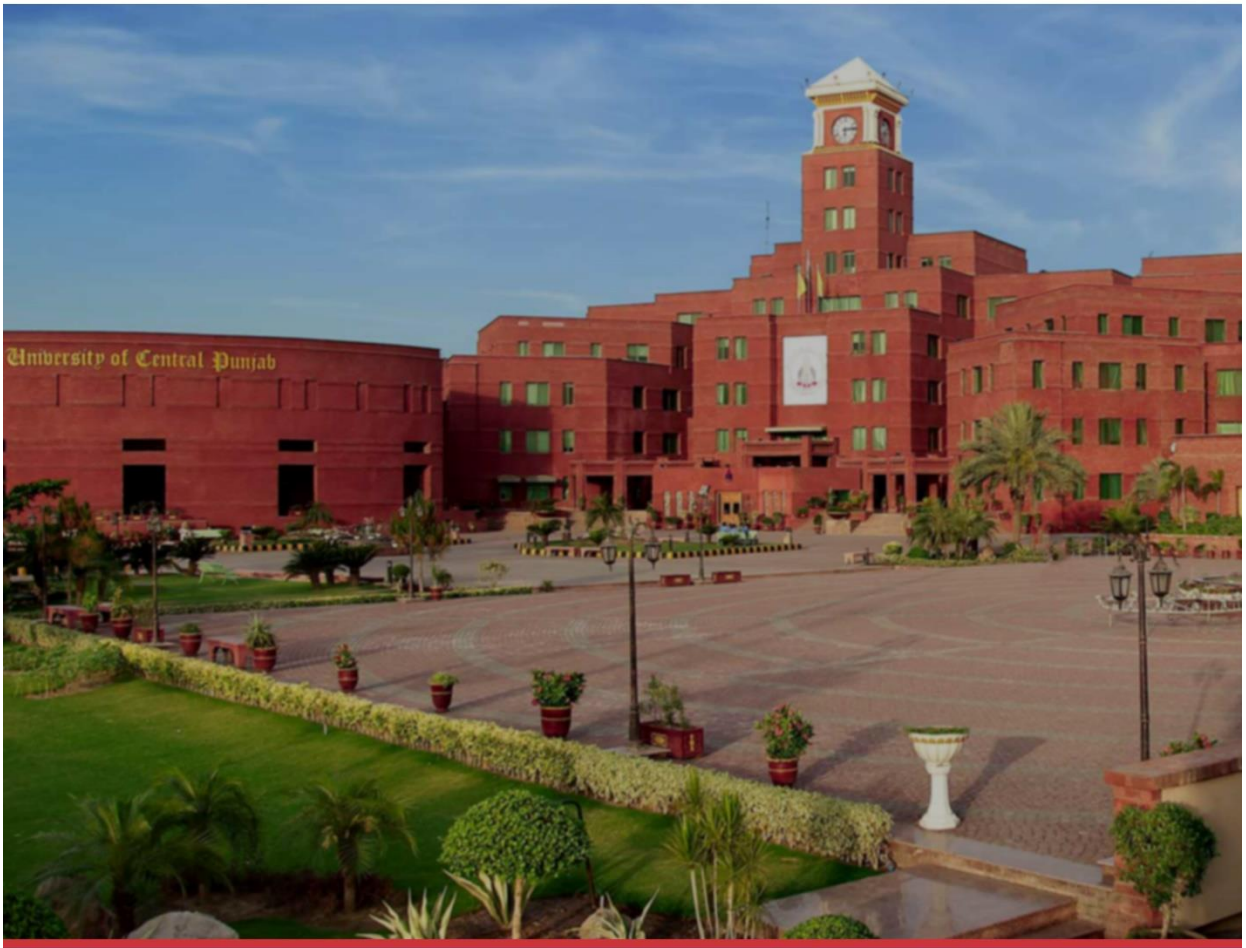
ABSTRACT BOOK

25TH INTERNATIONAL MULTI TOPIC CONFERENCE 2023 (IEEE INMIC 2023)



UNIVERSITY OF CENTRAL PUNJAB

Welcome Message from the General Chair

On behalf of the organizing committee, I am writing with immense pleasure to welcome to you to the IEEE 25th International Multi-Topic Conference 2023, held on November 17-18, 2023. As a General Chair, I feel honored and privileged to host world-renowned scholars, innovative researchers, and dedicated professionals at the University of Central Punjab, Lahore, Pakistan. This conference served as a platform to exchange research ideas, foster collaborations, and develop a mindset for cutting-edge research across different domains of computing and engineering. IEEE INMIC 2023 has offered various sessions for scientific papers, professional panel sessions, industrial workshops, and programming competitions. The highlights of the conference are listed very briefly:

- 71 Papers were presented in 15 technical sessions.
- 3 keynote speeches by world-renowned scholars from UK, USA and Thailand.
- 19 Invited Talks by leading scholars and domain experts from Pakistan, UK and UAE.
- One panel session was held on "Revolution in the IT Industry in Pakistan: Essential Skills for Thriving in the Evolving IT Ecosystem";
- 2 workshop sessions were held on "Hands-on Practice in Data Science" and "AI for Cyber Security" by leading researchers and industrial experts.
- Programming Competitions and Gaming Competitions were organized for the encouragements of younger generation programmers.

We are thankful to expert reviewers from across the world for executing a very careful double-blind review process. We appreciate the authors who have chosen IEEE INMIC'23 to present their significant research work and their work is going to appear in IEEE Xplore digital library.

The organization of this conference was tremendous relying on many stakeholders. I would like to express my sincere gratitude for the instrumental and influential support of Punjab Higher Education Commission (PHEC) in making the conference very successful. I am really grateful to IEEE for their invaluable support and guidelines. My heartiest gratitude to everyone who was involved in making the conference very successful. More specifically, I appreciate and acknowledge the excellent leadership and support of our conference chairs and their teams for running things smoothly and effectively at each stage of the conference.

I hope everyone has enjoyed this conference as a memorable learning hub and enriched experience with research collaborations.

Dr. Muhammad Amjad Iqbal,
General Chair,
IEEE INMIC 2023.

Table of Contents

1. Integrating Ensemble Learning into Remote Health Monitoring for Accurate Prediction of Oral and Maxillofacial Diseases

Paper ID: 021

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Abstract: Due to excessive use of tobacco, oral and maxillofacial diseases are prevalent in Pakistan. This paper presents a deep learning-based approach for the accurate diagnosis of oral diseases, specifically focusing on mouth ulcers, hypodontia, and dental caries, using RGB images. Unlike previous studies that primarily utilize X-ray images, this research uses a diverse dataset of over 6,000 annotated RGB images. The methodology involves training and evaluating three models including VGG16, MobileNet, and InceptionV3 for individual disease classification. The models achieve high validation accuracies ranging from 90% to 95%. The weighted ensemble model, combining the predictions of the three models, is also implemented which resulted in an improved accuracy of 97%. The proposed methodology demonstrates the potential of deep learning in enhancing the precision and effectiveness of oral disease diagnosis, enabling timely intervention, and optimizing patient care. Future work could focus on expanding the dataset size to further improve the model's accuracy

2. An Efficient Algorithm for Mapping Deep Learning Applications on the NoC Architecture

Paper ID: 022

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Abstract: Artificial Intelligence (AI) has a very important role in the modern world. Through the use of the AI, organizations are able to make better decisions, and can improve business processes because speed and accuracy both are increased in decision making. This study is related to mapping of Artificial Intelligence Algorithms, particularly Neural Networks (NN) on cores in a Network-on-chip (NoC) platform. In this work, neurons are the tasks of a NN in real life and our goal is to divide those tasks among processing cores of the NoC. To complete this process, multiple optimization algorithms are used to map neurons of NN onto the NoC to reduce its computation time. Furthermore, to evaluate the solutions, the hidden layer complexity of the NN is varied, and Octave/Google Colaboratory based simulations

are used to get these results. The result indicates improvement in terms of energy consumption, on-chip communication, and application processing time.

3. A MATLAB Toolbox for the Extraction of PV Module Parameters Using Optimization Algorithms

Paper ID: **023**

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Abstract: This paper presents a MATLAB toolbox for the extraction of design parameters of a PV module. User can input the values of any standard PV module and set the operating conditions manually. It offers eight different optimization algorithms to choose from. The output can be obtained in the form of I-V characteristic curves along with different box plots and 3-D plots which helps evaluate and compare the performance of these algorithms.

4. Design and Development of Multi-Stage CANSAT for Measuring Attitude and Atmospheric Parameters

Paper ID: **030**

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Abstract: CanSat is a small soda CAN-size satellite used as a prototype model for the real satellite. The objective of this paper is to design and develop different CANSAT models. It includes preliminary as well as engineering designs. The basic methodology is to integrate all the subsystems to perform primary and secondary missions. This developed prototype performs some basic tasks that a real satellite performs. The design and mass budget are per the basic requirements applied for CanSat competitions. The aim is to promote space technology awareness in the education sector.

5. Futuristic Fiber: Bringing the Future Home with FTTH

Paper ID: 039

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Abstract: Passive Optical Networks (PONs) serve as the cornerstone of Fiber-to-the-Home (FTTH) connectivity, promising enhanced broadband capabilities for users worldwide. In our research, we embark on a thorough examination of an array of PON types, notably EPON, GPON, 10G-PON, 10GEPON, NGPON1, NG-PON2, and NG-PON3. Our methodology integrates both quantitative and qualitative assessments. On the quantitative front, we scrutinize performance metrics such as bandwidth utilization, latency, and signal quality. From a qualitative perspective, we delve into factors like ease of implementation, adaptability, and alignment with future technological shifts. The findings present a nuanced understanding of each PON's advantages and limitations, thereby shedding light on their implications for the burgeoning FTTH infrastructure. In addition to our comparative analysis, the paper provides a glimpse into the anticipated technological advancements and innovations in the domain, ensuring stakeholders are well-equipped with the knowledge to make informed decisions for a robust FTTH ecosystem.

