INTERNATIONAL CONFERENCE ON
APPLICATIONS OF AI & MACHINE LEARNING

ICAML 2025

February 22 - 23, 2025

Engineer Bhavan, Madhya Marg, Sec.– 19, Chandigarh, India

Abstract Proceedings

THE INSTITUTION OF ENGINEERS (INDIA) – IEI

ASSOCIATION OF PROFESSIONALS – AoP

JAGAT GURU NANAK DEV PUNJAB STATE OPEN UNIVERSITY, PUNJAB, INDIA

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JAGAT GURU NANAK DEV PUNJAB STATE OPEN UNIVERSITY, PUNJAB, INDIA

It is with great honor and enthusiasm that I extend my warmest greetings to all the distinguished participants, researchers, and professionals attending the **International Conference on Applications of AI and Machine Learning (ICAML-2025)**. This conference stands as a testament to the relentless pursuit of innovation and excellence in the ever-evolving fields of artificial intelligence and machine learning.

As technology continues to redefine the way we live, work, and interact, ICAML-2025 provides a dynamic platform for thought leaders, academicians, and industry experts to exchange pioneering research, explore emerging trends, and collaborate on groundbreaking solutions. The contributions presented in this proceeding reflect the collective wisdom, dedication, and expertise of scholars committed to shaping the future of AI and ML.

I commend the organizing committee for their unwavering efforts in curating a conference of this stature and thank all the contributors for sharing their invaluable insights. I am confident that the discussions and deliberations at ICAML-2025 will lead to transformative ideas and meaningful advancements in this field.

Wishing you all a productive and enriching experience at ICAML-2025.

Dr. Baljit Singh Khehra
Chairman, The Institution of Engineers (India)

ਜਗਤ ਗੁਰੂ ਨਾਨਕ ਦੇਵ
ਪੰਜਾਬ ਸਟੇਟ ਓਪਨ ਯੂਨੀਵਰਸਿਟੀ
ਪਟਿਆਲਾ

It is with great pride and enthusiasm that **Jagat Guru Nanak Open State University (JGNSOU)** joins as a collaborator for the **International Conference on Applications of AI and Machine Learning (ICAML-2025)**. This conference is a significant platform for researchers, academicians, and industry experts to engage in meaningful discussions and explore the transformative potential of artificial intelligence and machine learning.

At JGNSOU, we are committed to fostering research-driven education and innovation. AI and ML are at the forefront of technological evolution, shaping industries, enhancing decision-making, and improving the quality of life. The insights and research contributions presented in ICAML-2025 will undoubtedly propel forward-thinking solutions, addressing real-world challenges and driving sustainable development.

I extend my sincere appreciation to the organizing committee, speakers, and researchers for their dedication to advancing knowledge in this ever-evolving domain. I am confident that this conference will open new avenues for collaboration, innovation, and academic excellence.

Wishing all participants a successful and intellectually enriching experience at ICAML-2025.

Vice Chancellor
Jagat Guru Nanak Open State University, Patiala

It is my great pleasure to welcome all esteemed researchers, academicians, industry experts, and participants to the **International Conference on Applications of AI and Machine Learning (ICAML-2025)**. This prestigious event serves as a vital platform for exchanging groundbreaking ideas, fostering collaborations, and exploring innovative advancements in AI and machine learning.

The rapid evolution of artificial intelligence continues to reshape industries, revolutionize research, and drive technological transformation. ICAML-2025 is a testament to our collective efforts in addressing emerging challenges, unlocking new opportunities, and pushing the frontiers of knowledge in this dynamic domain.

I extend my heartfelt gratitude to the organizing committee, distinguished speakers, and contributors whose dedication and efforts have made this conference a reality. I also commend the authors for their valuable research contributions, which enrich the scientific community and inspire future innovations.

On behalf of the **Association of Professionals**, I wish all participants a fruitful and engaging conference experience. May ICAML-2025 spark meaningful discussions, novel insights, and lasting collaborations.

Best wishes for a successful conference!

President,
Association of Professionals

AI-Powered Emotion Detection and Sentiment Analysis for Mental Health Care: A Comprehensive Review

Bijendra Tyagi (JSSATE Noida); Kunal Aggarwal (JSSATE Noida)*; Vanshika Pal (JSSATE Noida); Dipanshi Diwakar (JSSATE Noida)

This paper discusses the potential artificial intelligence has in addressing mental health challenges by combining advanced emotional control strategies with digital tools. An AI-based chatbot has been developed, which is particularly designed for emotion recognition as a virtual assistant that would help individuals with their mental health concerns. This requires a digital journal for tracking daily emotions, allowing the chatbot to change its responses based on the user's emotional status, thus giving them more personalized answers. This is intended to help users have better self-awareness and regulation of emotions. It integrates into such a paper an implementation of a specific task scheduler designed for such mental health disorders as ADHD. The scheduling tool encourages users to set, prioritize, and organize their tasks efficiently, minimizing the typical stress of not managing their time properly or procrastination. The article emphasizes a need for bringing the digital revolution together with more conventional therapeutic settings to make mental health services more accessible, affordable, and effective. AI-empowered tools can democratize access to quality mental health services as they alleviate barriers such as cost and stigma to receiving treatment. This revolutionary framework represents a more comprehensive approach that combines evidence-based methods with technology support, for the management of mental illness and the general well-being of individuals.

On System Verilog and FPGA Simulation of Generalized Pipeline Cellular Array

Harpreet Singh (Wayne State University)*; Lubna Alazzawi (Wayne State University); Kaveh Abani (Wayne State University); Bhupinder Mavi (Wayne State University); Ihfaz Islam (Wayne State University)

With the burst of data and networks, there is increasing interest in array computing. Array computing requires the operations to be done in the form of an array. A generalized pipeline array appeared in a number of conference papers by the authors. This array appeared in several books and research papers. The objective of this paper is to simulate a generalized pipeline array. This array can do arithmetic operations in a pipeline manner. Recently some interest has been shown in the VLSI implementation of this array. The paper shows FPGA simulation of this array. In particular, the BASYS 3 implementation of this array has been taken up in this paper. The implementation has been done by using different Boolean expressions of arithmetic cell and control cell, which are basic constituents of this array. These cells have been written in SystemVerilog as compared to conventional Verilog in previous papers. Some examples have been illustrated for this implementation using SystemVerilog. The testbench has also been done in SystemVerilog which has become an industry standard. It is hoped that this simulation on BASYS 3 will help in the design of the advanced digital circuits.

An Enhanced Underwater Object Detection Using Optimised Deep Learning

Nikhil Dangi (Vellore Institute of Technology, Vellore)*

As humanity pursues modernism and development, an environmental emergency is emerging under the surface of our oceans, lakes, and rivers. A large amount of trash continues to be dumped into the once-pure undersea world, posing serious threats to marine life, water quality, and human health. Underwater waste, often out of sight, should not be out of mind; it leads to catastrophic outcome for the natural environment and our own well-being. To address this silent crisis, here is an innovative underwater waste detection approach combining RAUNE-Net for image enhancement and YOLOv9 for waste detection. To enhance underwater images RAUNE-Net uses a combination of residual and attention-driven techniques, increasing visibility and clarity of images. Then, YOLOv9 leverages the latest advances in deep learning, such as programmable gradient information and the generalized efficient layer aggregation network, to accurately identify and classify various types of underwater waste.

Deep Learning Based Intelligent System For Visually Impaired Persons At Bus Station

Jefrin Kennedy J (Sathyabama University)*; Karthik V (Sathyabama University); Dr. Poonguzhuli S (Sathyabama University)

This project focuses on creating an intelligent bus announcement system to aid visually impaired individuals in independently recognizing and boarding buses. The system leverages a camera module paired with sophisticated object detection algorithms to identify bus numbers and convey the information via audio outputs. At its core, the system employs machine learning methods to reliably detect and interpret bus numbers under various environmental conditions, such as differing light levels, weather scenarios, and obstructions. By offering real-time auditory feedback, the system significantly improves mobility and independence for visually impaired users, ensuring they have better access to public transportation. This innovative solution directly addresses the need for greater accessibility, fostering autonomy for the visually impaired community. Designed to be economical, durable, and simple to deploy across urban environments, the system offers a practical solution. The introduction of this smart bus announcement system holds the potential to enhance the lives of visually impaired commuters by enabling them to confidently navigate public transportation systems. By integrating cutting-edge technology with real world applications, this initiative aims to contribute to a more inclusive society where everyone can seamlessly utilize modern public transit facilities.

