14th IEEE International Conference on Control System, Computing and

Park Royal Penang Resort, Batu Ferringhi, Penang, Malaysia
23 – 24 August 2024
http://acscrg.com/iccsce2024

Conference Proceedings

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IEEE MALAYSIA SECTION

IEEE Control Systems Society Malaysia Chapter

Universiti Teknologi MARA

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PREFACE

Welcome to the 2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE 2024). We are delighted to continue organising this annual conference series, which covers the broad areas of Control Systems, Computing, and Engineering. Various conference tracks are considered to focus niche areas of Control and Systems Engineering, Automation and Robotics, System Identifications, Signal and Image Processing, Sensors and Sensing Techniques, Artificial Intelligent and Optimization Systems, Autonomous and Navigation Systems, Mechanical Systems and Mechatronic, Computer and Information Engineering, Bioinformatics and Biomedical Engineering, Early Warning and Disaster Recovery System and Control Systems Applications for Power Engineering. For a decade, the conference had established a solid reputation as a high-quality conference that was indexed by IEEE Xplore® and SCOPUS.

The responses to the call-for-papers were encouraging, both from Malaysia and overseas. Following a plagiarism check and a double-blind review process, 58 papers were recommended for presentation and inclusion in the proceedings of the 2024 14th IEEE International Conference on Control System, Computing, and Engineering (ICCSCE 2024).

The Control Systems Society Chapter, IEEE Malaysian Section, is sponsoring the ICCSCE 2024, which is organised by the School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA (UiTM). This time, the conference will be held in a hybrid mode; Face to Face for local participants and via virtual environment for international participants.

The success of the conference is attributed to the hard work of many volunteers in the organizing committee, the reviewers and also support from all presenters and participants. We are very grateful to all authors, session Chairpersons, reviewers and delegates. Many thanks to IEEE-CSS Malaysia Chapter for sponsoring the conference, especially on the technical review and also production of the proceeding. Last but not least, thanks also to the Organizing Committee, colleagues and friends who have been working behind the scenes; who deserve this special mention. To all participants, the conference organizing committee wishes you a very fruitful conference.

Warm wishes.

Assoc Prof. Ir. Ts. Dr Siti Noraini Sulaiman

General Chair
23-24 August, 2024
2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE2024)

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2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE2024)

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2.30 pm – 5.00 pm	Registration

Day 2: Aug. 24, 2024 (Saturday)

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10.15 am – 11.15 am	Parallel Session 2 (2A, 2B, 2C)
11.15 am – 12.45 pm	Parallel Session 3 (3A, 3B, 3C)
12.45 pm – 2.15 pm	Lunch @ Cinnamon Asian Kitchen
2.15 pm – 3.15 pm	Parallel Session 4 (4A, 4B, 4C)
3.15 pm – 3.30 pm	Tea Break @ foyer
3.30 pm – 4.45 pm	Parallel Session 5 (5A, 5B)
4.45 pm – 5.00 pm	Closing Ceremony and Announcement of Best Paper Award

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Room : Kayu Manis

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2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE2024)
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2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE2024)
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Room : Pandan

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* Online presentation

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2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE2024)
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* Online presentation

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12.00 pm – 12.15 pm	**1010** Enhancing Pharmacokinetic Modeling with Fractional-Order Kinetics and Deep Learning
12.15 pm – 12.30 pm	**1054** Remote Monitoring Surveillance System via LabVIEW employing the use of Hybrid Renewable Energy
12.30 pm – 12.45 pm	**1069** Road Image Deblurring With Nonlinear Activation Free Network

* Online presentation

2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE2024)
Technical Session 4A – DAY 2 – Aug. 24, 2024
Session Chair: Dr. Muhammed Basheer Jasser
Time: 2.15 pm – 3.15 pm
Topic: Automation and Robotics & Control System

2.15 pm – 2.30 pm	**1024** Transforming Oil Palm Plantations: Leveraging Data Link using TV White Space, 5G, and Wi-Fi for Robotic Agriculture
2.30 pm – 2.45 pm	**1044** ROS Integration and Evaluation for Robot Navigation in a Narrow-Path Indoor Environment
2.45 pm – 3.00 pm	**1066** PID-DTC Controller for Nonlinear Knee Extension Model with Time Delay Effect in Closed-Loop FES
3.00 pm – 3.15 pm	**1068** System Reconfiguration to Control Knee Extension with Time Delay Nonlinearity in Closed-Loop FES