6. Post-Quantum Group Key Management in IoTs

Paper ID: 051

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Abstract: In our interconnected society, effective group communication is crucial for facilitating the efficient and secure interchange of data between multiple endpoints, particularly within the complex landscapes of the Internet of Things (IoT) and sensor networks. Group Key Management (GKM) arises as a crucial element for ensuring security amidst these complexities. Nonetheless, the emergence of quantum computers raises concerns regarding the security of existing GKM schemes that rely on public-key cryptography. This study investigates post-quantum GKM schemes, concentrating on their integration in the IoT context and addressing the underexplored field of GKM in the context of quantum computing advancements. By examining the security aspects of GKM protocols, particularly in relation to their resistance to quantum attacks, this study not only identifies current challenges but also outlines a path for future research directions, posing light on potential pathways in this changing landscape.

7. Enhancing Vehicle Entrance and Parking Management: Deep Learning Solutions for Efficiency and Security

Paper ID: **064**

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Abstract: The auto-management of vehicle entrance and parking in any organization is a complex challenge encompassing record-keeping, efficiency, and security concerns. Manual methods for tracking vehicles and finding parking spaces are slow and

wastage of time. In order to solve the problem of automanagement of vehicle entrance and parking, we have utilized the state-of-the-art deep learning models and automate the process of vehicle entrance and parking into any organization. In order to ensure the security, our system integrated the vehicle detection, license number plate verification and face detection and recognition models to ensure that the person and vehicle are registered with the organization. We have trained multiple deep learning models for vehicle detection, license number plate detection, face detection and recognition, however YOLOv8n model outperformed from all the other models. Furthermore, License plate recognition, facilitated by Google's Tesseract-OCR Engine. By integrating these technologies, the system offers efficient vehicle detection, precise identification, streamlined recordkeeping, and optimized parking slot allocation in buildings, thereby enhancing convenience, accuracy, and security. Future research opportunities lie in fine-tuning system performance for a wide range of real-world applications.

8. A Transfer Learning Based Detection and Grading of Cataract using Fundus Images

Paper ID: **068**

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Abstract: One of the most prevalent causes of vision impairment, especially among older adults, is cataract. According to the World Health Organisation (WHO), 2.2 billion people worldwide are estimated to be blind or have vision impairment. One of the most prominent and important causes of this is cataracts. Cataracts should be identified and treated as soon as possible to avoid blindness. Ophthalmologists use an expensive slit lamp to diagnose cataracts in regions with few medical facilities. Consequently, the issue is that a lack of skilled ophthalmologists may delay the identification of cataracts, for which medical treatment is unavoidable. Medical image analysis based on artificial intelligence provides a rapid and precise diagnosis in modern healthcare. We utilized deep learning models based on transfer learning, namely VGG19, and ResNet-50, to diagnose cataracts using fundus images and enhance classification accuracy. The metric used to evaluate the model's performance was accuracy; the highest achieved accuracy was 98%.

9. An Efficient Cyber Security Framework for Network Intrusion Detection using Hybrid Classifier

Paper ID: 074

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Abstract: The recent enormous increase in data volume and its ongoing growth has considerably increased the importance of information security and data analysis systems within the field of Big Data. An Intrusion Detection System (IDS) is critical in detecting unauthorized access or breaches within a system or network by actively monitoring and scrutinizing data. However, the large volume, diversity, and rapid rate at which networks generate data have made it difficult for traditional intrusion detection technologies to identify attacks efficiently. This paper focuses on applying machine learning techniques, specifically the Multi-Layer Perceptron (MLP) classifier, for network intrusion detection. The work begins with data exploration and preprocessing, removing unnecessary features and encoding categorical attributes. Numerical attributes are scaled using standardization techniques to ensure compatibility. Feature selection methods, using a random forest-based classifier to distribute feature importance, are employed to optimize the IDS performance. The selected features are used to train an MLP classifier suitable for learning complex patterns and making accurate predictions. The system is validated on a separate test dataset to assess its generalization and effectiveness. The results with 99% accuracy demonstrate the MLP classifier's effectiveness in identifying network intrusions and detecting anomalous activities. The paper contributes to network security by showcasing the potential of machine learning techniques, specifically the MLP classifier, in developing robust and efficient IDS.

10. An Ensemble Classifier for TVET Course prediction using Big Five Personality Traits

Paper ID: 076

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Abstract: Technical and Vocational Education and Training (TVET) is an educational stream that provides a skilled workforce to the industry nationally and internationally. Personality-aware recommendation systems are proven to be more accurate as compared to traditional recommendation systems. This paper evaluates an ensemble classifier for TVET course prediction based on Big Five Personality (BFI) Traits. Data collection for this research was conducted by one of the largest TVET public sector training providers in the Punjab - Pakistan. After data collection, data cleaning, and preparation, using machine learning, an ensemble method using Decision Tree, K Nearest Neighbor, and Logistic Regression classifiers to predict the TVET course based on BFI personality traits, age, gender and exam score. The result revealed that the ensemble classifier has achieved a prediction accuracy of 83.95% as well as K Nearest Neighbor algorithm has achieved the highest accuracy of 97.32%. This highest perdition accuracy supports the argument that in the future, TVET courses may be predicted based on BFI Traits and other variables.

11. Mechatronic Design of a Two Axis Solar Tracker System for Improved Efficiency

Paper ID: **077**

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Abstract: This paper presents a novel solar tracking system that employs mechatronics and photovoltaic engineering to enhance the efficiency of solar power systems. Sun trackers play a vital role in optimizing the real photovoltaic production in the field. However, several challenges need to be addressed during the different phases of the photovoltaic project life cycle, such as field arrangement, local content, labor skills, weather circumstances, budgetary limits, and short delivery terms. The proposed solar tracker includes sensors, a microcontroller, and a combination of Direct Current (DC) motor and Stepper motors to align the solar panel with the sun's position and maintain the angle of incidence of incoming sunlight. Other complimentary systems are also installed like constant output monitoring and automatic cleaning system. The complete working model of the solar tracking system is presented, and its efficiency is compared to traditional solar systems. The results demonstrate that the proposed solar tracking system outperforms traditional solar systems by 20.9%, thereby enhancing the efficiency of solar power generation. The proposed system offers a promising solution to improve the performance of solar power systems and reduce their impact on the environment.

12. Enhancing Pakistan Rice Plant Disease Detection: A Highly Effective Pre-Trained CNN Model

Paper ID: 080

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Abstract: Rice, a crucial global food source, faces numerous challenges impacting its quality and quantity. Pakistan is a significant rice producer and needs more agricultural technological advancements. Conventional disease detection methods for rice plants are time-consuming and ineffective. However, recent progress in agricultural technology, particularly machine learning & deep learning, holds great promise for improved disease identification. In this study, different datasets were considered for preparing a dataset that is specifically related to Pakistan's environmental rice diseases. This study uses a prepared dataset to train the proposed finetuned ResNet101V2 model and for the robustness of the proposed model comparison with ResNet101, ResNet50V2, and DenseNet121 also performed in this study. Among the models evaluated, ResNet101V2 exhibited superior performance with a test accuracy of 81%, demonstrating high accuracy in identifying six distinct classes, including five rice leaf diseases (Leaf Blight, Leaf Smut, Hispa, Leaf Blast, and Brown Spot) and one healthy category specific to Pakistan environments. This study represents a significant advancement toward developing more efficient disease detection and management systems in rice farming, ultimately leading to reduced financial losses and improved agricultural practices.

13. Does your robot know when to cross the road?

Paper ID: **082**

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Abstract: This paper presents a novel approach to enhance a robot's proficiency in correctly identifying Pedestrian Traffic Light (PTL) signs in adverse conditions. The pivotal aspect of this endeavor lies in the accurate recognition and interpretation of the pedestrian traffic light signals. By discerning signals such as the red pedestrian icon, countdown timer, or absence of display, the robot can make informed decisions to abstain from crossing. Conversely, upon detecting the green pedestrian icon, the robot can safely traverse the road. The primary objective of this study is to improve a model capable of processing images taken from the perspective of pedestrians, providing precise outputs corresponding to the exhibited PTL sign and improve its accuracy in unfavourable conditions. Considering the global variability in PTL designs, our focus is tailored to the specific street conditions prevalent in Japan. By enhancing the data the model is currently trained on, this research strives to enhance the robotic system's adeptness in recognizing and responding to PTL indications within Japanese crosswalks.

14. Adaptive Learning for Standardised Test Preparation

Paper ID: **086**

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Abstract: Online learning platforms have revolutionized education and gained immense popularity, particularly after the onset of the Covid-19 pandemic, due to their provision of flexible and accessible learning opportunities. Many educational platforms now incorporate adaptive learning technologies to personalize the learning experience for individual students based on their strengths and weaknesses. This stands in contrast to traditional tutoring systems that employ a one-size-fits-all approach. Despite the significant advancements in Intelligent Tutoring Systems, there remains a noticeable gap in the integration of adaptive learning for

standardized tests such as GRE, GMAT, SAT, and O/A Levels, tests that collectively attract millions of students each year. Thus, the objective of this paper is to extend the application of adaptive learning, exposing students to topics and questions of varying difficulty levels based on their individual strengths and weaknesses when preparing for standardized tests, and eventually helping them to break the traditional cycle of attempting all the past papers for MCQ based examinations. Through our experimental results, we demonstrate that the pipeline employed to develop our tutoring system can significantly enhance learning speed and assess topic proficiency by catering to the unique needs and abilities of each student.

