached with the beneficiaries and uses GIS to optimize the schedule dynamically for the emergency vehicle. The system dynamically collects and analyzes data on patient's vitals to identify the houses needing medical assistance and the nature of assistance. Then medical assistance team is sent by selecting shortest route through the selected houses to provide medical assistance. Traffic congestion in the route is monitored using GIS facility and the selected route is modified accordingly. Route selection through the selected locations(houses) can be treated as a TSP, where distance between any two locations can be found from GIS. Hence, an efficient and consistent algorithm for the TSPs is suggested and is used to develop a smart EMS with the help of IoT and GIS. in the algorithm, at first a procedure is used to generate a set of potential solutions (Hamiltonian paths through the target houses). Then, another procedure is used to explore the search space properly with the help of some predefined perturbation rules. If a selected rule (randomly selected) for the perturbation of a solution fails to improve the same then K-opt is used for possible enhancement. Another procedure is used for the regeneration of the stagnant solutions to overcome any local optima. The second and third procedures are repeated iteratively for searching the best schedule. The testing of the approach is done using different test instances from the TSPLIB and its efficiency and accuracy for considerably large size TSPs is well established. Using this heuristic, a case study in an urban setting is done to demonstrate the effectiveness of the EMS. The integration of IoT, GIS, and the proposed heuristic for the TSPs not only reduces response time but also enhances overall EMS efficiency, suggesting a promising solution for urban health-care systems aiming to improve emergency response and public health outcomes.

ID 510

IoT based Advanced Driver Assistance System for Emergency Services

Rajdeep Shaw, Sudip Mandal

Abstract: Advanced driver assistance system is an integral part in autonomous vehicle that not only assist the drivers to run the car smoothly but also enhance the safety of the passengers. This paper presents a smart machine for optimizing the performance of autonomous vehicles via the integration of multiple services and sensor information. Leveraging the strength of Raspberry Pi and Internet of Things (IoT), the machine activates users to visualize actual-time site visitors' statistics to monitor

and modify automobile velocity, with a focal point on minimizing traffic congestion and increasing protection. The system also consists of an emergency alert gadget designed to locate motive force drowsiness, tune alcohol intake, and screen injuries the use of a number of sensor information. By parsing and reading data from person sensors, together with GPS, alcohol, and vibration sensors, the gadget maximizes the efficiency of AI-primarily based self-riding cars. Sensor information is stored and analyzed on ThingSpeak server by Matlab, supplying real time valuable insights to the police and hospitals in case of accidents. This paper provides a detailed evaluation of the system's layout and implementation, in addition to an assessment of its performance. The proposed system represents a practical answer for promoting secure riding practices even as lowering the incidents of accidents happening because of impulsive driving.

ID 536

Position Estimation of An Autonomous Vehicle using Scaled Unscented Kalman Filter

Gangadharyya Korimath, Rohit Waddar, Anchal Aravind Patil, Sharatkumar S Kondikoppa, Rohit Kalyani1, Nalini Iyer, and Praveen N

Abstract: The accurate estimation of the position is very important for autonomous systems to operate effectively especially in mobile robotics and autonomous vehicles. Traditional estimation methods (e.g., Extended Kalman Filter EKF), which need to be linearized in nature, have difficulty with these nonlinearities and tend to lead the system into inaccuracies or instability. This paper aims to improve position estimation by Unscented Kalman Filters (UKF). The UKF which employs a deterministic sampling scheme, called the Unscented Transform (UT), to accurately approximate mean and covariance of state variables as opposed to Gaussian approximations over distributions in EKF hence is able exhibit better attitude estimation performance during highly non-linear flights. Here we proposed a step-by-step guide to explain how the UKF could be implemented in MATLAB for fusing GPS and IMU outputs from Xsens MTI G-710 sensor. The effort to prepare this implementation requires synchronizing sensor data, noise profile characterization and state vector, process model for autonomous navigation. Abstract through both simulation and real-world experiments, we empirically demonstrate the effectiveness of this approach using UKFs – showing large gains in localization accuracy with respect to state-of-the-art deterministic methods. This further emphasizes that the performance of UKF can contribute a lot towards the reliability and robustness of autonomous systems which makes it a suitable candidate for real-time mobile robot as well vehicular navigation applications.