Real-Time Patient Monitoring using AIML

Nagula Sathvik (Chandigarh University)*; Sai Varshith Kotha (Chandigarh University); Mula Venkata Amruth Reddy (Chandigarh University); Abdul Subahan Sheik Dawood (Chandigarh University); Dayal Sati (Chandigarh University)

In today's healthcare environment, real-time patient monitoring systems are critical for guaranteeing patient safety and quick medical intervention. This study describes a real-time patient monitoring system that uses Multivariate Long Short-Term Memory (LSTM) and Extreme Gradient Boosting (XGBoost) machine learning algorithms to classify and forecast pulse and heart rate data, thereby improving patient health tracking in a hospital scenario. The

system analyzes physiological data to forecast and detect anomalies, allowing for prompt intervention. The LSTM model captures temporal dependencies for forecasting, whereas XGBoost provides robust classification skills by dealing with complex, nonlinear interactions in multivariate data. Our system was evaluated in a simulated hospital setting, and it produced reliable and accurate real-time forecasts of patient heart and pulse rates. The findings show that this system can effectively help healthcare practitioners in continuous monitoring, enhancing patient safety and outcomes through early anomaly detection.

Bridging Art and Fashion: AI-Driven Techniques for Seamless Design Integration

Rishita Mantri (NMIMS)*; Sofia Francis (NMIMS)

This research explores the successful integration of artwork onto T-shirts using deep learning models, in particular ResNet18 and Pix2Pix, which allow for seamless integration of artwork onto T-shirts. That is, using the extracted feature capabilities of ResNet18, this model can retain and save the texture and contours of garments for integrity in the blending process. The Pix2Pix model, more specifically an image-to-image translation model, allows for it to map artwork properly onto the T-shirt and thus result in visually coherent and high-quality outputs. It contributes to the automation of fashion design with minimized manual effort, zero wastage, and rapid prototyping. The comparative advantage of the two models is depicted through quantitative measures, such as MSE and inference time. MSE for the former is 0.0486, but its speed is faster than that of Pix2Pix. Results vindicate AI-based approaches in fashion design and form a trajectory toward sustainable practices. It goes further to talk about the implications for the fashion industry and to discuss future extensions and broader applications of the methodology.

Leveraging Smart Contract for Blockchain-Based Collaborative DDOS Mitigation in SDN-Enabled Autonomous Systems

Shikha Garg (Punjabi University)*; Sonia Goyal (Punjabi University Patiala); Abhinav Bhandari (Punjabi University, Patiala)

Traditional DDoS mitigation mechanisms often need help with response time latency, trust in shared threat intelligence and the need for manual intervention during attacks. This paper explores how smart contracts leverage blockchain-based collaborative DDoS mitigation in SDN-enabled Autonomous Systems. Due to increased attack complexity and size scale within DDoS, traditional mitigation methods can hardly provide sufficient protection. This work explores the idea of integrating the programmability of SDN, the decentralized nature of blockchain, and the automation capability of smart contracts to mitigate DDoS attacks in SDN-Enabled AS. Further, the proposed idea will permit different autonomous systems to share threat intelligence, coordinate mitigation operations, and automatically execute predefined sets of actions through smart contracts. Based on this, the research will describe the design and efficient use of smart contracts that could help in threat mitigation in a timely, automatic resource allocation, and response across multi-domains.

Immediate Chemical Alerts For Drugging Crime Defence

Preetham H B (New Horizon College Of Engineering)*; Rakshan L (New Horizon College Of Engineering); Sanjay M (New Horizon College Of Engineering); Vilas T M (New Horizon College Of Engineering); Ms.Soumya K V (New Horizon College Of Engineering); Mr. Adinarayana V S (New Horizon College Of Engineering)

The misuse of drugs and alcohol in public settings poses significant public health and safety challenges. Traditional methods of detecting intoxication rely on manual observation, which may be slow, unreliable, and require extensive human intervention. This study proposes a robust system that integrates Internet of Things (IoT) and machine learning (ML) techniques to automatically detect signs of drug and alcohol consumption in real time. The system uses an ESP32 microcontroller, equipped with multiple sensors, including a sweat sensor, heartbeat sensor, alcohol (MQ) sensor, and MEMS accelerometer. These sensors continuously monitor physiological indicators like sweat composition, heartbeat irregularities, alcohol levels, and walking patterns to determine potential drug and alcohol consumption. Data collected from these sensors are transmitted to a cloud platform for real-time analysis. A machine learning model, utilizing a Random Forest algorithm, is deployed to predict intoxication and notify authorities in relevant cases. The system's ability to monitor and analyze data in real-time offers significant advancements in the detection and prevention of drug abuse in public spaces.

Exploring Features For Driver Fatigue Detection

Reshu (Punjabi University,Patiala)*; Abhinav Bhandari (Punjabi University, Patiala); Raman Maini (Punjabi University, Patiala)

In recent years, with the increase in the number of road accidents of driver drowsiness that has been accused, there is a significant amount of research for the advancement in the growth progress for the driver drowsiness detection systems that has received major interest. The review paper consists of overview of various methodologies, datasets, and evaluation metrics used in the study of driver drowsiness detection systems. Which consists of feature like extraction, classification and sensor-based methods. The paper has examined the core ideas on an exploration of the fundamental concepts of drowsiness detection that comprises of physiological, behavioral, and vehicular indicators of fatigue detection. It also describes the various data sources that are used by machine learning models for drowsiness detection. These sources include facial expressions, eye movement, head position, heart rate variability, and EEG signals. Finally, the paper discusses the advantages and disadvantages of the current techniques and provides a valuable perspective for researchers to enhance the road safety through advanced driver drowsiness detection systems. This review provides a comprehensive overview on the current state of research on driver drowsiness detection. It describes several important issues of drowsiness detection systems that must be ensure that are effective and reliable. The review also discusses about the future research directions that could lead for the improvement of drowsiness detection methods.

Empowering Users: The Role of Cybersecurity Awareness in Protecting Personal Data

Vishal Singh (Manav Rachna International Institute Of Research And Studies)*; Teena . (Manav Rachna International Institute Of Research And Studies); Yashwant Singh (Manav Rachna International Institute Of Research And Studies); Urvashi Sangwan (Manav Rachna International Institute Of Research And Studies)

Data protection, especially personal data, is a paramount concern in the modern world because of the ever-emerging and developing nature of cybercrime. Technology continues to score several breakthroughs in the cybersecurity aspect, but still, the user is the weakest link. The research question of this research is: how does awareness of cybersecurity affect one's capability

to secure his or her information? Therefore, conducted a survey of 1000 internet users and 50 in-depth interviews with cybersecurity professionals. Our research highlights demonstrate a positive linear relationship between cybersecurity assurance levels and the use of protective measures. Hence, participants who achieved higher awareness scores were 2.5 times more likely to use complex passwords, activate two-factor authentication, and update their software frequently. Furthermore, these people decreased the rate of falling into phishing scams with a 40% margin below the rate of such a score among those with low levels of awareness. Existential data supported the need for ongoing education and cued specific, applied, as crucial to sustained behavioral change. Finally, we understand that increasing cybersecurity consciousness is a cost-efficient intervention that could be scaled up as a solution to inadequate protection of personal data. From the above research findings, it is clear that greater focus is required in terms of awareness and that the education of cybersecurity should form part of the syllabi in schools and form part of the professional training for employees. In other words, with the help of knowledge and skills provided to the users, we can develop a more powerful and safe world from existential cyber threats.