15. An Architecture to Research Aggregated Vertical Web Search Results

Paper ID: **087**

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Abstract: Conventional search engines often present users with ranked lists of search results, necessitating manual sifting through documents to extract information. This approach restricts exploring web-based multimedia content, mainly using vertical search engines. Interacting with influences from various verticals can lead to a loss of exploration context, making it challenging to assemble relevant information and requiring extensive scrolling and clicking. To address these limitations, we propose an architecture for investigating vertical web search results, enabling a comprehensive exploration of aggregated multimedia documents. Our system employs advanced techniques, including clustering and summarization, to efficiently organize search results and enhance user interaction. It incorporates non-linear representations, such as tree maps and pie-chart visualizations, to offer an intuitive and interactive exploration experience. The designed Search User Interface (SUI) evaluates user behavior while interacting with multimedia documents and verticals. This enables seamless exploration across disjoint verticals, maximizing contextual understanding and cognitive engagement. The evaluation of our proposed system showcased promising results as it attained a B+ grade, placing it within the 80 to 84 percentile range, validating the effectiveness and efficiency of the proposed approach.

16. Advancing Dermoscopic Diagnosis: U-Net-Based Melanoma Cell Carcinoma (MCC) Detection with Embedded High-Quality Feature Selection Using Feature Visualisation Bag (FVB)

Paper ID: 088

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Abstract: Dermoscopy is a skin microscopy technique used to measure the epidermis of the skin. Skin cancer, particularly Melanoma Cell Carcinoma (MCC), is a major public health concern that can be fatal if not detected and treated early. An innovative framework for early detection of skin melanoma cells using a sophisticated Deep Learning (DL) approach is proposed in this article. The handcrafted and deep features are combined to form a vocabulary of features using the concept of transfer learning (TL). The binary patterns of melanoma are detected and merged with deep features in the first stage using the UNet architecture. Feature Visualisation Bag (FVB) is used to select a high-quality set of features after eliminating redundant features. Our experimental results demonstrate the efficacy of the proposed framework. This paper show significant improvements in accuracy and efficiency compared to the baseline U-Net approach in comprehensive evaluations on a curated dataset of dermoscopic images. Quantitative metrics with classification accuracy of 98.7%, and F1-score of 94.3% demonstrate the superiority of the U-Net architecture enhanced with feature selection. The proposed model is also computationally inexpensive and capable of detecting cancer cells at very early stages, claiming the model to be smarter than state-of-the-art models currently available.

17. Novel $BaTiO_3$@TiO_2 Incorporated Flexible Nanocomposites for Energy Storage Applications

Paper ID: 089

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Abstract: A paramount challenge confronting humanity in the current century is the assurance of our future energy needs. This article aims to provide a comprehensive overview of a research conducted, wherein BaTiO3@TiO2 coupled nanoparticles and a PVDF/PVDF-HFP polymer matrix, in a 30/70 wt.% ratio, were used to synthesize a novel flexible polymer nanocomposite capacitor. A major focus of this research was assessing the resultant properties of the composite after varying the wt% of nanoparticles present in the blend; the first sample, A1, has 0 wt.% of coupled nanoparticles, acting as the base control sample. The remaining five samples have an odd wt.% of coupled nanoparticles; starting from 1 wt.% all the way up to 9 wt.%; this was done to find an optimal ratio between the polymer blend and coupled nanoparticles primarily for energy storage purposes. Apart from the required characterization tests of XRD, SEM, TGA, and DSC, Electroding was also performed for each of the samples to test and compare their electrical properties. Analyzing the results of the six samples concluded that the Sample A2 with 1 wt. % coupled nanoparticles exhibited the best electrical performance, with a discharge energy density of 8.5 Jcm-3, whereas for thermal uses, Sample A6 with 9 wt.% coupled nanoparticles was the most effective, sustaining up to 447°C.

18. 3D Twist and Tilt Bipedal Model and Control Realization for Human Voluntary Motion

Paper ID: **090**

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Abstract: The field of biomechanical modeling for human voluntary motions in three dimensions encompasses a wide array of applications. The process of transitioning from a seated position to a standing position, referred to as sit-to-stand, is a fundamental human action that is frequently executed during various everyday tasks. The present study focuses on advancing 3D bipedal locomotion by developing of a new scheme based on Twist and Tilt feet mechanism for sit-to-stand (STS). This mechanism, in contrast with previous models, does not consider any foot fixed for the whole profile. Instead this model allows one foot a Twist movement and other

foot Tilt movement. Tilt foot mechanism is further designed into two schemes, one a sliding tilt and other a rotational tilt. This scheme is designed in order to study to STS issues faced by neurologically deficient human beings while carrying out different joint positions. These twist and tilt models are developed in CAD along with an 8-segment biped with two feet, two calves, two thighs, a pelvis, and a HAT segment. Both of these twist and tilt models are first produced in SOLIDWORKS Corp software. Subsequently, in order to facilitate control implementation, these models undergo linearization using SIMSCAPE/SIMULINK and MATLAB. The Controllability and Observability investigation of the constructed systems reveals that the model, which incorporates one foot linear tilt, consists of twelve states. Furthermore, it is determined that this model is both full rank controllable and observable, hence making it suitable for controller design.

19. MobileNet-based Prediction of Preterm Births

Paper ID: **093**

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Abstract: Nowadays preterm birth is a serious medical problem since it causes most perinatal deaths and puts people at risk for additional illnesses that could negatively impact their health. The early detection of such cases may prove to be very beneficial in raising society's overall health standards. In this work, uterine electromyography, also known as Electro Hysterography (EHG), is used to propose such an early diagnosis methodology. A 4^{th}-order band-pass Butterworth filter with a frequency of 0.8 to 5 Hz for each channel is used to filter the raw EHG signals from the EHG channels. Deep Learning (DL) algorithm is used for this purpose. Then, we extract features using DL, and the Quadratic Discriminant validation classifies EHG signals quite reliably. With 100% sensitivity and 99.5% specificity, the suggested framework has a 99.8% accuracy rate for classifying term and preterm birth. So this method provides an early pregnancy observation, preserving the lives of infants, and enhancing mother and baby health. This technology will assist in day-to-day clinical work.

20. Scale Invariant Tracking of Objects and Occlusion Detection in Challenging Thermal Infrared Sequences

Paper ID: 094

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Abstract: A major challenge in computer vision field is to track a target in different dynamic conditions such as changes in visual appearance, scale, occlusions and turbulence. Most of the vision-based trackers fails with changes in object appearance and low contrast conditions, especially in thermal infrared (IR) sequences. This paper proposes a robust technique that caters major challenges in tracking of objects in thermal IR sequences and shows promising results on Visual Object Tracking benchmarks (VOT). The proposed technique employs Discriminative Correlation Filtering with spatial and reliability maps to detect tracker failure conditions. It utilizes the Kalman filter for target translation estimation and tracking in situations such as low contrast or object size changes. Hence, using the enhanced correlation based discriminative filter along with occlusion detection and Kalman estimator results in excellent performance on challenging thermal IR sequences. Experiments have been conducted on VOT-TIR-2016 benchmark and CAMEL object tracking dataset to demonstrate the efficiency of the proposed approach in thermal IR sequences. Experimental results proved that our scheme better than other approaches by achieving an improved accuracy of up to 0.60, with a change in scale and contrast of the visual objects, whereas the original CSRT had an accuracy of 0.48.

21. Streamlining Software Release Process and Resource Management for Microservice-based Architecture on the multi-cloud

Paper ID: 098

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Abstract: The software development process is more flexible with the concept of containerization in the microservice platform. This research is on three key components to resolve problems faced by the developers and DevOps teams in the IT industry. First, the development phase expects a fully automated software release process from to the deployment phase and then optimize processes tailored to Docker, and Kubernetes, in microservice-based applications. Then streamline the process and leverage the container orchestration technologies to monitor the main aspect of the development lifecycle through the multi-cloud deployment on demand of the growth of day-today releases on multi-regions. A centralized monitoring platform is developed to monitor the deployed applications and that provides comprehensive visibility regarding performance and health of microservices. At the stage of scalarization in microservices, Vertical Pod Autoscaling (VPA) and Horizontal Pod Autoscaling (HPA) are available approaches for resource allocation, and they require measuring the minimum and maximum resource limits. As a result, an intelligent resource allocation system is proposed using a combination of Convolutional Neural Networks (CNN) and Bidirectional Long Short-Term Memory (Bi-LSTM) algorithms to cater to dynamic resource allocation, optimizing scalability, and improving costefficiency. This research aims to achieve practical insights into the IT industry's automated deployment, managing, scaling, and monitoring of microservice-based applications through the mentioned components.

22. Multi-Objective Optimization of the Traveling Salesman Problem using Merging Methodology

Paper ID: **100**

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Abstract: The Travelling Salesman Problem (TSP) is asymmetric in real life. It is also a multi-objective problem where there is more than one objective to be optimized. This research aims to apply a weighted merging methodology to solve the MultiObjective Traveling Salesman Problem (MTSP). The merging methodology shall convert the multi-objective problem into a single objective problem, allowing the single objective algorithms such as a Genetic Algorithm (GA), Ant Colony Optimization (ACO), and Particle Swarm Optimization (PSO) to provide a solution. These algorithms are single-objective but lead to solving the multi-objective problem, and the results of this research provide evidence that the weight adjustment can help skew the result based on the preference of the expected solution. The research focuses on two objectives: distance and time to optimize by applying weighted criteria. Such merging methodology could be applied to real-world problem solving, such as the welding robot path, circuit board design, and the design of a wireless sensor network by assigning the weights to the desired solution.