ID 473

Optimizing IoT Systems with Blockchain: A Comprehensive Framework for Security and Efficiency

Aditya Pal, Hari Mohan Rai, Abdul Razaque, Sanjana Kumari, Kaustubh Kumar Shukla

Abstract: The technology of blockchain, which stands behind the Bitcoin, was changed to become a secure system of reliable and transparent transactions offering higher levels of transparency within various fields including financial services, healthcare sector, and property market. As a decentralized system, the combination of IoT and blockchain provides improved security and functionality to IoT-based applications. However, despite such a great potential of synergy, both technologies have specific problems. These include the need for lightweight block chain solutions that provide the advantages of traditional algorithms in the areas of speed, Scalability and security. This paper presents three major contributions to tackle these challenges: faster hash functions, refined encryption and decryption algorithms, and creation of a new signature mechanism for non-repudiation purpose. To this end, we presented parallel models for hybrid encryption, decryption and hashing modeled after natural networks. Moreover, the performance analysis of elliptic curve based on empirical analysis and parametric analysis is done in this study and found that the Edwards curve is more secure and efficient than the conventional elliptic curves. Through addressing these critical areas, this research seeks to enhance the flexibility of blockchain to work for IoT by presenting a secure, efficient, and superior solution for providing trusted, verifiable, and non-rewritable IoT connected systems.

ID 556

Metaverse Research Barriers: An Internet of Things Aspect

Alaa Hassan

Abstract: The article outlines research issues stemming from the growing interest in facilitating more immersive and intelligent settings that promote the next generation of seamless human-physical interactions. These surroundings range from enhanced physical to virtual and will hereafter be referred to as the Metaverse. We concentrate on issues representing a logical Internet of Things (IoT) research progression. The primary applications of IoT involve the integration of physical and cyber environments, enhancing "things" with improved contextual awareness, and providing human users with more seamless methods of perception and control, encompassing smart home automation and industrial applications. This IoT vision was predicated on the assumption that the quantity of physical "things" on the Internet would soon substantially exceed that of people. Intelligent IoT anticipates an expansion of edge intelligence with which people will engage. The paper delineates the research issues that extend the trend mentioned above.

ID 557

Design and Performance Analysis of a Triangular Slit Loaded Circular Patch Antenna for Efficient RF Energy Harvesting for GSM 1800 Band

Prithwish Bhattacharya, Manoj Sarkar, Debajyoti Misra, Abhijyoti Ghosh, Lolit Kumar Singh, Sudipta Chattopadhyay

Abstract: In an Internet of Things (IoT) environment, RF energy harvesting offers an attractive opportunity to reduce rely on regular batteries while supplying power simultaneously. This work successfully demonstrates a coaxial-fed circular microstrip patch antenna featuring a symmetrical triangular metal slit at the radiating edge, optimized for the GSM 1800 band on an FR-4 substrate. The proposed antenna achieves consequent enrichment of CP-XP isolation, miniaturization, and consistent gain, quantified as 36.04 dB, 29.68%, and 5 dBi, respectively. The structure also incorporates a single-stage Dickson voltage multiplier, and a T-type distributed matching network, resulting in a power conversion efficiency (PEC) of 29% at -5 dBm input power, with an output voltage of 0.6 V, and a PEC of 28% at 10 dBm input power, achieving an output voltage of 2.67 V.