Sarcasm Detection For Hindi Social Media Text

Jayashree Salunkhe

Sarcasm is a unique sentiment that concludes with the exact opposite implication of what individuals are trying to say in the text. To detect irony in the text that expresses sentiments is known as sarcasm identification. Sarcasm's imaginative and symbolic nature presents crucial difficulties for perceptual computing systems that perform sentiment analysis. Sentiment analysis is just one of several uses for natural language processing NLP. In sentiment analysis, the key point is that the power to change or reverse the polarity of the message being transmitted is sarcasm. It is difficult to identify when someone uses corrected words to convey a negative meaning. Sarcasm is now broadly utilized by users on the platforms of social media in regional languages to express their opinions about any subject, problem, or individual. Various methods are employed to identify sarcasm in English scripted material. It's a language that's widely used in social networking. Nevertheless, there hasn't been much research done on sarcasm recognition in Bengali, Hindi, Telugu, Tamil, Urdu, and Telugu. Despite their popularity in a large networked society, the main reason for the limited research done on these distinct languages for sarcastic analysis is the absence of an annotated corpus. We have gathered and created sarcastic lines in Hindi for this study. Hindi is a spoken language all over the world. This study provides a thorough analysis of the accuracy of sarcasm detection in Hindi social media writing by the use of DL (Deep Learning) and ML (Machine Learning) algorithms. The paper suggests a novel method for sarcasm detection that takes into account the contextual aspects of DL and ML algorithms. A new dataset of Hindi text labelled with relevant expressions was developed to train and test the model.

Vigilant Vision: A Review on Real-Time Fight Detection Using Computer Vision and Deep Learning

Anushka Tyagi (JSS Academy of Technical Education, Noida)*; Poonam Chaturvedi (JSS Academy of Technical Education, Noida); Khushi Nagpal (JSS Academy of Technical Education, Noida); Manya Gupta (JSS Academy of Technical Education, Noida)

Conventional surveillance systems often fail to identify violent situations in real time, a critical requirement for maintaining public safety in high-risk environments such as public gatherings, airports, and schools. This review consolidates the latest advancements in computer vision and

deep learning techniques for violence detection, focusing on approaches leveraging Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks. Key challenges, including dataset limitations, computational constraints, and real-world implementation barriers, are critically analyzed. In contrast to traditional reviews, this paper introduces the Vigilant Vision system as a novel, lightweight, and scalable solution optimized for edge devices. Synthesizing insights from over 40 studies, this work highlights the need to address dataset diversity and biases while identifying pathways to enhance public safety automation through the integration of edge computing, multi-modal detection, and predictive analytics. Emerging trends, such as transformer-based architectures and synthetic data generation, are also explored as promising directions for future advancements.

Investigative research on multiple document summarization in healthcare domain

Akanksha Dhamija (IGDTUW)*

Over the past two decades, text summarization has played a vital role across various industries, particularly in the scientific and medical fields, where it enhances efficiency by enabling researchers and practitioners to quickly comprehend large volumes of information. With advancements in information technology and the Internet, the exponential growth of electronic medical data necessitates effective retrieval methods. Multi-Document Summarization (MDS) has emerged as a reliable solution, integrating information from multiple sources to generate concise and informative summaries. This is particularly crucial in medicine, where clinical reports, research papers, and patient records contain extensive data essential for informed decision-making. This survey explores the key aspects of MDS in the medical domain, with a focus on patient medical reports, and analyses various methods, algorithms, challenges, applications, and future directions for improving automated biomedical text summarization.

Symptom Based Drug Recommendation System Using Machine Learning Algorithms

Padmavathi Anbarasan (Amrita Vishwa Vidya Peethamn)*; vinay vardhan (amrita vishwa vidya peetam)

The adoption of machine learning in the health sector has grown rapidly, planting smart systems for diagnosis and treatment suggestions. This work presents a medicine recommendation system that analyzes the kind of disease a user is likely to have based on the symptoms he or she is experiencing and suggests the right prescription. A large list of symptoms and corresponding illnesses is used as a parameter for predicting the accuracy of the model. The system intends to assist the medical practitioner in first-line diagnosis as well as administering the first choice of treatment. There can be improved patient status and decreased pressure on health care facilities from this. The proposed architecture also focuses on the issue of robustness and applies data pretreatment techniques such as cleaning, normalization for the noisy data, and missing data occurrence that is common in a real-life health care environment and feature extraction. Also, techniques such as augmentation overcome cases of missing variables and improve the training process of models. The areas of application, the practicality of the system, and its performance for pragmatic clinical requirements are assured by a strict means of assessment that also assures optimum performance with test data and the system’s adaptability to unpredictable situations.

Revolutionizing Audiological Reporting through Audiogram Digitization and AI Integration

Issac V (St.Joseph's College Of Engineering)*; Jack Tillo T (St.Joseph's College Of Engineering); Dr.Elavarasan R (St. Joseph's College Of Engineering)

The proficient interpretation and punctuation out of audiological reports is vital to achieving optimal patient outcomes in this burgeoning, challenging arena. A new approach to enhance the accessibility and omnipresent hearing reports for reporting audiograms, the Audiogram Digitization Tool (ADT). The ADT converts traditional audiograms into a uniform digital format for use within electronic health record systems. It provides the significant hearing threshold data using state-of-the-art image processing techniques which are helpful in interpreting data and correlating with clinical implications. Initial evaluations demonstrated a symbol detection accuracy of 93.5%, a frequency mapping error within ±3.5 Hz, and a threshold mapping error within ±2.0 dB. Furthermore, the ADT reduced processing time, completing tasks in an average of 5.2 seconds compared to 12.5 seconds for existing systems.

Recommender System Using Machine Learning Techniques: A Review Paper

John Mhagama (Kurukshetra University)*; Kanwal Garg (Kurukshetra University)

Recommender systems are vital for sorting through the vast online information, driven by changing user habits, personalization, and increased internet access. This paper presents a systematic review of recent advancements and applications in recommender systems, focusing on their evolution across domains such as e-commerce, e-learning, healthcare, social media, travel and tourism, financial services, entertainment, food and dining, real estate, gaming, news, and publishing. It examines various recommendation techniques, including content-based, collaborative, and hybrid systems, while addressing challenges such as data sparsity, scalability, and privacy concerns. By analyzing studies conducted from year 2011 to 2024, the paper highlights the significant role of machine learning in enhancing recommendation accuracy and adaptability. Additionally, it explores emerging approaches like graph-based and deep learning models, providing insights into the current research landscape and identifying gaps to inform future innovations in efficient and user-centric recommender systems

Unlocking Insights: Generating Synthetic Data with GANs Across Diverse Datasets

Padmavathi Anbarasan (Amrita Vishwa Vidya Peethamn)*; Udatha Thanuja (Amrita Vishwa Vidya Peetam)

Generative adversarial networks (GANs) are a cutting-edge approach to generative modelling in deep learning. GAN’s was proposed in 2014 by Ian Goodfellow. Since then, there has been significant growth in adversarial networks. New break- throughs and innovative approaches in generative adversarial networks can radically elevate and increase the quality of synthetically generated images by extracting patterns from the original datasets. Among the major advancements of GAN, image synthesis is the most prominent and extensively studied application. The concept of adversarial training, where two neural networks compete against each other, has introduced a novel paradigm for learning complex patterns in the Images. The paper emphasizes the vital role of GANs in strengthening and fine- tuning datasets, honing further research to create GANs capable of producing high quality synthetic samples with constrained practice of data.

Harnessing YOLOv4 and Faster R-CNN for AI-Driven Pothole Detection and Road Infrastructure Analysis

Akshat Sharma (Jaypee University of Information Technology Waknaghat)*; Amardeep Boora (Jaypee University of Information Technology Waknaghat); Yugal Kumar (STME NMIMS Chandigarh campus, India)

Maintaining road infrastructure for long time is essential for ensuring safety, minimizing maintenance expenses, and improving vehicular performance. This research presents an innovative deep learning methodology for the automation of pothole detection and infrastructure assessment utilizing YOLOv4 and Faster R-CNN models. More than 1000 road surface pictures acquired from drones, smartphones and publicly available dataset in the Kaggle were annotated, preprocessed, and utilized to train and evaluate the models. The preprocessing methods encompassed image scaling, normalization, and augmentation to enhance detection precision. Our methodology shown substantial enhancements compared to conventional pothole detection techniques, attaining a detection accuracy of 92% and a mean average precision (mAP) of 88%. The models underwent thorough validation across multiple performance metrics, including precision, recall, and F1-score, demonstrating robustness under diverse environmental conditions during real-world testing. The identified potholes were assessed with GIS technologies to determine the severity and distribution of road damage, hence guiding maintenance plans and priorities. This analysis indicates that the adoption of the suggested deep learning technique may decrease road maintenance expenses by as much as 20%, indicating significant economic advantages.