23. Design and Development of Assistive Ankle Exoskeleton for Rehabilitation using Electromyography

Paper ID: **103**

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Abstract: Powered ankle exoskeletons can be used in gait rehabilitation and gait assistance. For this purpose, the design must be light weight, comfortable and controlled by the user. In this study, a two degree of freedom light weight ankle exoskeleton (0.5 Kg at ankle, 0.2 Kg at waist) was developed with an EMG driven Brain Computer Interface based control to provide powered mechanical assistance according to motion intention of the user. The developed brain computer interface uses EMG pattern recognition with previously tested signal processing and feature extraction techniques with only a small window time of 100 milliseconds. The design was tested on 08 healthy subjects with high offline ($98.4 \pm 1.0\%$) and online accuracies ($92.1 \pm 2.0\%$) accuracies ($p<0.05$). The design also incorporates force measurements at sole for gait phase recognition.

24. Enhancing Urdu Intrinsic Plagiarism Detection Through Stylometry Features and Machine Learning

Paper ID: 106

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Abstract: The creation of digital content and the easy accessibility of information have led to a surge in academic and textual plagiarism. Plagiarism detection in multiple languages is essential to maintain the integrity of academic and literary works. In the context of the Urdu language, there is a growing need for effective plagiarism detection methods that are tailored to its unique linguistic characteristics. Existing Urdu plagiarism detection tools often rely on external sources or lack robustness in handling intrinsic forms of plagiarism, where the copied content is slightly modified or paraphrased. This research aims to bridge this gap by developing an intrinsic plagiarism detection system for the Urdu language, using a combination of machine learning, ensemble learning and Multi-Layer Perceptron (MLP). Furthermore, to train and evaluate our plagiarism detection models, we manually curate a corpus comprising a substantial collection of 1807 documents in Urdu. This corpus forms the foundation of our research, enabling us to develop and fine-tune our detection algorithms to effectively identify instances of intrinsic plagiarism in Urdu text. To comprehensively assess the unique stylistic fingerprints of documents, we employ a diverse set of word based stylometry features. This multifaceted approach enhances our ability to pinpoint instances of plagiarism in a robust manner. This research contributes to the ongoing efforts to combat plagiarism and uphold the integrity of written content, particularly in the context of the Urdu language, while also showcasing the effectiveness of different word based stylometry features in addressing this critical issue.

25. Design and Analysis of an Efficient ESPWM Based Induction Motor Drive

Paper ID: 107

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Abstract: High harmonic distortion, increased and uncertain torque ripples factor, and speed ripples have been the reason for reduced efficiency of three-phase induction motor drives. This article proposes an Extended Sine-Wave Pulse Width Modulation (ESPWM) based inverter with lesser THD, low speed ripples, and reduced torque ripple factor. Hence, high operational efficiency of three phase induction motor drive is achieved. Results of the proposed approach are validated and analyzed using MATLAB/Simulink. Additionally, the efficacy of the proposed ESPWM is justified by comparing it with Space Vector Pulse Width Modulation (SVPWM) and Sinusoidal Pulse Width Modulation (SPWM). Proposed ESPWM outperforms both SVPWM and SPWM.

26. Convolutional Matching Technique for Urdu Text Recognition

Paper ID: 112

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Abstract: Visual understanding of linguistic information is a crucial research topic because of its applications like Optical Character Recognition (OCR), opinion mining, and language translation. This paper focuses on the automatic Urdu text recognition system. Our work primarily consists of Urdu text recognition using a convolutional template matching technique. To this end, this paper investigates the character-wise explicit Urdu character detection and recognition method with Nastaleeq font. The proposed method comprises the grouping of homogeneous shaped classes that have their diacritic marks identified independently in a synthesis manner. Furthermore, we conduct experiments using an advanced Urdu News Ticker (UNT) dataset that provides precise character component-level labeling. The presented method attains 82.33% on the Urdu Printed Text Images (UPTI) dataset.

27. A Strip-Isolated Two-port Millimeter-wave MIMO Antenna for 28 GHz 5G Communication Band

Paper ID: 113

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Abstract: A compact two-port mm-wave MIMO antenna with good isolation is proposed in this research. The antenna has a dimension of 16 × 7 mm2 and operates in the frequency range of 27 - 29 GHz. The proposed MIMO antenna has two elements which has simulated gains of 4.75 and 5.05 dBi, respectively. The single element is ring-shaped monopole antenna obtained from a circular patch antenna. An isolation of greater than 20 dB is achieved by introducing a vertical parasitic strip between the MIMO elements. A very low Envelope Correlation Coefficient (ECC) of 0.0019 is attained in the operating band. The proposed antenna uses Rogers RT/Duroid 5880 substrate dielectric constant 2.2 and a thickness of 0.254 mm. The small size, high gain, and better isolation features make the proposed MIMO antenna suitable for the next-generation wireless applications.

28. An Empirical Study of the Impact of Software Process Patterns on Software Quality and Team Productivity

Paper ID: 118

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Abstract: Software development companies use a variety of software processes to improve team productivity and software quality. Each software process has its own set of patterns and practices. These process patterns are general reusable solutions to common problems that arise anywhere in the software development lifecycle. The

main goals of this research are to identify the commonly used software process patterns in the Pakistani software industry and to quantitatively measure the impact of some of these common software process patterns on the quality of the software produced and the productivity of the teams producing these software systems. To achieve these goals, first a survey was designed and conducted in the Pakistani software industry to identify the commonly used software process patterns. Three of these identified patterns – daily scrum, test-driven development, and small releases - were then shortlisted for a set of controlled experiments. These controlled experiments were performed using two consecutive sprints of three different real-life projects each undertaken at a different software house. Values derived from the data obtained in the controlled experiments were calculated using three metrics - team productivity, defect density and weighted defect density. Results of these experiments conclusively demonstrated that each of these three selected software process patterns has a positive impact on both team productivity and software quality.

29. A 3-Stage 22.5W GaN High Power Amplifier at 10 GHz for Satellite and Radar Applications

Paper ID: **119**

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Abstract: With the advent of GaN technology in the field wireless communication systems, the demand for high-performance GaN based Solid State Power Amplifiers (SSPA) has increase manifolds. But designing a high power and high frequency (i.e. 10GHz and above) SSPA still remains a daunting task. Considerations such as an accurate device model, parasitic effects, device selection, load and source Pull analysis, circuit topology, biasing techniques, input and output matching networks, and thermal management make SSPA design a perplexing endeavor. This study presents the design and characterization of a three-stage Class-AB High Power Amplifier (HPA) using GaN technology for satellite and radar applications. The TGF2977, TGF2978, and TGF2979 transistors from Qorvo are employed as the building blocks of the power amplifier. Modelithics' non-linear transistor model library is utilized for efficiently and accurately simulating the transistor amplifier performance at each stage. This work explores the advantages of GaN technology for satellite and radar applications, discusses the design considerations, presents the simulation results, and concludes with the performance evaluation of the power amplifier using Keysight's Advanced Design System (ADS).

30. Intelligent Agriculture Robot for Tea Plantation Preservation - TeaBot

Paper ID: 120

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Abstract: Tea cultivation stands out as one of the most significant export products that contribute to the Gross Domestic Product (GDP). In the previous decades, the substantial workforce gradually transitioned to different occupations. Compared to other crops, tea cultivation demands costly and meticulous upkeep. With a shortage of labor, maintaining tea estates grew tougher, leading to decreased yields. In reaction, estate owners transitioned to cultivating low-maintenance crops. The TeaBot is an advanced robot designed to replace human labor for watering and fertilizing vast tea estates. The TeaBot distinguishes itself by operating in rough outdoor terrain and infrastructure-free navigation in real tea plantations. Given that tea plants demand continuous hydration and nutrients for optimal crop yield, TeaBot plays a pivotal role in enhancing efficiency while reducing water and fertilizer wastage. Mainly four motor-powered wheels move accurately by translating linear and angular velocities using a precise motor control algorithm. An autonomous navigation algorithm was developed using two distinct approaches, which include deep learning-based computer vision and classical computer vision. The selection of the classical computer vision method was predicated upon its notable attributes, including high precision, minimal resource utilization, and optimal efficiency. A deep learning-based stem identification model was trained based on MobileNetV2 architecture to detect where the plant stem meets the ground for efficient hydration of individual plants. This lightweight model achieved 90% detection accuracy. The precise results of stem detection have made the liquid fertilization process more efficient.

31. Intelligent Buffer Management Policy in Post Disaster Network Using DTN

Paper ID: 122

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Abstract: Due to limited resources, lengthy and unpredictable delays, network separation, and high error rates, Delay Tolerant Networks (DTN) place a high priority on efficient message arrangement and storage. Ineffective memory management practices lead to issues such as the loss of crucial data, decreased delivery ratios, and higher overhead. Research in recent years has concentrated on memory management strategies to minimize overhead and increase the delivery ratio for life-saving signals. We update the forwarding strategy for post-disaster response networks in this research and test it using several protocols (such as Epidemic, Spray and Wait, and PRoPHET). Performance measurements for the policy include throughput, latency, and the flow of high-priority data. The single parameters used by existing tactics make it impossible to get decent outcomes. In this study, we provide enhancements across several parameters to effectively use memory and boost performance.

32. Quality Requirements Elicition in Agile

Paper ID: 123

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Abstract: Eliciting quality requirements also referred to as non-functional requirements is crucial in software development. In Agile software development, functional requirements are given more importance, therefore quality requirements receive less attention. Negligence of quality requirements elicitation is due to lack of user and developer knowledge about them. Non- functional requirements are often treated as additional software requirements. Quality attributes like maintainability, performance, reliability, accuracy, and security must be taken into consideration early, like functional requirements. However, finding quality requirements is a difficult task. There are few standard methods to elicit the functional requirements, but there is no mechanism for eliciting quality requirements. This study proposes a methodology to involve domain experts in the early stages of elicitation, so that

quality requirements can be extracted together with functional requirements. Moreover, cloud computing tools such as Google Docs will be used to save the quality requirements so that it can be used in future for the different projects of similar domains. The methodology is evaluated by implementing it on real time projects. The results show that to achieve customer satisfaction and to avoid schedule overrun and increased cost, it is important to consider quality requirements in the early stages of software development and to deliver a quality product, it is important to associate the functional requirements with the quality requirements.