Track 03: Image, Video & Signal Processing

ID 555

Benchmarking Crowd Counting Bird-Eye Images from Drones

Muhammad Saqib, Rabi Sharma, Saeed Anwar, and Nabin Sharma

Abstract: Crowd analysis is a widely studied automation problem with many surveillance applications, such as crowd monitoring, counting, public safety and security, and space design. Similarly, in automatic driving, crowd detection, counting, and analysis are fundamental tasks. However, the essential aspect of the mentioned task is that the datasets are not suitable for detection-based approaches, as most crowd datasets suffer from perspective distortion. To overcome this issue, normalization is often required before analyzing the crowd. Recently, as an alternative, Unmanned Aerial Vehicles (UAVs) are becoming very common for surveillance applications due to their low-cost and high-resolution images of crowded areas. The article benchmarks state-of-the-art object detection and density-based methods utilizing UAV aerial photographs on a new crowd-counting dataset called VisDrone. We aim to evaluate and compare various crowd analysis and counting techniques, explicitly focusing on using high-resolution UAV imagery to address the challenges associated with conventional ground-level camera datasets. Furthermore, we conduct extensive experiments to provide the results through commonly used metrics with accompanying insights, future direction, and conclusions. We hope this article will provide the community with baselines on the VisDrone dataset.

ID 349

Automated Multi-Class Brain Glioma Segmentation Using 3-phase Cascaded mLinkNet with Dense Concatenated Connections

Ashis Datta, Kuna Purkayastha, Palash Ghosal Rustam Ali Ahmed, Hiren Kumar Deva Sarma

Abstract: Glioma, one of the most prevalent and aggressive brain tumors, can significantly reduce life expectancy. The potential carried by noninvasive magnetic resonance imaging (MRI) to help physicians diagnose, determine the extent of tumors, plan treatment, and manage disease was significant. However, automatic brain glioma segmentation from MR scanning remains difficult, time-consuming, and computationally intensive. This paper uses a modified version of LinkNet (mLinkNet) based on convolutional neural networks (CNN) to present an automatic method for detecting brain tumor regions in multiclass brain MRI. Three types of deep CNN models were trained: W-mLinkNet, C-mLinkNet and E-mLinkNet. The multiclass segmentation problem was solved by dividing it into three binary segmentation steps for glioma regions: whole tumor, tumor core, and growing tumor core, and the models were applied sequentially. In addition, we investigated zero-centering and intensity normalization as preprocessing steps to ensure uniform intensity variation in tissues. To demonstrate the effectiveness of the proposed CNN model, a comparative study was conducted using the Brain Tumor Segmentation Challenge 2015 database (BraTS 2015).

ID 463

An Optimized Algorithm for Blocking Artifact Removal in Grayscale Images

Amanpreet Kaur Sandhu

Abstract: Image compression plays a vital role in today's era. The primary objective of the compression algorithm is to enhance the quality of compressed images while preserving the diagnostic integrity essential for medical analysis. The proposed technique first compresses the images using the JPEG algorithm, followed by a deblocking process to mitigate artifacts introduced during compression. However, to check the performance of the proposed technique is evaluated on a diverse set of medical images, including CT, MRI, Ultrasound, and X-ray images, with varying bit rates. Consequently, there are three types of compression algorithms such as lossless, lossy and hybrid. In order to, the algorithm was assessed using metrics such as Peak Signal-to-Noise Ratio including Blocking Effects (PSNR-B), Mean Structural Similarity Index (MSSI). Results indicate that the proposed method consistently outperforms existing methods, particularly that of exiting methods across all types of images and bit rates. The proposed algorithm generates higher PSNR-B and MSSIM values, indicating superior image quality and structural similarity.