2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE2024)
Technical Session 4B – DAY 2 – Aug. 24, 2024
Session Chair: Nur Athiqah Harron
Time: 2.15 pm – 3.15 pm
Topic: Artificial Intelligence & Communication Engineering
Room : Pandan

2.15 pm – 2.30 pm	**1065** Innovative Kenaf-Brick Composite for Effective Microwave Absorption
2.30 pm – 2.45 pm	**1071** Microwave Absorption Performance of Multilayer Anti-Radiation Bricks for Sustainable Construction Materials
2.45 pm – 3.00 pm	**1070** A Novel Application of MLP Networks in Classifying L Band Eco-Friendly Microwave Absorbers
3.00 pm – 3.15 pm	**1039** Microcalcification Detection for Digital Breast Tomosynthesis Images Using Faster-RCNN

2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE2024)
Technical Session 4C – DAY 2 – Aug. 24, 2024
Session Chair: Assoc. Prof. Ir. Dr. Audrey Huong
Time: 2.15 pm – 3.15 pm
Topic: Signal and Image Processing
Room : Serai

2.15 pm – 2.30 pm	**1009** PSO-optimized U-Net for Automatic Retinal Optic Disk Segmentation
2.30 pm – 2.45 pm	**1011** Enhancing Lung Cancer Classification: Leveraging Existing Convolutional Neural Networks within a 1D Framework
2.45 pm – 3.00 pm	**1016** Covid-19 Chest X-Ray Classification using Convolutional Neural Network
3.00 pm – 3.15 pm	**1003** Enhancing High-Value Asset Security: RFID based Anti-theft System Evaluation and Optimization

2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE2024)
Technical Session 5A – DAY 2 – Aug. 24, 2024
Session Chair: Dr. Iza Sazanita Isa
Time: 3.45 pm – 4.30 pm
Topic: Artificial Intelligent & Optimization Systems
Room : Serai

3.30 pm – 3.45 pm	**1032** Impact of Dust Deposition on PV Performance and Hotspot Generation: I-V and Thermal Analysis with SEM and UV-VIS-NIR
3.45 pm – 4.00 pm	**1038** Analyzing Model Order Estimation in Industrial Hydraulics System using Open Loop Identification
4.00 pm – 4.15 pm	**1052** Dysgraphia Handwriting Image Augmentation for CNN Model Classification
4.15 pm – 4.30 pm	**1074** Design of Digital System Identification Controller for a Nonlinear Knee Model in Closed-Loop Functional Electrical Stimulator (FES)

2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE2024)
Closing ceremony – DAY 2 – Aug. 24, 2024
Time: 4.45 pm – 5.00 pm
Room : Pandan

4.45 pm – 5.00 pm	Closing Ceremony and Announcement of Best Paper Award

2024 14th IEEE International Conference on Control System, Computing and Engineering (ICCSCE2024)

Paper Title & Authors (Abstract)

ID1001

Analysis of Power Consumption and Maximum Demand on Power Factor Using Support Vector Machine Regression

Siti Nursyafiqah Md Isa, Kamarulazhar Daud, Mohammad Nizam Ibrahim, Ahmad Asri Abd Samat, Saodah Omar, Mohd Affandi Shafie

Abstract— This paper analyzes the power consumption and maximum demand to evaluate the effect of the power factor and forecast the value of the power consumption and maximum demand using support vector machine (SVM) regression in MATLAB software. The data on power consumption and maximum demand are collected from the previous 12-month electricity bills for the year 2019 until 2022 at Universiti Teknologi Mara (UiTM) campuses: Pulau Pinang, Arau, and Tapah. The graph of the maximum demand, power consumption, and power factor has been plotted to show the relationship between these three variables for the year 2022. From the graph, it was found that when the power factor is low, more current is needed to supply the same amount of power to a load. This means that more power is being drawn from the electrical supply system, which increases the power consumption. The power factor also shows the efficiency of the electricity at the UiTM. The quadratic SVM in regression learning is used to forecast the value of power consumption and maximum demand in MATLAB software without or with the use of the Principal Component Analysis (PCA). Therefore, it can show which one is better to use to make a prediction. This study successfully achieved the objective of analyzing power consumption, maximum demand, and power factor and forecasting the value of power consumption and maximum demand.