33. AI's Challenge to Ethics and Law: Privacy, Bias, and Beyond

Paper ID: **128**
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Abstract: In case of AI based data processing systems, the relationship between ethics and laws gets more complicated, especially when these systems become more smarter and independent. These evolving autonomous AI systems challenge human cognition and dependence. But, serious concerns lie in AI's power to exceed its boundaries, posing difficulties in human comprehension, predictability, and control, especially concerning issues like privacy, bias, and ethical dilemmas in human judgment. Moreover, the advent of AI introduces new concerns, such as data inaccuracies and breaches, in the context of evolving digital technologies. This article highlights the escalating legal, ethical, and social dilemmas arising from AI-driven data processing systems, emphasizing the imperative of responsible governance and ethical reflection in our journey through the evolving AI landscape. It also gives some suggestions that can be used to address AI issues pertaining to social, ethical and legal norms of human beings. However, it continues to pose an enduring challenge for AI ethicists, reformers, and legal experts to work together in order to shape AI in the best interest of humanity.

34. A High Efficiency 25W Class-AB and Class-F GaN High Power Amplifier at 10 GHz for Satellite Applications

Paper ID: **129**
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Abstract: With the advent of GaN technology, the use of GaN based RF Solid State Power Amplifiers (SSPAs) has increased manifolds in satellite communications, radar applications and electronic warfare. But designing a highly efficient (e.g. Class-F) High Power Amplifier (HPA) at high frequencies (i.e. 10GHz and above) still remains a daunting task. Considerations such as an accurate device model, parasitic effects, device selection, load and source Pull analysis, circuit topology, biasing techniques, input and output matching networks and thermal management make SSPA design a challenging endeavor. At higher frequencies (i.e. C-Band and above), Class-F amplifiers are predominately developed using MMICs because transistor's internal parasitics affect the Harmonic Control Networks (HCNs). Therefore, in order to use a packaged device for Class-F design at X-Band, transistor's parasitics have to be extracted and embedded in the HCN design. This work presents the design and characterization of a 10 GHz GaN based 25W High Power Amplifier (in Class-AB and Class-F classes) for satellite and radar applications by embedding internal parasitics of Qorvos's TGF2979 transistor in the HCN. The paper discusses design considerations, presents simulation results for Class-AB and ClassF classes, compares the results with existing literature and concludes with the performance evaluation of the power amplifier using Keysight's Advanced Design System (ADS). The achieved efficiency for Class-F is 56% which is significantly greater than that achieved by Class-AB implementation in same transistor's evaluation board (i.e. 31.25%), in datasheet (i.e. 40.8% max.) and in available reference design [3] (i.e. 42.3 at 5.8 GHz%).

35. Modeling and Analysis of Design Parameters Selection for Biomechanical Movement of Prosthetic Finger

Paper ID: **130**

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Abstract: Prosthetic hands are modeled to mimic the human motion pattern for full and partial amputations. Partially amputated anthropomorphic hands have a variety of challenges for movement coordination between human fingers and robotic digits or prosthetic fingers. Modeling a prosthetic finger with an equivalent degree of freedom for various grip patterns with electrically actuated motors and mechanical assemblies requires a careful selection of design parameters for robust controllers in a wide range of application environments. In this study, we propose modeling of a prosthetic finger with two control joints operated with a DC micro-motor through gears, rotational spring, and rotary dampers. The torque of the motor drives the proximal-interphalange of the robotic finger coupled with the rotary shaft of the motor with gears. The distal inter phalange is coupled with rotary spring and damper assembly and electrical motor characteristics are taken into account for their

parameter selections. We then simulate results for different design values of gear ratio, spring constant, and rotary damper constant meeting the power transfer requirements of DC micro-motor and inertial loads of phalanges. We then tune a PID controller for optimal values and check its performance against variations in parameters. Our results demonstrate the applicability of the modeling and design scheme of a prosthetic finger for application in anthropomorphic hands.

36. Analyzing Tools and Techniques for Evaluating Requirements Traceability

Paper ID: 131

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Abstract: Requirements change throughout the software development lifecycle, from requirement elicitation and analysis to software operation. Software requirements can be traced back to their source and shown to depend on one another. According to studies, the tools and techniques for the present traceability methodologies need to be revised to prevent the practical application of traceability. We analyzed evaluation techniques and requirements traceability tools in this article to determine whether evaluation techniques are truly being used and supported by software tools. As a result, we noted no connection between the approaches and tools examined and that some criteria, such as stakeholder communication, difficulty of tools, and requirement stability, needed to be better considered in the evaluated tools.

37. Ideal Answer Generation for Biomedical Questions using Abstractive Summarization

Paper ID: 132

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Abstract: Finding precise information from biomedical literature is challenging because of the information overload and the ever-increasing size of the biomedical literature. Biomedical experts struggle to find precise information by reading complete documents, so there is a need to develop query-based summarized answers from the relevant articles. One solution to overcome this challenge is the development of question-answering (QA) systems to provide biomedical experts with precise information in the form of a summary (also referred to as ideal answer). Although extensive studies exist to find the answers to biomedical questions as facts (also known as factoids), the work on ideal answer generation is limited. In this study, we introduce a methodology for generating rephrased summary answers for biomedical questions from the relevant articles using the benchmark BioASQ dataset. We compare three transformer-based models, namely: BigBird, BART Large CNN, and Long T5 pre-trained models of abstractive summarization for generating ideal answers from biomedical snippets. We evaluate these models using the wellknown ROUGE metric. Our experiments suggest that the BART Large CNN model outperforms other transformer-based models, achieving an average score of 0.428, 0.304, and 0.376 for ROUGE1, ROUGE-2, and ROUGE-L respectively.

38. A Hardware-in-Loop Platform for Nonlinear Control of Isolated Boost Converter with Voltage Doubler

Paper ID: **141**

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Abstract: DC-to-DC converters are widely used due to their compact size and lower losses for power grids and electric vehicles like isolated boost converter with voltage doubler. Applying a controller to a DC-DC converter will improve its ability to regulate voltage under a variety of circumstances, including load changes and variations in the supply voltage. Particularly, a digital controller will be similarly effective due to its programmable nature and size reduction. Because power converters are nonlinear systems with regards to the duty cycle accepted as input, the focus of this study is on building a controller employing feedback linearization. To assess the controller's performance, a hardware-in-loop approach is adopted. This approach can enable real-time evaluation of the controller's effectiveness.

39. Feedback Controlling Turbine Position for a Prototype Tidal Power Plant

Paper ID: 142

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Abstract: In light of the rising worldwide energy demand brought on by both the rapid depletion of fossil fuels and the escalating effects of global warming, tidal power systems present a dependable and sustainable source of renewable energy. By putting the turbine in the region of maximum tidal current flow, this work intends to design a feedback controller for a prototype tidal power plant. To make the design of the controller for efficient regulation and performance optimization, we focus on accurate mathematical modelling and representation of system components. The proportional-integral (PI) controller used in our research is renowned for its improved system stability and acceptable steady-state performance. The transfer function, which explains the connection between applied voltage and turbine angular position, is given. Using control theory to determine the proper gains, the PI controller is designed for the derived transfer function. Additionally, the use of operational amplifiers is exploited to construct an analogue PI controller. The prototype is then tested with the analogue PI controller, and the position of the turbine is effectively managed.

40. An Intelligent Model to Predict Cardiovascular Disease using Machine Learning Techniques

Paper ID: 144

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Abstract: Human life is the most important asset of human beings. Every year millions of people lose their lives to cardiovascular diseases. It is a group of diseases related to blood vessels and the heart. The chances of developing cardiovascular diseases in a person can be controlled by reducing some risk factors that cause them. If they are predicted timely in patients, the patients can take decisions and make changes to their lifestyles, and consequently reduce the risk of developing cardiovascular diseases. The proposed model gave very promising results. It has proven to be very efficient in predicting cardiovascular disease in a person using the Gradient Boosting Tree algorithm. The model had 78.78%, 76.78%, 81.10%, 82.43%, and 18.90% accuracy, sensitivity, specificity, miss rate, and precision, respectively. Moreover, the fallout, LR+, LR-, and NPV were 18.90%, 4.06, 3.82, and 75.16% respectively. The classification time was 13 milliseconds per record and the detection time was approximately 0.2137 seconds per record. The proposed model also outperformed various well-known machine learning algorithms and state-of-the-art models.

41. Real time Heart Attack Detection Using Emerging Technologies

Paper ID: **149**
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Abstract: Heart attack, also called Myocardial infarction, is when the blood supply to the heart muscle is significantly decreased or entirely blocked. The early diagnosis of heart attacks is essential for protecting against adverse cardiac events and delivering prompt medical assistance. The real-time heart attack detection system presented in this study solves the shortcomings of previous approaches. The proposed study gathers data from patients using IoT technologies, such as temperature, heart rate, and pulse oximeter sensors. Then, for safe storage and later analysis, these sensor values are sent to a cloud-based database. The key innovation lies in the integration of cloud-based data storage with mobile application. The final result of the study is

in the form of mobile application which is an interface between doctors and patients and provides real-time temperature, heart-rate, and oxygen saturation monitoring. The application compares the gathered data to predetermined thresholds and, if abnormal readings are found, sends immediate alerts to both the doctor and the patient's mobile devices. The results show that it has the potential to improve patient outcomes, lower healthcare expenses, and offer insightful data for medical research.