Open Set Logo Detection and Blurring Using YOLOv5 and CSP ResNeXt-50

Divinia Dsouza (NMIMS University); Jaiden Dsouza (NMIMS University)*; Kenneth Pereira (NMIMS University); Tanish Anam (NMIMS University); Sofia Francis (NMIMS University)

Digital content continues to grow exponentially, as does the consumer base it reaches. This makes the online positioning of any brand synonymous with its reputation. Poor editing and unintentional display of copyrighted content can cost brands or content creators a pretty penny in copyright claims and legal disputes. Existing censoring software follows a laborious and time-consuming process of manually adding black bars, pixelation or blurring spots. In this paper, we present a two-stage open-set approach to detect and identify logos automatically from images or frames. We propose implementation of two methods to apply this approach: identifying all logos and matching only a specific target brand logo or matching logos from a set of target brands. The proposed methods can be applied to a diverse set of use cases, such as logo censoring and brand volume detection.

Trip Trove - Comparative Review Analysis

Mridvi Sharma (PES University)*; N Shreelekha (PES University); A Geethika Chowdary (PES University); Siddarth Rao (PES University); Dr. Ashwini M Joshi (PES University)

It has become increasingly challenging for the traveler to take the right decision in this era of digital transformation because of the flood of online hotel reviews. One major barrier lies in distinguishing between the original and the deceptive reviews. Fake feedback can very effectively mislead the user, and our solution,Trip Trove, integrates machine learning algorithms that very effectively detect fake reviews. Apart from this, Trip Trove takes the summaries of honest reviews and condenses it further to provide important information relating to the hotel's amenities. The platform also provides comparative analysis of hotels that aid users in selection and decision-making based on personal interests. Combining the elements of authenticity

review, summarization, and comparison into one place brings more confidence to a traveller's decision-making and eases the planning.

A Novel Neural Network Approach for Solving Multi-Objective Capacitated Single Allocation Hub Median Problem

Arup Bhattacharjee (RCC Institute of Information Technology)*; Anirban Mukhopadhyay (University of Kalyani)

The Single Allocation Hub Median Problem is a well-known research domain under the Hierarchical Facility Location Problem. In this paper, we introduce a capacity constraint into the Multi-Objective Single Allocation Hub Median Problem. The aim of this study is to develop a novel neural network architecture for the capacitated Single Allocation Hub Median Problem, efficiently solving real-world supply chain networks while capturing complexity and nuances. The primary objectives include the performance evaluation and comparison of the proposed neural network techniques with traditional optimization methods. The study compares the results of a mixed-integer linear programming problem formulation using the PuLP Python library and two neural network techniques, namely Sigmoid and ReLU activation functions with the Nadam optimizer. The proposed neural network architectures outperform traditional optimization methods in terms of solution quality and computational time. Results for different combinations of hub and central hub nodes show that the Sigmoid-based approach performed better in 30.0% of combinations, while the ReLU-based approach performed better in 70.0% of cases. Overall, the ReLU-based approach demonstrated superior convergence speed compared to the other techniques.

Artificial intelligence assisted intraoral image analysis to identify and distinguish oral potentially malignant disorders and oral cancer

Dr. Achla Yadav (PGIDS)*; Dr. Mala Kamboj (Post Graduate Institute of Dental Sciences); Dr. Kamaldeep Joshi (University Institute of Engineering and Technology, MDU)

Universally, oral cancer is a major health concern, with the highest incidence being reported in the Indian sub-continent. More than two-thirds of oral cancer cases in a prevailing population are preceded by asymptomatic, clinically evident lesions, referred to as oral potentially malignant disorders (OPMDs). Most cases of oral cancer are diagnosed at an advanced stage, which leads to an increase in the mortality and morbidity of such cases. Screening at an early stage with collateral diagnosis of OPMD would increase the chances of cure and survival of suspected cases. An advance, prompt, accessible practice to diagnose OPMDs or malignant lesions might be achieved by automating the detection procedure. Artificial intelligence (AI) based diagnostic systems can analyze large amounts of data, including intraoral pictures, radiographs, and advanced imaging like MRI or CT scans. In recent times, many machine-learning models have been developed using intraoral images, to distinguish and diagnose OPMDs and oral cancer. Existing models exhibit limitations in recall rates, specificity, and error rates, which leads to missed diagnoses or false positives. Advances in AI and deep learning have enabled the development of models capable of identifying high-risk populations and detecting oral cancer and precancerous lesions. In the present paper, we aimed to generate deep learning models to detect OPMDs and oral cancer in the Haryanvi population through intraoral image analysis of the original 583 image datasets with augmentation to 3378 image datasets. Here, we trained the YOLOv8 segmentation model for robust detection capabilities and achieved a mAP@50 of 0.9604 and mAP@50-95 of 0.7166 in detecting "cancer" over "precancer" cases. These results surpassed similar studies in one way or another when compared with the existing

contemporary studies. Key Words: Artificial intelligence (AI); deep learning models; oral potentially malignant disorders (OPMDs); oral cancer.

Anomaly Detection in Crowds: Predictive and Explainable Approaches Using RNNs, GANs, and XAI

Ujan Pradhan (SRM Institute of Science & Technology)*; Sukanya Singh (SRM Institute of Science & Technology); Heemamghsu Chattopadhyay (SRM Institute of Science & Technology); P Karthik Manikantan (SRM Institute of Science & Technology); M N Aditya (SRM Institute of Science & Technology); Md Mushir Alam (SRM Institute of Science & Technology)

In recent times, one of the important fields of research is anomaly detection in crowds, which is highly useful in public safety, urban planning, and event management issues. This paper focuses on cutting-edge machine learning approaches to address the problem of adaptive and explainable anomalous activity identification of running crowd behavior, where Recurrent Neural Networks (RNNs) and Generative Adversarial Networks(GANs) frameworks have been utilized to learn to perform predictive analysis. In this contribution, we present a framework that combines these approaches to boost the accuracy and interpretability of anomaly detection. Using RNNs to learn temporal characteristics and GANs to generate synthetic datasets from learned patterns to build a detection model. In addition to leveraging the most accurate models, we augment our predictions with Explainable Artificial Intelligence (XAI) techniques that provides transparency on how the decision making in our models occurred, allowing better confidence in their predictions. The experimental results validate the applicability of the proposed approach on real crowd datasets, resulting in a significant improvements in detection rate as compared to conventional approaches. Our experimental results further indicate that our framework achieves high anomaly identification precision, in addition to providing explanations that are essential in real-world applications. By reducing the growing literature on anomaly detection to those goals of predictive performance and explainability, this research provides awareness towards developing safer and more efficient crowd management routines.

Real-Time Code Quality Prediction with Explainable Al and Interactive

Gottapu Hitesh (Seshadri Rao Gudlavalleru Engineering)*; Kodamala Bhanu (Seshadri Rao Gudlavalleru Engineering); Banki Sambasiva (Seshadri Rao Gudlavalleru Engineering); Dodda Rahul (Seshadri Rao Gudlavalleru Engineering); Balla Manoj Venkata Sai (Seshadri Rao Gudlavalleru Engineering)

Reducing development expenses and guaranteeing excellent code quality depend on real-time software fault prediction. In order to efficiently forecast and analyse software problems, this research offers a revolutionary Streamlit-based framework that blends Explainable AI (XAI) approaches with interactive visualisations. Real-time forecasts of code quality and possible defect risks during development are made possible by the framework's integration of machine learning models based on historical defect datasets.To shed light on model choices, the system makes use of XAI techniques like SHapley Additive exPlanations and LIME Local Interpretable Model-agnostic Explanations. This guarantees interpretable predictions, enabling developers to comprehend the reasons behind a particular code segment being marked as flawed.In order to promote a user-friendly experience, the Streamlit framework offers an easy user interface that shows important metrics, defect forecasts, and visual explanations. Among the features are real-time analysis of code snippets, defect heatmaps, and actionable recommendations to improve code quality.