ID1003

Enhancing High-Value Asset Security: RFID based Anti-theft System Evaluation and Optimization

Syed Muhamad Solahuddin Syed Zainal Abidin, Shabinar Abdul Hamid, Zuraida Muhammad, Nor Adni Mat Leh, Samihah Abdullah, Siti Juliana Abu Bakar, Solahuddin Yusuf Fadhlullah

Abstract— High-value assets are prime targets for theft. Mitigating the losses associated with such theft requires swift detection, accurate identification, and real-time response. This research proposes an anti-theft system employing active RFID technology to automate the process of tracking, comprising RFID tags and readers. The study evaluates the system's performance in a real-world environment by adopting Design of Experiment (DOE) and Analysis of Variance (ANOVA), focusing on key factors influencing throughput and communication range. The analysis revealed that baud rate and frame size were significant factors affecting throughput, with frame size having a stronger influence than baud rate. In evaluating communication range, power level and obstruction were the primary factors impacting read range performance, with power level exerting a greater influence than obstruction. The findings of this study provide guidelines for optimizing the deployment of RFID-based anti-theft systems.

ID1004

Identification of Lung Lesions in Computed Tomography Scan Images using Machine Learning Techniques

Mohd Firdaus Abdullah, Siti Noraini binti Sulaiman, Muhammad Khusairi Osman, Noor Khairiah A. Karim, Adi Izhar Che Ani,Nurfadzilah Ahmad

Abstract— Lung cancer is a common cause of death among people throughout the world. Other methods for detecting lung cancer include computed tomography (CT), magnetic resonance imaging (MRI), and radiography. This method suggests CT is useful for detecting lung cancer since it is widely available, has a shorter imaging time, and is less expensive. For clinical analysis and effective preventive planning by medical authorities to lower the number of fatalities, early diagnosis of lung lesions is crucial. Visual score is a typical method used by skilled radiologists to manually identify lesions on CT images. Nevertheless, the manual approach is labor-intensive, time-consuming, tedious, and visible. This research proposes a method for automatically detecting soft lung tissue lesions for CT images. To detect lung lesions from CT scans, the system employs image processing and machine learning techniques. The proposed automatic identification system divided into three stages. The first stage is image acquisition and data collection. The second stage proposed method involved designing a procedure for lung region segmentation using an image processing technique specifically for lung region for detection of lesions. The final stage explains an automated lesion identification for further classifying the lesion and non-lesion from CT scan lung images based on geometrical properties that have been calculated. Finally, a system that utilized the best of above-mentioned methods is proposed to perform the automated lesion detection. The method achieved high capability for automatically identifying lung lesions near the manually delineated lesion by radiologists with 98% accuracy. These findings show the possible used of this approach as an assisted tool for the radiologist in detecting lung lesions.

ID1005

Machine Learning Approaches for Sentiment Analysis on Balanced and Unbalanced Datasets

Ahmed ElMassry, Abdulla Alshamsi, Ahmed F. Abdulhameed, Nazar Zaki, Abdelkader Nasreddine Belkacem

Abstract— Sentiment analysis, sometimes referred to as opin-ion mining, is essential for understanding public opinion and attitudes toward various social topics and trends. This study aims to explore the effectiveness of machine learning (ML) models, namely support vector machine (SVM), long short-term memory (LSTM), and bidirectional encoder representations from transformers (BERT), in analyzing a dataset obtained from Kaggle, which contains 37,000 user reviews on the Instagram Threads app. After initial data cleaning and preprocessing, the dataset was partitioned into 70% for training and 30%for testing. Subsequently, the training set was used to create three datasets: a balanced dataset and two unbalanced datasets, one featuring 90% positive instances and the other featuring 90% negative instances. Subsequently, these datasets were used to train the three machine learning models mentioned above, resulting in nine different models. Evaluation metrics, including accuracy, precision, recall, and F1 score, were applied to assess model performance. The finetuned BERT model on the balanced dataset outperformed all the other models with an accuracy of 86%, precision of 85%, recall of 87%, and F1-score of 86%. Furthermore, these findings underscore the effectiveness of diverse ML techniques, particularly transformers, and the crucial role of data balancing in optimizing sentiment analysis tasks.