42. Humor Detection Using Deep Learning

Paper ID: **160**

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Abstract: Humor, a fundamental component of human nature and interpersonal communication, brings lightness and depth to relationships. Detecting humor in written language is difficult because of its subtle reliance on aspects such as context, environment, taunts, and reactions. Several attempts have been made to find comedy in text, but few have been successful in detecting the desired humorous impact. Although deep neural architectures have been used to address this issue, their findings have frequently fallen short of delivering significant results. This study describes a novel approach for recognizing jokes that makes use of pre-trained models such as BERT. We thoroughly investigated a dataset of 200k short texts to address the problems of humor identification. The objective is to utilize a model capable of reliably detecting instances of comedy inside text while outperforming existing state-of-the-art approaches. Our proposed model achieved an accuracy of 0.968 and f1 score = 0.962.

43. Comparing Interconnected Dynamics: An Edge-based Analysis of Sector ETFs via Non directional Dependencies

Paper ID: **162**

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Abstract: This research delves into the intricate interdependencies among nine sector ETFs, harnessing linear and nonlinear analyses to elucidate financial market dynamics.

Utilizing methodologies such as Pearson correlation, mutual information, Spearman and Kendall rank correlation coefficients, and the insights from Minimum Spanning Tree (MST) networks, we provide a detailed insight into the relationships underpinning these ETFs. This study highlights the importance of using various statistical dependencies for decision-making.

44. Optimizing Smart Transportation Systems with Blockchain-Based Consensus Mechanisms: A Novel Approach

Paper ID: **165**

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Abstract: Intelligent transport plays a pivotal role in smart cities by optimizing traffic flow, reducing congestion, and minimizing environmental impact. Through real-time data analysis and smart routing, it enhances transportation efficiency while promoting sustainable urban development and improving the quality of life for residents. To improve the security of digital transportation systems, researchers are investigating blockchain-based solutions. The decentralized and immutable nature of blockchain can protect transportation data from unauthorized access. However, the consensus mechanism of blockchain platforms may hinder the responsiveness of intelligent transportation systems. Processing time-sensitive data could be delayed if multiple nodes are required to reach a consensus. To address this problem, a novel consensus mechanism utilizing smart contracts and the blockchain's underlying consensus protocol has been proposed. This strategy seeks to improve the responsiveness of smart transport mechanisms by combining the strengths of smart contracts and the consensus protocol of a blockchain. It has the potential to optimize realtime data processing and boost the overall performance of intelligent transportation systems.

45. Multilevel Converter-based Dynamic Voltage Restorer for Mitigation of Voltage Disturbance in Distribution Network

Paper ID: **169**

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Abstract: In today's power systems, one of the main problem is power quality. The emergence of complex equipment and excessive use of power electronic devices, have made them highly dependent on the quality of the supplied power that has increased its importance to both suppliers and consumers. Sensitive equipment's can be damaged due to voltage sag, voltage swell and harmonics present in the power system, which are mostly occurring power quality issues. This research focuses on enhancing the performance of a DVR under extreme sag and swell conditions by using a multilevel converter. In the proposed approach, we first employ the Synchronous Reference Frame (SRF) technique with positive sequence detection, followed by the integration of a Proportional-Integral (PI) controller, and lastly utilization of a Cascaded H-Bridge (CHB) five-level converter. SRF technique is employed to accurately detect and extract the fundamental components of voltage disturbances, enabling precise compensation and restoration of distorted waveforms. PI controller ensures accurate voltage regulation and robust control performance. Cascaded H-Bridge MLC topology is utilized to generate compensating voltage with increased voltage levels as compared to the conventional two-levels, reduced total harmonic distortions (THD), and improved power quality. The proposed technique is compared with traditional converter and control methods using MATLAB/Simulink simulations. The result shows significant improvements in voltage restoration, reduced THD and enhanced dynamic response under extreme sag and swell conditions. This research contributes to the advancement of power quality technologies, providing a reliable and efficient approach to voltage restoration in power distribution systems.

46. Facial Emotion Recognition using Deep Learning (FERDL)

Paper ID: **174**

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Abstract: Facial Emotion Recognition is one of the indemand and rapidly growing research topics in the domain of Computer Vision (CV) and artificial intelligence (AI). The ability to identify or detect human emotions from real-time facial expressions (FEs) has vast conceivable applications in different domains, such as sentiment analysis, human-computer interaction, human resource management, security, and human psychology. In this paper, a deep learning model Convolutional Neural Network (CNN) is trained with haar-cascade classifier to recognize the real-time FEs. The suggested model is specially trained to categorize the FEs into one of the seven emotion categories, namely six basic emotions (sad, happy, angry, surprised, disgusted, fear) and a neutral emotion. It includes several convolutional layers, as well as fully connected neurons, max-pooling layers, and soft-max activation function with the corresponding seven classes. ReLU activation functions along with various kernels to enhance filtering depth, and extraction of facial features. FER-2013 dataset is used for experimentation purpose. To improve the classification performance and model accuracy, a data augmentation technique is used for rescaling and horizontal flipping. The proposed model outperforms the previous related works by achieving a validation accuracy of 71.96% and training accuracy above 90%, with fewer epochs.

47. Advancing Urdu Character Recognition Through Neural Network-Based Segmentation and Classification

Paper ID: **183**

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Abstract: The compound character recognition of Urdu is not highly developed; therefore, it needs advanced techniques to make progress. Similar to Arabic, Urdu is written in a fluid, cursive style that flows from right to left. This means that the shapes and sizes of characters change based on the word's position. In this paper a method based on neural network is developed to deal with these challenges. The proposed method measures the strength of pixels to identify words within a sentence and the connections between characters in compound words, which is named as segmentation phase. In the next step, these segmented characters are fed into a neural network that has been trained for classification and recognition. The aim of this method is to test the algorithm's ability to accurately segment compound characters. MATLAB is used to check the performance of the proposed method, and currently it achieves an average accuracy of 99%. This is a significant step forward in the development of Urdu character recognition systems, especially for compound characters.

48. Security Challenges Faced by RISC-V open-source Processors and its Security Features: A Survey

Paper ID: 193

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Abstract: RISC-V, an open-source instruction set architecture (ISA), presents unique security dynamics due to its transparent development model. This survey illuminates the principal security challenges inherent to RISC-V and elaborates on the corresponding countermeasures, from hardware security mechanisms to cryptographic interventions. We explore the unique security challenges posed by its open-source nature and detail the innovative security features implemented to counteract them, including hardware security extensions and cryptographic solutions. As RISC-V processors gain traction, this comprehensive overview aids professionals in understanding both its vulnerabilities and strengths, serving as a guide for future research and development in the realm of RISC-V security.

49. Multi-channel Episodic Memory Building using Recurrent Kernel Machine

Paper ID: 208

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Abstract: Incremental learning is learning of new information without forgetting previous knowledge. Implementation of incremental learning faces the biggest challenge of catastrophic forgetting problem due to stability plasticity dilemma, algorithms should adapt new information with retaining of previously learned information. For

accurate solution of incremental learning, we studied the incremental learning process in humans and focus on brain‘s hippocampus memory involved in learning, information retaining, or recalling and. By inspiration of human‘s brain working and architecture we proposed a model in layered architecture, connected hierarchically. First, we develop working memory to automatically extract features vector of input images using CNN‘s VGGNet architecture. Second, we develop episodic memory and input feature vector from working memory. Episodic memory is build using recurrent neural network to implement incremental learning with achievement of stability by adjusting weights of neuron and plasticity by adding neuron for unseen input. Also, episodic memory’s network maintains by deleting outliers, node, and edges. Having no connection represents no information. Performance of proposed model is evaluated by incrementally learning of KTH dataset’s frame and comparison with already implementation of IL approaches.

50. Enhancing Public Safety: Detection of Weapons and Violence in CCTV Videos with Deep Learning

Paper ID: **210**

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Abstract: Our research employs cutting-edge deep learning techniques to automate the detection of weapons and violent activities in CCTV footage. By utilizing advanced deep learning models, our system swiftly identifies violence, including fights, and detects weapons, enhancing public safety by generating real time alerts for relevant authorities. We have employed YOLOv5 for weapon detection and a combination of ResNet and Bi-LSTM for Violence Detection. After preprocessing and feature extraction, trained models can detect weapons and violent activities effectively. Evaluation on diverse datasets demonstrates strong performance. We have also demonstrated the effectiveness of proposed architecture on hockey fight dataset showing comparisons with state of the art models. We address real-world challenges like data biases and model generalization, emphasizing scalability through integration with law enforcement systems. In conclusion, our work contributes to automated detection with promising security applications.

51. A Systematic Review on Pattern-based GUI Testing of Android and Web Apps: State-of-the-Art, Taxonomy, Challenges and Future Directions

Paper ID: 212

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Abstract: Graphical User Interface (GUI) designing and testing of different applications is significant from a user point of view. GUI testing ensures that the user interface of apps is visually appealing, user-friendly, and enhances user satisfaction. Pattern-Based GUI Testing (PBGT) is a new model-based testing approach that aims to increase reusability and diminish the effort in user interface modeling and testing apps. The objective of conducting a Systematic Literature Review (SLR) on pattern-based GUI testing is to consolidate existing knowledge and provide insights for improving the effectiveness of PBGT methods. The objectives of conducting an SLR are the identification of current state-of-the-art approaches and tools in the targeted research context. To accomplish the mentioned objectives, A hybrid methodology combining Kitchenham's SLR and PRISMA guidelines was used to conduct this SLR. We performed a keyword-based search on well-known databases IEEE, ACM, Science Direct, Wiley, and Springer Link to determine the potential studies published in the last 10 years between the years 2013 to 2023. Following a comprehensive systematic analysis, we identified a total of twenty-four studies employing varied approaches for pattern-based GUI testing. Additionally, we identified 11 tools that have been used/proposed in pattern-based GUI testing for Android and web apps and made a taxonomy of tools. We also identified challenges and research directions. The implications of this study are significant. The current study is helpful for researchers intending to work in pattern-based GUI testing. The comprehensive knowledge about the current state-of-the-art Tools, techniques/approaches will help practitioners to effectively apply them in industry and enable researchers to extend their work in this context in future research.