Driverless Autonomous Car Using Sensors and Deep Learning Techniques

Pruthvi Darshan S S (M S Ramaiah Institute Of Technology)*; Salma Itagi (Sai Vidya Institute of Technology)

Autonomous vehicles, also referred to as self-driving cars or AVs, are automobiles that can operate without human intervention through the integration of advanced technologies such as sensors, cameras, radar, and AI. These technologies empower vehicles to autonomously navigate roads, circumvent obstacles, and make informed decisions, eliminating the need for human drivers. To demonstrate the capabilities of this technology, we have successfully implemented an autonomous vehicle that utilizes a combination of sensors and a Raspberry Pi. The primary function of the sensor is to detect objects in the surrounding environment of the vehicle, providing crucial information for safe navigation. Meanwhile, the Raspberry Pi leverages deep learning techniques to analyze captured images and accurately distinguish between objects, humans, and traffic signs. This differentiation enables the vehicle to perform specific operations and take appropriate actions based on the detection results. By integrating these components, our autonomous vehicle exemplifies the potential of self-driving cars. It showcases the ability to perceive and interpret the environment through sensor data and employ sophisticated algorithms for effective decision-making. As a result, autonomous vehicles can efficiently navigate the roads, ensuring a safe and controlled driving experience.

Spiking Meets Ann: A Hybrid Architecture For Energy-Efficient, Multimodal Language Modeling

Mohamed Azharudeen

This study explores a novel spiking transformer-based architecture for multimodal generative text modeling, integrating visual context from images via CLIP embeddings. We introduce a spike-driven adaptation of GPT-like language models using Recurrent Weight-Key-Value (RWKV) blocks and Spiking Feed-Forward Network (SRFFN) layers with spike-timing-dependent plasticity (STDP) and Hebbian learning. The approach aims to bridge the gap between biologically-inspired spiking neural networks and large-scale sequence modeling. Empirical results demonstrate that our model can learn to generate coherent text sequences conditioned on images, with improved sample complexity and energy-efficient operation due to spiking computations. The findings suggest that combining spiking dynamics, multimodal inputs, and biologically plausible learning rules holds promise for future research in energy-efficient, integrated multimedia modeling.

Machine Learning-Driven Genetic Disorder Prediction with Explainable AI for Clinical Applications

Suchetan Ghosh (NMIMS)*; Archana Lakhe (NMIMS); Swati Vaishnav (NMIMS)

This research predicts genetic disorders under three categories: Mitochondrial, Multifactorial, and Single-gene inheritance. To this end, advanced machine learning models, namely Random Forests, XGBoost, and Neural Networks are built. These models have been trained through a wide range of clinical and genetic features such as inheritance patterns of the gene, health factors that may lie in parents, and blood cell counts among others to ensure robust performance. Ensemble methods, specifically XGBoost and Voting Classifier, had a high accuracy score in predictions both for Mitochondrial and Single-gene disorders. For Multifactorial disorders, the models performed moderately. Moreover, Explainable AI tools such as LIME and SHAP have been used to build explanatory power and toward applicability towards clinical use, offering instance specific explanations and also understanding the importance of features at a more holistic level. It is an integration of high performing predictive models with interpretability tools in such a way that ensures that transparency is maintained alongside accuracy for the purpose of building trust and reliable decision making in a clinical setting.

Enhanced Brain Tumor Segmentation Using a Detectron2 and CRF Based Hybrid Framework for Boundary Refinement

Sukanya Singh (SRM University)*; Diksha Singh (SRM University); John Regi (SRM University)

Brain tumor segmentation is crucial for surgical planning and monitoring disease progression. Accurate brain tumor detection and localization from magnetic resonance imaging (MRI) is a critical challenge, particularly making boundary precision segmentation along with fine anatomical detail preservation. This paper presents a novel hybrid framework that combines Detectron2 for instance segmentation of brain tumor with Conditional Random Fields (CRFs) for enhanced boundary refinement. Our approach first employs Detectron2, a state-of-the-art instance segmentation model, to generate initial tumor segmentation maps. The second stage applies Conditional Random Fields (CRFs) as a post-processing step to refine the segmentation boundaries by considering both spatial relationships and intensity patterns between neighboring pixels. We introduce a key innovation, the post-processing pipeline that preserves critical anatomical features. The framework achieves IoU scores of 0.937 on the training data and 0.912 on the test data, along with high precision (0.948) and recall (0.915) values. These results suggest its potential for immediate clinical application in tumor volume estimation and treatment planning. The framework demonstrates significant improvements in segmentation accuracy compared to standalone deep learning approaches.

Exploring Multi-Object Tracking: Machine Learning and Transformer-based Methods and Dataset Analysis

Amandeep Kaur (Punjabi University)*; Navdeep Kanwal (Punjabi University); Manoj Kumar (YDOE Punjabi University)

This study explores the selection of optimal datasets for multi-object tracking (MOT) tasks, specifically comparing MOT17, VisDrone-MOT2019, and MOT20. Each dataset is evaluated in terms of its suitability for different research goals, such as general pedestrian tracking (MOT17), drone-based tracking in diverse urban and rural environments (VisDrone-MOT2019), and tracking in crowded urban scenes with high object densities and occlusions (MOT20). The paper also highlights advancements in object detection and MOT through deep learning and transformer-based models. Lightweight architectures like ShuffleNet and MobileNetV2 have enhanced real-time tracking performance, while transformer models like ABQ-Track, LTJPA, and MixFormerV2 have shown exceptional progress in improving accuracy, training efficiency, and real-world deployment capabilities. The study underscores the significant role of deep learning in evolving MOT technologies, providing promising solutions for complex, real-time vision tasks.

A Comparative Study of Autoencoder Architectures for Noisy Image Reconstruction

Tresa Maria Josylin (Ms Ramaiah Institute Of Technology)*; Sangeetha J (Ms Ramaiah Institute Of Technology)

Reconstructing images from noisy or incomplete data has been a longstanding pursuit in image processing. Autoencoders have emerged as a powerful tool for tasks that enables the restoration of image quality while learning efficient data representations. It’s capacity to learn effective representations of input data has made them a vital tool for image restoration tasks. The research

delves into a comprehensive evaluation of three autoencoder-based models for image restoration— Convolutional Autoencoders, Long Short-Term Memory Autoencoders, and Variational Autoencoders, specifically focusing on the MNIST dataset. Performance comparison is conducted using various evaluation metrics,which help in quantifying the image quality after reconstruction. Anomaly detection is another crucial aspect of this study, wherein the reconstruction error from the autoencoder models is leveraged to identify anomalies in the dataset. The results highlight distinct advantages and trade-offs: CAE demonstrates balanced performance with computational efficiency, LSTM AE excels in temporal feature extraction but struggles with spatial data, and VAE achieves the best reconstruction quality through latent space regularization, albeit at higher computational costs. These findings underline the versatility of autoencoders in noise reduction and anomaly detection tasks, providing insights for designing robust deep learning models tailored to specific applications.

AI-Powered Innovations in Traffic Management Systems: A Comprehensive Review

Anand Kumar (Bharati Vidyapeeth's College of Engineering, New Delhi)*; Aayush Gupta (Bharati Vidyapeeth's College of Engineering, New Delhi)

There have been and continue to be several global challenges related to traffic congestion and inefficiencies existing within transportation systems. Among other things, economic loss, lowered quality of life, and environmental degradation stem from such challenges. Formulating the solution is Artificial Intelligence (AI), an absolute shaker and mover in current and future developments intended to support such problems by generating new technologies such as Generative AI, CNN-LSTM models, and LLMs (Large Language Models). Generative AI has empowered productive vehicular network optimization. CNN-LSTM has ramped up its real-time traffic flow prediction capabilities. LLMs, or Large Language Models, are being considered for human-like decision-making capabilities. Also, simulation platforms such as CARLA and SUMO are used to verify AI-driven systems' behavior. However, challenges of scalability, privacy, and weaker advancements in regulations remain vast roadblocks to the 100% promise enclosed in these technologies. This review builds upon these advancements and recognizes current trends before developing an all-encompassing roadmap for future research and development into AI-powered traffic management systems.