ID1006

Monitoring Water Quality for Catfish Ponds Using PID Control with Internet of Thing

Zuraida Muhammad, Nuramirah Md Jafri, Shabinar Abd Hamid, Siti Juliana Abu Bakar, Nor Adni Mat Leh

Abstract— Catfish is one type of fish that holds a prominent position due to ease of cultivation, the popularity of its high protein and economic significance in aquaculture or fish farming that has become a significant sector in the global food industry, meeting the increasing demand for seafood. However, maintaining of clean water parameters in the rearing environment is crucial for a catfish farm to be successful. African Catfish is one of Malaysia's most popular and favored freshwater food fish species. The ideal hatching and the greatest larval survival of African catfish is a pH level of within the range 6.7-7.5. The family Clariidae includes the African catfish (Clarias gariepinus). This project focuses on the design and implementation of a water quality monitoring system for catfish ponds using PID control and Internet of Things (IoT) technology. The pH level fluctuations can have adverse effects on the catfish's health. The PID Water Quality Monitoring for Catfish Pond are designed to see the results of the pH data using MATLAB Software and ThingSpeak software. The circuit is designed by using WEMOS D1 R32 microcontroller, Sensor E-201-C and 12V Solenoid Valve. The experiment is conducted by throwing bread into the plastic basin. PID controller is implemented to control the opening of valve for water flow to achieve setpoint. The sensor performance was evaluated. The sensor can read pH level of the water and can stabilise the pH water using PID controller.

ID1007

Optimized Feature Selection based Approach forpredicting Cardiovasuclar Disease Risk in Indian Population

Abha Marathe, Virendra Shete, Suraj Ingole, Tabrez Pathan

Abstract— Cardiovascular disease (CVD) has become a significant concern, being a leading cause of illness and death in many parts of the world. India, being a developing nation, plays a significant role in the burden of cardiovascular disease due to its unique combination of factors such as demography, lifestyle, pollution, genetic tendency, and other influences. Traditional cardiovascular risk calculators may not always provide precise estimates for the Indian population due to variations in risk factors. Hence, there arose a necessity to incorporate machine learning algorithms in this domain. This research suggests an effective cardiovascular disease prediction system tailored specifically for the Indian population, utilizing a novel feature selection approach. This new feature selection method (NFS) is the integration of three different existing methods- Mean Gini decrease (MDG), Recursive feature elimination (RFE) and Mutual Information (MI) based selection. The novelty in the method is that the importance score of each feature was obtained from each traditional feature selection method. These scores were then normalized and added. The top 10 features were selected on the basis of total score. After selecting these 10 features Statistical technique of Pearson Correlation coefficient was used to check the correlation between these features which resulted in selection of optimal feature set of 8 features. Three different machine learning techniques were used to compare the performance of this NFS namely Random Forest (RF), Naïve Bayes (NB) and Logistic Regression (LR). Out of all, RF was found to be the best algorithm with accuracy of 97.5% and sensitivity of 98.2%. The preprocessing techniques used were missing value imputation by Proximity Matrix and Normalization by Min/Max method. K fold cross validation was used with value of K as 10 to avoid any overfitting.

ID1008

Performance Comparison of Breathing Signal Classifiers Using Machine Learning Techniques

Nur Fatin Shazwani Nor Razman, Haslinah Mohd Nasir, Suraya Zainuddin, Noor Mohd Ariff Brahin, Mohd Syafiq Mispan, Idnin Pasya, Nur Haliza Abdul Wahab