52. Cardboard-Based Facile Triboelectric Sensor for Footstep Monitoring and Illuminating Shoes

Paper ID: **215**

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Abstract: This paper presents the design and implementation of a cardboard-based triboelectric nanogenerator (CB-TENG) sensor for illuminating light and monitoring footsteps in children's shoes. The sensor utilizes the triboelectric effect, where the material becomes electrically charged after friction to generate power from the foot's motion. The sensor is integrated into the shoe's sole and utilizes a simple circuit to convert the generated electricity into a usable form to power an LED light. The sensor also includes a step-counting mechanism to track the number of steps taken. Using a low-cost and sustainable material such as cardboard in the sensor's design makes it an affordable and ecofriendly solution for illuminating and monitoring children's shoes. The sensor was tested and found to have a high energy conversion efficiency, and the LED light provided sufficient illumination for the wearer. The step-counting mechanism was also found to be accurate in tracking the number of steps taken. The proposed sensor has the potential to be a useful tool for parents and caregivers to monitor the activity levels of children and ensure their safety in low-light conditions.

53. Customer Segmentation for Targeted Marketing: A Comparative Analysis of Clustering Techniques

Paper ID: **217**

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Abstract: In the contemporary landscape of data-driven decision-making, businesses are increasingly harnessing customer segmentation as a strategic tool for tailoring their marketing endeavors. His research employs the Cross-Industry Standard Process for Data Mining (CRISP-DM) methodology to investigate customer segmentation for targeted marketing. It encompasses phases such as data understanding, preprocessing, modeling, evaluation, deployment, and monitoring. Our study applies K-Means and Hierarchical Clustering algorithms to create customer segments. While Hierarchical Clustering provides a visually insightful segmentation structure, K-Means excels in terms of the Silhouette score, a crucial clustering metric. Overall, K-Means Clustering emerges as the superior choice due to its interpretability and comprehensive utility. This research contributes to data-driven marketing by offering insights for businesses seeking to enhance marketing strategies, elevate customer engagement, and boost revenue.

54. Effects of Parasitic Elements in High Frequency GaN-based DC-DC Converters for Electric Vehicle Applications

Paper ID: **218**

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Abstract: This paper analyzes half-bridge DC-DC buck converter topology operating in buck mode using Gallium Nitride (GaN) transistors for Electric Vehicles (EVs) application. The LTspice-based simulation model is developed for the buck converter with parasitic elements to evaluate performance efficiency for varying load. The impact of parasitic passives (resistance, inductance, and capacitance) such as ringing by parasitic inductance on GaN transistor operation are also explored. Effects on performance efficiency has been carried out with and without including the parasitic elements in the simulations to evaluate the importance of modeling with parasitics. Performance efficiency evaluation results are also bench-marked against

the results of the EPC 9162 demonstration board working as a bi-directional buck converter.

55. MIMO-NOMA in Heterogeneous Network for 5G System

Paper ID: 219

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Abstract: The integration of Multi-input Multi-output (MIMO) antennas with Non-Orthogonal Multiple Access (NOMA) has emerged as a compelling advancement within the realm of fifth-generation (5G) wireless systems, promising remarkable enhancements in network capacity, spectrum efficiency, and reliability. Nevertheless, deploying MIMO-NOMA in heterogeneous 5G networks presents a spectrum of intricate technical challenges, encompassing inter-cell interference, user pairing, and power allocation. This article offers an exhaustive examination of the existing research gaps in the domain of MIMO-NOMA. Furthermore, it undertakes a comprehensive analysis and discourse on this field's myriad challenges. To empirically evaluate the performance of the MIMO-NOMA HetNets heterogeneous networks (HetNets) system, Monte Carlo simulations were employed to assess the outage probability under a proposed system model. The study involves the manipulation of key parameters, including the number of antennas and the number of users per cluster, to rigorously validate the simulation results and provide valuable insights into the performance characteristics of MIMO-NOMA HetNets.

56. Automatic Detection of Diabetic Retinopathy from Fundus Images using Machine Learning Based Approaches

Paper ID: 220

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Abstract: Diabetes-related retinopathy (DR) is the primary cause of blindness in the modern world. It affects retinal blood vessels. It causes blindness over time with no initial symptoms. Early detection of DR helps prevent vision loss. The method for detecting DR is based on Machine Learning (ML) network algorithms that categorize patient fundus photos by DR severity. This research proposes accurate ML-based architectures. Cropping and scaling are used to preprocess Kaggle DR Dataset photos. Unbalanced data affects our model's accuracy. 70:30 split evaluates prediction performance. 94% accurate decision model ML-based approaches have a more robust and generic method for quantitative DR image analysis. These results are useful for imbalanced large-scale datasets. Machine learning-based approaches have better results.

57. FDF: Fragment based Data Forwarding in NDN based UWSN

Paper ID: **221**

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Abstract: Utilizing underwater technology encompasses a range of applications, such as monitoring ecosystems, locating resources, identifying objects in military operations, detecting underwater pollution, and predicting natural disasters. These endeavors aim to enhance convenience and well-being for individuals. One of the solutions offering the mentioned applications is the underwater wireless sensor network. Decentralized wireless networks hold significant promise. NDN, a network paradigm, prioritizes the network environment over IP addresses. However, the lossy nature of water leads to an increased packet loss ratio. This highlights the necessity for an energy efficient forwarding approach in Underwater NDN. In this proposed approach, our aim is to access the packet with lesser number of loss rate. We deal with the big chunk size for avoiding huge delay in satisfying packets.

58. Comparison of Genetic Algorithm and Particle Swarm Optimization for DC Optimal Power Flow

Paper ID: **224**

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Abstract: In this paper, a comparative analysis is provided for Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) applied to DC Optimal Power Flow (OPF). The study was conducted on a 4-bus network with three generating units connected to three different buses and supplying loads at two distinct buses. The proposed approach focuses on optimizing the control variables for the DC OPF. By comparing the GA and PSO, this study aims to assess their effectiveness in improving the accuracy of the optimized objective functions. To validate the efficacy of this comparative analysis, a MATLAB-based code was developed and tested under various objectives, including fuel cost minimization, while considering line constraints. The results provide insights into the strengths and weaknesses of both GA and PSO in the context of the DC OPF.

59. A Framework for Multi-Grade Classification of Ulcerative-Colitis Using Deep Neural Networks

Paper ID: **226**

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Abstract: Endoscopic disease severity assessment is a critical component in the management of ulcerative colitis patients. Endoscopic evaluation, on the other hand, suffers from significant intra-observer and inter-observer differences, reducing the reliability of individual assessments. As a result, we set out to create a deep-learning model capable of distinguishing between distinct endoscopic disease severity levels. Initially, we preprocessed the dataset and then applied data augmentations on the images using various geometric transformations. Subsequently, we have utilized the transfer learning concept by applying modified ResNet-50 by stacking additional layers which further improves the classification performance. Our proposed model achieved an accuracy of 84.21%, 81.06% recall, and 88.33% precision.

60. Crowd Scene Analysis: Crowd Counting using MCNN based on Self-Supervised training with Attention Mechanism

Paper ID: 227
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Abstract: Fully-supervised learning requires expensive and laborious annotations of labeled data for crowd-counting tasks. To alleviate this burden, it is desirable to explore methods that reduce the need for extensive labeling. Fortunately, there are a vast number of unlabeled images available in the world, making them easily accessible compared to labeled datasets. This paper proposes a self-supervised learning-based M-CNN framework with an attention mechanism that aims to leverage unlabeled data for pretraining the model. The framework consists of four submodules: a data augmentation framework, a self-supervised training network, a multi-column CNN, and an attention mechanism. These networks receive the images that undergo random processing using two defined augmentation transformations. Transformed images are then subjected to self-supervised learning and fed to a feature extraction network. FEN consists of M-CNN with five convolutional branches to extract features at a multi-scale level. These extracted features are then employed as an attention mechanism to focus on the head or shoulder location of people. To evaluate the effectiveness of our proposed model, experiments are conducted on two public datasets: ShanghaiTech Part A, Part B, and UCF-QNRF. The experimental results demonstrate that our approach outperforms state-of-the-art semi-supervised methods, showcasing the effectiveness of our proposed approach in leveraging both unlabeled and limited labeled data for crowd counting tasks.

61. Diabetic Retinopathy Classification of Fundus Images of eyes using Deep learning Algorithms

Paper ID: 228
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Abstract: A common retinal condition called diabetic retinopathy can cause blindness. Diabetes mellitus is a primary cause of diabetic retinopathy. To prevent vision loss, initial identification and intervention are essential. Using fundus retina images, researchers have proposed various computer vision and machine learning algorithms for identification and classification of retinopathic disorder in diabetics. This article provides a thorough overview of some deep learning techniques for detecting diabetic retinopathy using fundus images after passing through various aspects of that pipeline. We have also presented a CNN based pretrained EfficientNet model of machine learning with appropriate preprocessing to detect retinopathy with an efficiency score of 85% based on the input dataset containing the fundus images.

62. Leukemia Cell Classification using Deep Learning Approaches

Paper ID: **231**
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Abstract: Leukemia is a type of blood cancer that originates in the bone marrow and results in the proliferation of a significant quantity of irregular cells. Early detection and treatment offer the possibility of a cure for this disease. Considering this context, rapid analysis of blood cells for leukemia becomes a critical priority within the healthcare industry. Identifying and categorizing white blood cells poses a significant challenge in image processing due to labor-intensive manual data analysis and frequently inaccurate nature. To tackle this challenge, this research article proposes a technique to classify blood smears that uses multiple deep learning architectures including SqueezeNet, ResNet-50 and AlexNet. To develop a technique, Acute Lymphoblastic Leukemia image dataset is used. Moreover, a comparative analysis is perfomed among applied deep learning models to select the appropriate one for the targeted domain.The experimental results indicate that the AlexNet outperforms others with 99% accuracy. Furthermore, results are compared with state-of-the-art techniques that depict the superiority of the proposed system.