Leveraging Vision Transformers and MobileNet for Corrosion Detection: A Holistic Framework

Dr. Sangeetha J (M S Ramaiah Institute of Technology); Yogesh KN (M S Ramaiah Institute of Technology)*

In this paper, complex deep-learning architectures for automated corrosion detection and segmentation are thoroughly investigated and implemented. Three distinct models were created and tested to discuss various aspects of corrosion-detecting tasks. The first model combines a Convolutional Neural Network (CNN) and a Vision Transformer (ViT), relying on the CNN's capacity to extract local features and the ViT's global attention mechanism to categorize corrosion images accurately. The second model, combining EfficientNet-B7 and DeepLabv3, and DenseNet i.e. the backbone of Deeplabv3 focuses on semantic segmentation to precisely locate and identify areas of corrosion in detail using feature propagation in EfficientNet and that of DenseNet. The third model is an efficient deep MobileNet is developed to perform real-time scenarios of edge deployments with competitive performances. The final is a U-Net model for corrosion detection purposes. The characteristics of each experimental result show effectiveness

in different applications. This work leads to the development of reliable and scalable corrosion monitoring technologies for industrial and infrastructure applications.

Integrated Pothole Detection and Damage Assessment Model for Road Analysis

Riya Jain (JSS Academy of Technical Education, Noida)*; Rudrani . (JSS Academy of Technical Education, Noida); Puja Thakur (JSS Academy of Technical Education, Noida); Vivek Chauradhy (JSS Academy of Technical Education, Noida)

Potholes and unmaintained pavements lead to disrupted transportation that becomes unsafe and more costly to maintain. Repairing damage takes these prices up, delays traffic, and brings about a higher accident risk for the so-called most vulnerable road users, such as cyclists and motorcycle riders. They also affect travel and logistics, thus the dire need for monitoring and timely remedies. The usual manual techniques such as the surface distress index have been used in road damage assessment. However, it is limited with respect to human endeavor and time and scalability. They include automated techniques for analyzing the road surface. Examples of successful methods adopted are the K-Nearest Neighbours (KNN)[21] coupled with the Gray Level Co-occurrence Matrix (GLCM)[20] to detect and classify road defects. Likewise, Support Vector Machines(SVMs) have been used effectively in classifying potholes, using partial differential equations for image segmentation. However, although these methods may work well, they have limitations, such as being very dependent on the datasets and being sensitive to the lighting conditions during capture. Recent advances in deep learning, such as the family of models of You Only Look Once (YOLO)[12], have provided good opportunities to improve these pothole detection systems concerning speed and accuracy. This work aims to continue by improving the process of pothole detection and segmentation for greater efficiency, wider applicability to the detection of potholes, and more accurate damage assessments. This ultimately facilitates effective repairs and maintenance processes.

IOT-BASED SURVEILLANCE SYSTEM FOR FLOOD MONITORING USING COMPUTER VISION

Dhyanesh S J (MIT Anna University)*

The flood control systems that exist today frequently depend on antiquated technologies, like manual monitoring and simple sensors, which have a restricted range, high maintenance costs, and poor modern integration. Our creative approach uses IoT and computer vision technologies to collect, analyze, and monitor data in real-time, thereby overcoming these shortcomings. Important information on temperature, humidity, pressure, rainfall and water level is captured by environmental sensors close to bodies of water. Cloud-based machine learning forecasts precipitation patterns to evaluate the risk of flooding. To increase public awareness of floods, both projected and real-time data are broadcast via a web page. Drones equipped with AI can identify victims in flooded areas and quickly provide help. Communities are kept informed through an easy-to-use interface, and authorities are notified when environmental thresholds are surpassed using an alarm system that allows for quick action.

Deep Linguistic Analytics: A Vector-Based Framework for CSR Communication Analysis using LLMs

Arunima Haldar (SPJIMR)*; Milind Kamat (SPJIMR)

This study introduces an AI-powered framework that leverages Large Language Models to analyse the linguistic patterns in corporate social responsibility (CSR) reporting by large listed Indian companies. This novel approach combines Mini-LLM (384-dimensional vectors) and

Llama Index to examine the signals created by companies through textual characteristics in their CSR communications. The study analyses annual reports of sample companies using a custom-built pipeline (Python/Streamlit) that examines linguistic features, including sentiment polarity, textual complexity, and semantic coherence. Our LLM-based analysis suggests that companies with strong CSR performance typically use concise, straightforward language vectors, while those with weaker performance exhibit more complex linguistic patterns and verbose documentation. The implementation leverages vector embeddings stored in MongoDB to create a searchable knowledge base of CSR communications. Our system, deployed via Hugging Face, provides real-time analysis of linguistic signals in CSR reports. The framework demonstrates 85% accuracy in classifying CSR communication effectiveness based on linguistic features validated against human expert annotations. This research extends natural language processing applications to CSR analytics by quantifying linguistic features through vector representations. The findings provide actionable insights for automated CSR report analysis and stakeholder engagement optimisation. Our approach contributes to the emerging AI-powered corporate communication analysis field by establishing a scalable, evidence-based framework for linguistic pattern recognition in CSR reporting.

OPTIMIZING KNEE OSTEOARTHRITIS ASSESSMENT THROUGH RESNET-18 CLASSIFICATION

Varshini M S (St. Joseph's College of Engineering)*; Usharani T (St. Joseph's College of Engineering); Archana Jenis M R (St. Joseph's College of Engineering)

A prevalent degenerative joint disease, knee osteoarthritis (KOA) often must be diagnosed quickly and accurately to minimize its effects on mobility and quality of life. To improve the identification and categorization of KOA phases from medical images, in this investigation a model that incorporates architectures is proposed. Using weighted averaging, resnet-18 model incorporates the prediction capabilities of these cutting-edge convolutional neural networks, using their advantages. The OAI data set is utilized to train the suggested framework and advanced pre-processing and enhancement techniques are applied to strengthen the model. According to experimental data, classification accuracy, precision, and recall are significantly improved using a model rather than individual designs. Thus, this study demonstrates how a model can facilitate the automated evaluation of KOA. It encourages the continued integration of AI into healthcare and offers a reliable tool for clinical decision-making. Future research will focus on improving the model for wider use and practical implementation

Early Identification of Critical Health Conditions of Breast, Chest, and Brain through Medical Imaging

Indira Linginani (Vignana Jyothi Institute of Engineering and Technology); Pradhyumna Paloju (Vignana Jyothi Institute of Engineering and Technology)*; Shoba Kuruva (Vignana Jyothi Institute of Engineering and Technology); Yenwanth Anumula (Vignana Jyothi Institute of Engineering and Technology); Nithin Prasad Errolla (Vignana Jyothi Institute of Engineering and Technology)

Advancements in deep learning and medical imaging have given an entirely new look to its early detection. The application that has been envisaged to be developed is actually for the evaluation of medical images pertaining to chest, breast, and head to intervene sooner for the detection of offensive diseases like tumors and cancer. The application has three different options to upload images (either of CT, MRI, and mammography) coming from the analyzed parts of the human body. Thereby, an automatic disease segmentation was conducted and furnished with an overall result of a message for disease-free or disease-diseased parts should such be found. Models like CNNs, U-Net, transfer learning, and synthetic data augmentation were used to overcome the

problem of small data and domain generalization. By this intelligent app, a greater diagnostic accuracy can be ensured that saves time and relinquishes manual assessment since, in the end, highly proficient tools can be given to the healthcare professionals for their respective screens on time and also patient-related outcomes can be improved greatly.

Multi-class Lung Disease Classification Using an Enhanced Vision Transformer: Performance Analysis and Clinical Implications

Busra Beevi A (TKM CE)*; busra beevi A (TKM college of engineering)

The rapid evolution of deep learning in medical imaging has opened new frontiers in automated disease diagnosis. Vision Transformers (ViT) have emerged as powerful tools for image classification, yet their application in complex medical imaging tasks remains under-explored. This study addresses the critical need for accurate and efficient multi-class lung disease classification systems, particularly important in resource-constrained healthcare settings. We present an enhanced Vision Transformer architecture specifically optimized for chest X-ray analysis, capable of distinguishing between normal cases, COVID-19, pneumonia, and tuberculosis. Our methodology attains exceptional classification performance, exhibiting a weighted average precision of 94.32% and a recall of 94.00% across all categories. The model has exceptional performance in pneumonia identification, attaining 98.31% precision and 93.87% recall. These findings substantially enhance the domain of automated medical image analysis, providing a reliable instrument for clinical decision assistance.