Abstract— One of the most important indicators of a person's health status is their rate of respiration, which is why clinical exams should closely monitor it. In the medical field, respiratory signal classification plays a vital role in the diagnosis and management of a range of respiratory conditions. However, effectively categorising respiratory signals remains a considerable issue due to the complexity and diversity of these signals. This study presents a thorough analysis of machine learning models for the categorization of respiratory signals, using a comparative method to assess each model's performance. A variety of machine learning approaches, encompassing both conventional techniques investigated such as Random Forest, Support Vector Machine (SVM) and k-Nearest Neighbors (kNN) to see how well the algorithm classifies the respiratory signals. Processing procedures, data modeling, data classification, and data analysis used in the classification process are all included in the paper. The findings of each model in terms of classification accuracy, computational efficiency, and interpretability are examined through thorough testing on benchmark datasets. SVM was found to execute 92% more accurately than the other ML technique. This study can be expanded to compare with the various deep learning approaches to obtain better classification capable of real time application.

ID1009

PSO-optimized U-Net for Automatic Retinal Optic Disk Segmentation

Audrey Huong, Xavier Ngu

Abstract— Retinal optic disk (OD) fundus imaging is a valuable tool for glaucoma diagnostics, while deep learning methods are often used to assist ophthalmologists in their clinical practice. Nonetheless, the performance of deep learning-assisted OD evaluation can be severely affected by the experiment variations and the use of small samples in network training. This study proposes using a particle swarm optimization (PSO)-optimized U-Net model to automatically segment OD in fundus photographs. The PSO method is used to fine-tune the training hyperparameters, i.e., learner, number of epochs, mini-batch size, and initial learning rate, to achieve good generalization performance even with a small training dataset. The findings showed a considerably good performance of the trained model with average overlap measures of 0.93-0.96 and mean performance evaluation metrics ranging between 0.89 and 0.99, comparable with the results of the state-of-the-art methods. This study concluded that the segmentation model trained using the proposed optimization framework could potentially be used for early glaucoma detection and improve healthcare delivery.

ID1010

Enhancing Pharmacokinetic Modeling with Fractional-Order Kinetics and Deep Learning

Junting Zou, Mohd Rizal Arshad, Ziyan Wang

Abstract— In this study, we present an innovative pharma-cokinetic modeling that combines fractional order kinetics with deep learning techniques to improve the prediction accuracy of drug concentration distribution in biological systems. Traditional pharmacokinetic models rely on ordinary differential equations, which often fail to accurately predict complex drug behaviors. To address these limitations, we develop a fractional-order pharma-cokinetic model that can more accurately represent the memory and genetic properties of biological systems. To complement this, we combine fractional-order pharmacokinetics with the predictive capabilities of Long Short-Term Memory (LSTM) models in recurrent neural networks (RNNs). Synthetic datasets were first generated by selecting appropriate pharmacokinetic parameters to simulate a range of drug

behavior scenarios. The dataset was then used to train and optimize the LSTM model, aiming to improve the prediction of the fractional-order model and thus achieve higher accuracy. Compared to traditional models, our results show significantly better prediction accuracy, with lower root mean square error (RMSE) and higher coefficient of determination (R2) values across time. This study not only highlights the potential of combining fractional-order kinetics with deep learning to improve pharmacokinetic models, but also opens avenues for more personalized and accurate drug therapy planning.

ID1011

Enhancing Lung Cancer Classification: Leveraging Existing Convolutional Neural Networks within a 1D Framework

Nurul Najiha Jafery, Siti Noraini Sulaiman, Muhammad Khusairi Osman, Noor Khairiah A. Karim, Zainal Hisham Che Soh

Abstract— Cancer remains a significant global cause of mortality, presenting substantial challenges for both medical practitioners and researchers. Recent data from a 2023 American Cancer Society study anticipate 238,340 new cases of lung cancer, with 127,070 resulting fatalities—constituting approximately 20% of all cancer-related deaths. Early detection plays a crucial role in improving survival rates across various cancer types, and precise classification based on medical images aids physicians in selecting optimal therapies to reduce cancer mortality. While extensive work has been conducted in lung cancer detection using Convolutional Neural Networks (CNN), challenges persist due to the complex structures present in CT scans. In addition, CNN models encounter challenges related to their functionality, such as choosing an ideal architecture, figuring out appropriate model parameters, and fine-tuning weights and biases. This paper introduces an innovative approach to lung cancer classification, utilizing deep learning techniques within a 1D framework based on pretrained neural network architectures. First, a 1D architecture is designed, and then the solution vector of the model is computed, providing a foundational understanding of the architectural framework. The study integrates three distinct pretrained classifiers—AlexNet, VGG-16, and VGG-19—into the 1D framework and trains them on a curated set of features crucial for accurate lung lesion classification. The proposed system produces promising results, with both AlexNet and VGG-19 achieving an impressive accuracy of 92%, while VGG-16 outperforms them, reaching the highest accuracy at 94.67%. This research underscores the potential of leveraging pretrained neural networks within a 1D framework to enhance lung cancer diagnosis, contributing to more effective and timely interventions in the battle against this deadly disease. The findings confirm that the hybrid algorithm offers a reliable solution for the classification of lung cancer.