63. Leukemia Cell Classification using Deep Learning Approaches

Paper ID: 233

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Abstract: Leukemia is a type of blood cancer that originates in the bone marrow and results in the proliferation of a significant quantity of irregular cells. Early detection and treatment offer the possibility of a cure for this disease. Considering this context, rapid analysis of blood cells for leukemia becomes a critical priority within the healthcare industry. Identifying and categorizing white blood cells poses a significant challenge in image processing due to labor-intensive manual data analysis and frequently inaccurate nature. To tackle this challenge, this research article proposes a technique to classify blood smears that uses multiple deep learning architectures including SqueezeNet, ResNet-50 and AlexNet. To develop a technique, Acute Lymphoblastic Leukemia image dataset is used. Moreover, a comparative analysis is perfomed among applied deep learning models to select the appropriate one for the targeted domain.The experimental results indicate that the AlexNet outperforms others with 99% accuracy. Furthermore, results are compared with state-of-the-art techniques that depict the superiority of the proposed system.

64. Integration of Artificial Intelligence for Demand Forecasting and Resource Allocation in Renewable Energy Supply Chains

Paper ID: 235

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Abstract: In the rapidly evolving landscape of renewable energy, efficient supply chain management is pivotal for sustainability and market competitiveness. One of the most challenging aspects is accurate demand forecasting and the subsequent resource allocation to meet this demand. This research aims to investigate the transformative potential of Artificial Intelligence (AI) in enhancing these critical supply chain operations. Utilizing machine learning algorithms, the study explores how AI can effectively analyze patterns and trends in consumption data, thereby refining demand forecasts for renewable energy resources like solar and wind energy. The paper also examines the optimization of resource allocation facilitated by these AI-driven insights, contributing to cost reduction, waste minimization, and the overall efficiency of the supply chain. Through a blend of case studies, empirical data, and computational models, this research showcases that the integration of AI technologies can yield significant improvements in both demand forecasting accuracy and resource allocation optimization. Findings reveal that AI implementation can lead to a more coordinated, responsive, and sustainable supply chain, thereby addressing the dual challenges of meeting increasing energy demands and reducing environmental impact. This study provides both practitioners and policymakers with a nuanced understanding of the benefits and challenges of applying AI in the renewable energy supply chain and suggests avenues for future research and technology integration.

65. Perception of Managers Regarding Implementation of Energy Management Practices: Barriers and Challenges – A Focus Group Discussion in Pakistan's Manufacturing Sector

Paper ID: **237**

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Abstract: In the pursuit of sustainable operations, the manufacturing sector is increasingly adopting standards like the ISO 50001 Energy Management System (EnMS). This study delved into the challenges faced by energy managers in the manufacturing sector of Pakistan while implementing this standard. Through a qualitative focus group discussion involving 25 energy managers, four predominant barriers were identified: Lack of Training and Awareness, Organizational Barriers, Technical Challenges, and Financial Constraints. Notably, a significant 92% of participants highlighted the need for enhanced training and awareness campaigns tailored to the ISO 50001 standard. This research provides critical insights into the barriers to

EnMS implementation in Pakistan's manufacturing sector, emphasizing the importance of targeted interventions to bolster its adoption and efficacy.

66. Quantifying the Benefits of Implementing Energy Management Systems on Energy Performance and Organizational Competitiveness: A focus group discussion

Paper ID: **238**

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Abstract: This study delves into the critical topic of quantifying the benefits of implementing Energy Management Systems (EnMS) on energy performance and organizational competitiveness through a focused group discussion. Notably, this research marks a pioneering effort as it is the first of its kind conducted in Pakistan. As organizations worldwide face increasing pressures to reduce energy consumption and environmental impacts, EnMS has emerged as a strategic tool to enhance energy efficiency and sustainability. To understand the multifaceted impact of EnMS adoption in the Pakistani context, this research conducts a comprehensive focus group discussion involving key stakeholders from various industries. The focus group participants, comprising energy managers, sustainability experts, and organizational leaders, engage in a structured dialogue aimed at uncovering the tangible advantages of EnMS integration within the unique socio-economic and environmental landscape of Pakistan. Through this qualitative approach, the study investigates how EnMS initiatives influence energy performance, cost savings, environmental stewardship, and overall competitiveness within Pakistani organizations.

67. FPGA Design of a Reconfigurable UART IP Core and its SoC Implementation for IoT Applications

Paper ID: **240**

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Abstract: Data interruption during serial transmission is a commonly encountered issue. It is mostly caused by inappropriate buffer size allocation between the two Universal Asynchronous Receiver Transmitter (UART) modules to store the entire data chunk being sent or received. This problem can be mitigated if both modules can communicate with each other to adjust the size of their Transmit (Tx) and Receive (Rx) buffers through either static or dynamic reconfiguration. In our proposed design, both these approaches have been used to modify the typical UART architecture. In the 'Instantiation' mode, the sizes of Tx and Rx buffers are specified statically when the core is instantiated in a project during simulation and synthesis steps. In the 'Runtime' mode, the buffer sizes are dynamically adjusted based on the communication between the CPUs at the two ends. In the later case, the Tx UART modifies its own buffer size and then sends control packets to configure the size of the Rx UART preceding the data transfer. A System-on-Chip (SoC) based on RISC-V SwerRV IP Core and the modified 16550 UART IP Core has been developed, tested, and synthesized for both Artix-7 FPGA and TSMC 180 nm ASIC technologies. The design demonstrated correct UART behavior while adding configurable data buffers at both ends to provide non-blocking data transfers up to a buffer size of 32 KB.

68. A Neurocognitive Approach to Evaluate Mobile Game Player's Experience Using EEG

Paper ID: **241**

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Abstract: In recent years, the gaming industry has witnessed exponential growth, with an increasing focus on enhancing player experience and engagement. To achieve this, we propose a method that recognizes game experience traits of players using Electroencephalography (EEG). The proposed method aims to comprehensively

assess player engagement with neural measurements from EEG recordings. For this purpose, data is recorded using MUSE EEG headband while playing a game. Data is preprocessed to minimize the unwanted noise in the EEG data. Different frequency domain features are extracted and three different classifiers i.e., K-nearest neighbor, Random Forest, and Naive Bayes are used to classify the existence (i.e., High/Low) of two game experience traits i.e., Tension and Challenge. A highest accuracy of 86.6% and 88.8% is achieved for challenge and tension game trait recognition respectively using Random Forest classifier. Notably, the study unveiled that different game traits can be recognized using EEG, suggesting the potential for personalized game design.

69. Motorbike Driving Activity Recognition Using Smartphone Motion Sensors

Paper ID: 242

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Abstract: Motorbike driving activity recognition plays a crucial role in various domains, including rider safety, vehicle diagnostics, and driver behavior analysis. Traditional methods for activity recognition often rely on dedicated sensors or onboard systems, which can be expensive, cumbersome, or limited in terms of availability. In recent years, the widespread use of smartphones with built-in motion sensors has opened up new possibilities for activity recognition in a more cost-effective and accessible manner. This paper presents a novel approach for motorbike driving activity recognition using smartphone motion sensors. Motorcyclist are inquired to take after a predefined way for recording accelerometer and gyroscope data. Twelve factual features are extricated to classify four driving events i.e., right turn, left turn, U-turn, and a straight path. Four machine learning classifiers i.e., Bayes Net, K-nearest neighbor, support vector machine, and random forest is utilized to classify motorbike driving events. The findings indicate that fusing of a gyroscope and accelerometer can significantly improve the detection of bike driving occurrences, achieving a noteworthy precision rate of 92.13%.

70. Transformative Conversational AI: Sentiment Recognition in Chatbots via Transformers

Paper ID: 243

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Abstract: Recent years have seen a dramatic increase in the use of conversational artificial intelligence (CAI) for both academic and commercial applications, primarily in the context of chatbots and AI virtual assistants. The user's engagement produces a human like responses. However, the capacity to discern sentiments and respond adequately is one of the major difficulties faced by conversation systems. In the present study, we propose a transformer-based framework for a sentiment-aware chatbot. The suggested transformer is a neural network architecture that is highly parallelizable and solely dependent on the selfattention mechanism. A transformer model controls variablesized input using stacks of self-attention layers rather than deep neural networks or CNNs. In this manner, language creation is carried out using the cutting-edge pre-trained model CTRL, which can easily adapt to various pre-trained models without needing architectural adaptations. Our model was trained using the DailyDialogues dataset and was evaluated using automated metrics. Findings from experiments confirm that, in terms of content quality and emotion perception, our suggested technique works better than cutting-edge baselines.

71. PAPR Reduction in OFDM Signal Using Machine Learning Base Tone Reservation

Paper ID: 246

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Abstract: The orthogonal frequency division multiplexing (OFDM) is a wireless communication modulation and multiplexing technology that has been widely used in practice due to its salient advantages, i.e., high spectral efficiency and multi-path fading resistance. However, OFDM signals is known to suffer from High Peak-to-Average Power Ratio. PAPR reduction techniques are subject of extensive research. Among them, Tone Reservation technique is considered a viable solution, as it is capable of reducing the PAPR of OFDM signals without scarifying the BER performance; this is achieved by reserving some subcarriers to control the peaks. Assigning appropriate signals to these subcarriers is required to maximize the PAPR reduction performance. In this paper, we apply two machine leaning algorithms, namely Support Vector Machine (SVM) and Artificial Neural Network (ANN) to help determine appropriate peak canceling signals for the Tone Reservation PAPR reduction technique. Numerical results on a relatively small subcarrier OFDM system have shown that both SVM and ANN offer good performance in assigning peak canceling signals as compared to the solution obtained by the exhaustive search, with ANN being a slightly better than SVM.

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