A Review on 6G Technologies Horizons – Characteristics, Challenges, and Research Directions

Poonam Jyoti (Chandigarh university)*; Kiranpreet Kaur (Chandigarh university)

The advent of 6G wireless networking calls for innovative approaches to overcome the limitations of existing network architectures. Cell-free networks represent a promising solution by eliminating the traditional constraints of cell-based designs, offering enhanced adaptability and performance for a wide range of applications. By deploying a dense network of distributed access points that collaboratively serve users, cell-free systems can provide more consistent connectivity, reduced latency, and improved overall network efficiency. However, the transition to cell-free networks within the 6G framework is not without its challenges. The complexity of coordinating numerous distributed access points, ensuring seamless connectivity, and efficiently managing network resources requires significant advancements in both network design and operational strategies. Moreover, the integration of emerging technologies, such as artificial intelligence, into cell-free architectures is crucial for optimizing performance and meeting the diverse demands of future wireless communication systems. As research continues to address these challenges, cell-free networks are poised to play a critical role in shaping the future of 6G networks. By overcoming existing limitations and harnessing the potential of distributed, cooperative architectures, cell-free networks could become the backbone of next-generation wireless communication, enabling unprecedented levels of connectivity, reliability, and efficiency.

Develop load-balancing applications in Software-Defined Networking (SDN) under Distributed Denial of Service (DDoS) attacks.

Lalisa Diribsa (Punjabi University, Patiala)*

Despite the potential of Software-Defined Networking (SDN) to enhance network management, existing solutions often fall short of effectively mitigating Distributed Denial of Service (DDoS) attacks while ensuring optimal resource utilization and service availability. To address this

research gap, this study aims to develop an advanced load-balancing application tailored for SDN environments under DDoS attack scenarios. Leveraging SDN's centralized control and global network visibility, the proposed solution integrates intelligent traffic analysis and dynamic load-balancing algorithms to detect and isolate malicious traffic while efficiently distributing legitimate traffic across network resources. The approach improves resource utilization, reduces latency, and ensures uninterrupted service availability even during an attack. Experimental results reveal that the proposed solution reduces attack impact by up to 85%, improves traffic throughput by 40%, and maintains network stability, demonstrating its practicality and effectiveness as a scalable framework for mitigating DDoS attacks in SDN-based networks.

A Hybrid CNN – RF Model for Pest Detection and Classification

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Early and precise pest detection is essential to keep crops healthy and maximise agricultural production. But conventional ways of pest detection can be time-consuming and susceptible to human error. This paper presents a new hybrid model based on the complimentary power of Convolutional Neural Networks (CNN) and Random Forest (RF) classifiers to address these shortcomings. The EfficientNetV2-derived CNN learns to extract complex visual patterns from pest images in an efficient manner and then the RF classifier groups these patterns into distinct pest classes. The hybrid model aims to establish a reliable and precise automated system for pest detection and identification, mitigating the need for manual intervention. This research shows the power of the hybrid approach, which has the potential to be widely adopted and which will require continued research in the years to come. With this combination of strengths from the two models, such an approach could transform how pests are managed, leading to higher crop production and less economic loss to farmers.

AI-Driven Early Detection of Alzheimer's Disease

Heemaal Jaglan (Chandigarh University); Natasha Sharma (Chandigarh University)*; Hiten Nain (Chandigarh University); Aditya Nandal (Chandigarh University)

Alzheimer’s disease (AD) is one of the challenging disorders in the area of neurodegeneration, which is slowly progressing and never halting. Although in the early stages of the disease it is characterized by a slight decline in memory, AD leads to a severe decline in the intellectual and motor activity of the patient. The medical fraternity especially stresses the issue of early detection since this brings forth opportunities for preventive or reparative measures or a range of intercessory and remedial approaches that can help in slowing down the progression of the disease. The approaches to diagnosis though have largely used conventional tools such as assessment and imaging of the brain, the field is rapidly expanding in the use of advanced technology. Machine learning and deep learning algorithms of the contemporary artificial intelligence have opened up a new chapter for accurate diagnosis. These advanced computational techniques require various forms of information such as; neuroimaging scans and a wide range of clinical measures to detect more complex patterns characteristic of AD.Businesses and organizations have been particularly instrumental to this revolution since

they have submitted voluminous and anonymous data to public research that feeds algorithms' learning as well as tests their effectivenessThe use of such techniques has brought about good outcomes whereby some proposed models achieved high performance in differentiating between controls, MCI, and AD cases. These encouraging innovations notwithstanding, there remains some major issues; one of them is the issue of data scarcity and another is the issue of feature extraction However,the possibility of these approaches to transform AD diagnosis using Artificial Intelligence cannot be utterly dismissed As the science of genetics continues to filter the better techniques,diagnosis can be made sooner and more accurately which may lead to better ways of handling .

AI-Powered Real-Time Speech-to-Text Translation for Multilingual Communication

Arshdeep Singh (Chandigarh University)*; Er. Deeksha Sonal (Chandigarh University); BGVR Krishna Reddy (Chandigarh University); Samarjit Singh (Chandigarh University); Sunny Badsara (Chandigarh University); Udaybir Singh Gill (Chandigarh University)

In an increasingly globalized world, language barriers hinder effective communication across multilingual environments. This paper proposes an AI-powered real-time speech-to-text translation system designed to bridge these gaps through seamless multilingual interaction. Leveraging advanced neural network architectures, including transformer-based models and automatic speech recognition (ASR), the system converts spoken language into text, translates it into the target language, and delivers output with minimal latency. By integrating noise reduction and context-aware translation algorithms, the framework addresses challenges such as dialect variations, background interference, and linguistic ambiguities. Experimental evaluations demonstrate the system's efficacy across six languages (English, Mandarin, Spanish, Arabic, French, and Hindi), achieving an average translation accuracy of 92.3% and a latency of 1.8 seconds, outperforming existing tools like Google Translate and DeepL in real-time scenarios. Case studies in international conferencing and customer support highlight its practical utility. The results underscore the potential of AI-driven solutions to revolutionize cross-lingual communication while emphasizing ethical considerations, including data privacy and bias mitigation. This work lays the groundwork for future innovations in adaptive, low-resource language support.

Object Detection for Assisting Blind Individuals

Shariq Bhat (Chandigarh University)*

This groundbreaking project is a response to the challenges faced by approximately 285 million blind individuals globally, which is roughly equivalent to one-fifth of India's population. It harnesses the power of TensorFlow, Google's state-of-the-art library, specifically employing the TensorFlow Object Detection API, to drive its innovation. The project's core technology revolves around the SSD (Single Shot MultiBox Detector) algorithm, a crucial component during the training phase. It pairs anchor boxes with the actual object bounding boxes in images, with the anchor box exhibiting the highest compatibility responsible for predicting an object's class and its precise location. In an effort to empower the visually impaired with enhanced mobility and self-sufficiency, a smart walking stick, complete with a microcontroller featuring built-in Wi-Fi, has been devised. This device enables users to navigate both indoor and outdoor

environments with ease through a user-friendly interface. Additionally, the project addresses navigation challenges head-on by integrating an obstacle detection system that relies on ultrasonic sensors. This system identifies the closest obstacle and provides an alert to the user, ensuring safe and independent navigation.

Skin cancer detection system using AI

Abhishek Singh (Chandigarh University)*

This research paper presents a novel approach to skin cancer detection using artificial Intelligence (AI), leveraging advancements in deep learning and image processing for accurate and early diagnosis. Skin cancer, particularly melanoma, is one of the most prevalent and dangerous forms of cancer, with early detection significantly improving patient outcomes. Traditional diagnostic methods rely heavily on visual examination by dermatologists, which may be subject to human error and limited access. In response, this study proposes a convolutional neural network (CNN) based model to automate skin lesion classification, differentiating malignant from benign conditions with high precision. By training on large, diverse datasets of dermoscopic images, our model can recognize subtle features and patterns indicative of cancerous lesions. Performance evaluations indicate that the proposed model achieves a high accuracy rate, sensitivity, and specificity, comparable to expert dermatologists. Additionally, the system incorporates a userfriendly interface, making it accessible for real-time, point-ofcare applications. This AI-powered approach holds potential as a valuable tool for both healthcare professionals and patients, contributing to early detection, reduced costs, and enhanced accessibility in skin cancer diagnostics. Future work will explore improvements in algorithm robustness, including addressing imbalanced datasets and deploying the system in real-world clinical settings.