ID1016

Covid-19 Chest X-Ray Classification using Convolutional Neural Network

Meteab Abdullah Abdo Ali Moqbel, Muhammad Dinul Ikram Mohd Radzi, Nurul Hazwani Abd Halim, Zainal Hisham Che Soh, Muhammad Khusairi Osman, Zuraidi Saad

Abstract— COVID-19, or Coronavirus Disease 2019, is an infectious ailment caused by the SARS coronavirus 2 (SARS-CoV-2). Identifying infected individuals poses a challenge due to symptom similarities with other common illnesses like fever and cough. One method to assess infection involves examining chest X-rays, but with the volume of images, misdiagnoses may occur, causing delays. To address this, an automated COVID-19 classification using Convolutional Neural Network (CNN) techniques is proposed. Models like AlexNet, SqueezeNet, MobileNetV2, and ResNet-18 are employed and trained on datasets containing normal and COVID-19 chest X-rays, with efforts to expand and enhance the datasets. In the comparative analysis of pre-trained models for chest X-ray image classification, MobileNetV2 stands out as the superior model, achieving an impressive average accuracy of 96% alongside equivalent precision, recall, and F1-score metrics. This

remarkable performance underscores MobileNetV2's efficacy in distinguishing between normal and COVID-19 affected images, positioning it as the most suited model for this crucial diagnostic task.

ID1019

Crack Detection on Asphalt Road in Malaysia using UAV images and YOLOv4

Mat Nizam Mahmud, Muhammad Khusairi Osman, Anas Ibrahim, Ahmad Puad Ismail, Fadzil Ahmad, Khairul Azman Ahmad, and Azmir Hasnur Rabiani

Abstract— Road transport, utilizing roadways, is important for the movement of goods and people, posing a significant maintenance challenge due to the deterioration caused by poor materials and natural disasters. Cracks in asphalt roads are a major concern, impacting transportation quality, safety, and comfort. Identifying these cracks is crucial for maintaining high-quality roads. Nonetheless, the subjective nature of crack detection, time limitations, inaccuracies, and expenses restrict the extent of manual assessment by professionals. To address these issues, this study proposes YOLOv4, a deep learning solution adept at detecting road cracks. Utilizing Unmanned Aerial Vehicles (UAVs) or drones, the road pavement was captured in Perlis, Malaysia, at an altitude of 10 meters for optimal image acquisition. These images are then labelled and input into the YOLOv4 model for training, resulting in accurate crack detection and validation. Comparing the results with the YOLOv3, Faster RCNN, and SSD model, found that YOLOv4 significantly improves crack detection accuracy, especially when using UAV images, thus enhancing previous research outcomes.

ID1021

Integrating AI-Driven Robust Control Algorithm with 3D Hand Gesture Recognition to track an Underactuated Quadrotor Unmanned Aerial Vehicle (QUAV)

Ibrahim Emad Al-Shayeb,Ghulam E Mustafa Abro,Fawad Salam Khan, Rozan Boudville, Ayman M. Abdallah