ID 371

Swin-ResNeST: A CNN-Transformer Based Hybrid Model for Skin Image Lesion Segmentation

Aaditya Lochan Sharma, Kalpana Sharma, Kunal Purkayastha, and Palash Ghosal

Abstract: Skin lesion segmentation is a well-studied topic that faces obstacles such as differences in lesion shape, size, color, skin tones, and image noise. This study describes a U-shaped architecture designed for skin lesion segmentation. It uses ResNest blocks, Swin Transformer blocks, and Unified Attention methods integrated into skip connections. This CNN-Transformer hybrid model is effective in capturing both the local and global features. Squeeze attention and convolution are used in parallel in the bottleneck to balance the extracted local and global features, while the Unified Attention between the encoder and decoder blocks improves critical feature learning. The model's effectiveness is proven through training and testing on three publicly available datasets: ISIC 2016, ISIC 2017, and ISIC 2018. Comparative analysis with state-ofthe- art models indicate the suggested model's remarkable performance, emphasizing its ability to delineate skin lesions precisely.

ID 496

Novel Approach to Fruit Caloric Estimation Based on 2D Image-Driven Volume Measurement

Sayfullah Monsur Sujan Sarkar, Kazi Fardin Islam, Dhrubo Roy Partho,

Abstract: Nowadays, the need for a healthy lifestyle has become increasingly essential due to the surge in unhealthy food options. Nutritional awareness is crucial in promoting overall well-being. A balanced diet includes consuming foods that provide essential nutrients and meet caloric requirements. Fruits are vital source of micronutrients making them an important component of a healthy diet. Therefore, obtaining information about a fruit and its caloric content from a smart phone captured image can be highly beneficial. This capability can aid in dietary planning, help the individuals to make informed choices about their food intake, and maintain a balanced diet. In this research, we propose a fruit calorie measurement system that uses estimated volume from a single 2D image to calculate the amount of calories it contains. Our approach employs the YOLOv8 model for fruit detection and segmentation. For volume estimation, we take advantage of the almost symmetric shape of most of the fruits and use a modified disc integration method on each side of the fruit's shape curvature. This volume is then used to calculate how much calories are contained in the fruit. We tested our system to estimate calories of the fruit "Apple". The experimental results show a reasonable accuracy for calorie estimation.

ID 541

A Teaching Learning Based Optimization Approach for Registration of COVID-19 Lung CT Images

Tapas Sangiri , Dr. Md Ajij , Subhodip Mondal

Abstract Meta-heuristic algorithms are extensively used in medical image registration to address optimization challenges and aid in diagnosing various illnesses, including cancers such as breast, lung, and brain cancer. Lever- aging image transformation, intensity-based registration techniques in both multi-modal and mono-modal registration combine several images containing identical information into a single representation. Enhancing the similarity metric across different images is crucial. In this study, we propose a novel approach for detecting COVID-19-impacted lung regions in Computed Tomography (CT)images by addressing image registration. Given the success of the Teaching Learning Based Optimization (TLBO) algorithm in medical image analysis and comparisons. We propose a TLBO algorithm for registering lung CT images of COVID-19 patients. Simulation results demonstrate that the proposed algorithm surpasses the Particle Swarm Optimization (PSO) algorithm in both registration accuracy and robustness.

ID 558

Supervised Learning Approaches for OSCC Detection: A Comparative Study of SVM, MLP, and Random Forest Classifiers on Histopathological Images

Rupesh Mandal, Tenzin Thabkhe, Musaddique Anwar, Nupur Choudhury, Anuran Patgiri, Jyoti Barman, FHA

Abstract: Oral Squamous Cell Carcinoma (OSCC), is a prominent category of cancer and often detected at advanced stages, leading to poor survival rates. Advanced image classification techniques aid in early and accurate detection of OSCC, improving diagnosis and treatment outcomes. This work is based on diagnosing OSCC at an early stage. We combine local binary patterns as well as features extracted using Convolutional Neural Networks (CNN) from the dataset. The combined resultant features are then used to train three different classification models using the resulting feature vectors. The classifiers used are Support Vector Machine (SVM), Multi-Layer Perceptron (MLP) and Random Forest. The study comprises of experimenting on a dataset of two classes, Normal and OSCC images consisting of 89 and 439 images respectively. The data imbalance is handled through data augmentation. The result demonstrates a test accuracy of 94.89% by the SVM model using only 528 images of 100× magnification images.

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