Real-Time Facial Emotion Recognition Using CNN: A Comparative Analysis and Implementation of Deep Learning

Shariq Bhat (Chandigarh University)*

Extensive research to develop face recognition systems for a broad range of applications has been based on rapid advances in High Speed Processor and High Resolution Camera technology. These systems can either rely upon prerecorded information offline or on the processing of Realtime Offline input according to the particular application. A new approach has been introduced in this paper: the design and evaluation of a realtime face recognition system based on neural networks, using convolutional Neural Networks(CNN). The beginning stages includes assessing the system’s execution utilizing set up dataset upon OpenCV and tensorflow. Hence, this assessment is amplified to the advancement of a real-time framework. Also, we dig into the fine-tuning of CNN parameters to gage and improve the system's acknowledgment precision and productivity. We moreover show a efficient strategy for parameter tuning to optimize framework execution. The comes about grandstand noteworthy most extreme acknowledgment correctnesses of 98.75% and 98.00% when applying the proposed framework to standard datasets and real-time inputs, individually.

Blending Old with New: A Fresh Take on Hybrid Cryptographic System

Sumer Singh (Chandigarh University)*; Aditi Singh (Chandigarh University); Shreya Gupta (Chandigarh University); Natasha Sharma (Chandigarh University); Nitin Kumar (Chandigarh University)

This paper explores the implementation and enhancement of a hybrid encryption model combining shift cipher and Vigenère cipher techniques. Classical cryptography works already in existence, such as the Caesar and Vigenère ciphers, offers fundamental but insecure techniques for communication security. But simple ciphers are vulnerable to brute-force and frequency analysis because of their simplicity. The requirement for a more secure hybrid paradigm that reduces these vulnerabilities is the highlighted research need. This work aims to increase security by proposing a hybrid encryption paradigm that incorporates contemporary cryptographic algorithms. The research approach entails integrating cutting-edge algorithms like AES after a thorough examination of the key space, attack vectors, and computing capacity needed to crack the encryption. The study focuses on two primary areas: thematic examination of cryptographic assaults and responses, and the area of specialty in both classical and modern cryptography. The results of the study show that the upgraded hybrid model gives much higher security and is more resilient to different types of cryptographic assaults, which advances the field of secure communication.

Speech to Speech Translation

Ananya Gaba (SRM Institute of Science and Technology-Kattankulathur)*

At present, speech-to-speech translator systems often involve multiple intermediary steps, such as automatic speech recognition (ASR), text to text machine translation (MT) and text to speech generation (TTS); thus, leading to latency in response time and error propagation to later stages. Furthermore, they face challenges when dealing with languages lacking text representation. This paper explores the feasibility of a direct speech-to-speech translator model trained without the use of intermediate text representations during both training and inference. Employing the Librosa library for feature extraction, our approach utilizes Mel-frequency cepstral coefficients (MFCCs) in conjunction with a sequence-to-sequence Recurrent Neural Network (RNN) model for training on a dataset of German-to English audio. In our performance analysis, which includes BLEU score assessment, we evaluated the performance comparison with traditional speech-to-speech translation techniques. In certain cases where sequence length is small, our proposed RNN model is at par with traditional speech-to-speech translator, trained with text-to-text conversion data. We evaluated the generation of noise free speech generation using the Griffin Lim algorithm. These experiments stand as a promising platform for future research.

A Comprehensive Review of Video Forgery Datasets: Availability, Features, and Analysis

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With the increasing prevalence of digital video manipulation, video forgery detection has become a crucial area of research in multimedia forensics. The effectiveness of forgery detection systems largely depends on the availability of high-quality datasets that encompass diverse tampering techniques, video formats, and real-world scenarios. This paper provides a comprehensive review of publicly available video forgery datasets, examining their availability, key features, and relevance to forensic research. It categorizes datasets based on forgery techniques, such as splicing, copy-move, frame-swapping, and deepfake manipulations, while also analyzing their resolution, compression levels, and recording conditions. Despite significant progress, existing datasets still present challenges, including limited diversity, lack of standardized benchmarks, and insufficient representation of modern forgery techniques. This review highlights current research gaps and emphasizes the need for more extensive and realistic datasets to enhance the robustness of video forgery detection methods. By identifying strengths and limitations across available datasets, this study serves as a valuable resource for researchers aiming to develop more effective and resilient forensic analysis techniques.

CNN Based techniques to detect violence in videos: A Review

Jaspreet Singh (Punjabi University Patiala)*; Ashok Kumar Bathla (Yadvindra Department of Engineering,Talwandi Sabo)

The construction and operation of smart cities depend heavily on video monitoring, which improves security, dependability, and many aspects of urban life. These systems consist of end camera devices, edge computing systems for initial data processing, cloud computing systems for intensive data analysis, and blockchain systems for secure data storage and consensus [1]. Video surveillance improves public safety and security by allowing authorities to recognize and respond to occurrences such as crimes, accidents, and crises. Violence detection, in the recent years has emerged as field of research to ensure safety of the public. Over the years, researchers have introduced a variety of methods and features for violence detection. As advancements in computer vision continue, new techniques and features are being developed, often outpacing previous methods. Therefore, in this paper we review and analyze different research works to support ongoing studies in this field. Starting from traditional activity recognition methods, machine learning and deep learning techniques revolutionized the research era using spatial and temporal features from videos. Main focus of this research will be to review CNN Based techniques utilised for detection of violence in videos.

Artificial Intelligence and Its Relevance In Future Battlefield

Shubhaan Bhandari (Thapar Institute of Engineering & Technology)

Artificial Intelligence; or in short AI; has caught the attention of professionals in every field. It has great potential for both commercial military applications. However, since it’s an evolving field, the real potential is yet to be realised in true sense. As per Merriam-Webster dictionary AI is ‘a branch of computer science dealing with the simulation of intelligent behaviour in computers’. In other words, AI is the intellectual capability of a machine to perform tasks like speech recognition, visual perception, decision-making and analysis which normally are done

by intelligent beings like humans. Though AI as a concept is around seven decades old, however only recent few years have witnessed its manifestation in real world. So when Apple's Siri or Google's Assistant or Amazon's Alexa interprets your voice command, it is employing AI. All this has been enabled by Big Data, cloud computing, lowering prices of hardware like chipsets (GPUs) powerful machines. Globally many corporations, organisations and institutions are working more efficiently, faster and smarter due to AI. The AI applications in military domain are also slowly but surely, being utilised by the world's leading military powers especially in past few years. It may not be farfetched to say that the future war will be won by the side which will harness technology better than its adversary AI will be at the heart of each military hardware or software sooner than later

Navigating the Metaverse: Evolution, Architecture, and Security Challenges

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The Metaverse represents a ground-breaking fusion of physical and virtual worlds, enabled by technologies such as augmented and virtual reality, blockchain, digital twin, 3d reconstruction and artificial intelligence. This paper offers a detailed exploration of the Metaverse, tracing its evolution from early internet concepts to the immersive virtual environments envisioned for the future. The paper analyses a seven-layer architecture for the Metaverse. It also addresses critical security and privacy challenges essential for successful implementation, such as data confidentiality, integrity, authentication, and asset ownership. Additionally, the paper identifies open issues and future research directions within the Metaverse. By offering insights into technological foundations, architectural frameworks, security concerns, and future prospects, this study sets the stage for further advancements in this dynamic field.

Open-source VLSI design implementation using efabless

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Since the advent of microprocessors and chips VLSI design has contributed most to the electronic industries, every school in the world has VLSI design as an important part of the curriculum. A number of schools the students do the design and send the design to silicon foundries for making the chip. The process of chip making is expensive and not within the reach of a large number of schools internationally. A number of software have been developed for computer aided design. Cadence is one of the important tools which is used by both academics and industry. This process is very expensive and not within the reach of students. In this paper we present a low-cost tool recently developed. This tool is known as efabless and is becoming popular amongst students. We hereby give an overview and the need for efabless and give a procedure by which the VLSI design can be made using efabless. We hope that this will be useful for students not only to develop the design but to get chips fabricated at almost no cost.