Abstract— The aviation sector has seen several modifications, most of which are connected to autopilot systems. In the current era of artificial intelligence (AI), robust control algorithms can be tuned for optimal accuracy by utilizing AI's power. To adjust the control system for controlling the drone, this publication suggests combining the Reinforcement Learning algorithm with the ability to recognize 3D hand gestures as input. This study uses Deep Deterministic Policy Gradient (DDPG) in conjunction with 3D hand gesture recognition to determine the optimal reward and transfer the processed input to proportional integral derivative (PID) control. This method demonstrated how an AI-powered control algorithm can enhance an underactuated quadrotor unmanned aerial vehicle's (UAV) ability to fly and hover. In addition to simulation data, the study includes hardware results that were verified with a DJI Tello Drone. When compared to a typical PID flight controller, the examination of the findings shows that the new design framework provides better accuracy and computing time. Six reward functions normalized between 0 and -4000, have been estimated for training episodes of 2500, 5000, 7500, and 10,000. The greatest observation, wherein the rewards are computed for maximum value, has been recorded on 2500 episodes.

ID1022

Recent Constraints and Challenges in Battery Management System of EVs – A Brief Review

Faizan Zahid, Ghulam E Mustafa Abro, Rozan Boudville, Noureen Talpur, Summaiya Rajput

Abstract— As world embark on the revolution in electric vehicles, battery management systems (BMS) represent the center of technological innovation. Through a thorough analysis of academic publications from the prestigious Scopus database, our study reveals several critical issues that BMS technology faces. Our findings provide light on the significant challenges faced, from enhanced data security and accurate temperature control to real-time state estimates. Nonetheless, concealed

within these difficulties are the keys to unleashing the whole possibilities of electric cars: smooth charging, enhanced longevity estimates, and stable power availability. In the midst of inventiveness gone wild, sustainability lurks, raising the difficult problem of battery disposal. This study provides an in-depth exploration of the complexities inside BMS, serving as a beacon of guidance. By taking immediate action to address these issues, we clear the path for an era in which electric cars—driven by their superior performance and increased efficiency—will predominate.

ID1023

Modernizing Home Protection: An IoT-Driven Approach with Smart Lock and Android Application

Summaiya Rajput, Noureen Talpur, Rozan Boudville, Ghulam E Mustafa Abro, Beenish Talpur, Faizan Zahid

Abstract— In the field of access control locks, conventional methods often require users to download applications with Bluetooth connectivity, and biometric measures such as fingerprints or face recognition that introduce challenges like access to only authorized parties, limited device accessibility and intricate registration processes. To address these challenges, the research paper presents an innovative IoT-based Smart Door Lock System, aiming to redefine access control. Diverging from traditional approaches, this system eliminates the need for application downloads and simplifies the complexities tied to biometrics. The core innovation lies in the simplicity of a user-friendly 4-digit PIN for primary access, prioritizing ease of use. To overcome real-time access constraints, the system introduces One-time Password (OTP) and One Touch Access (OTA) modes. These modes eliminate the intricacies linked with traditional methods, ensuring immediate and hassle-free access for both authorized and unauthorized users.

ID1024

Transforming Oil Palm Plantations: Leveraging Data Link using TV White Space, 5G, and Wi-Fi for Robotic Agriculture

Shahrol Hisham Baharom, Bukhary Ikhwan Ismail, Mohammad Fairus Khalid, Hishamadie Ahmad, Muhammad Nurmahir Mohamad Sehmi

Abstract— This research investigates the appropriateness of utilizing TV White Space, 5G, and Wi-Fi for data transmission in challenging plantation settings. Findings suggest that TV White Space has benefits in terms of latency and stability, rendering it suitable for applications requiring real-time communication. Nevertheless, the expensive module unit and infrastructure setup pose a notable obstacle to widespread acceptance. In contrast, 5G technology exhibits superior capacity for data-intensive operations, indicating its potential usefulness. However, issues related to limited coverage and subscription costs present financial hurdles for implementation. Wi-Fi emerges as a cost-efficient alternative but struggles with inadequate coverage within plantation areas. To summarize, although TV White Space holds potential for real-time applications, its cost could hinder adoption, while 5G provides high throughput but encounters challenges with coverage and expenses. Wi-Fi is economical but lacks sufficient coverage. Therefore, a careful assessment of these elements is essential in selecting the most appropriate communication technology for plantation environments.

ID1025

YOLOv9-Based Hotspots Recognition in Solar Photovoltaic Panels: Integrating Image Processing Techniques for Targeted Region Identification

Mohd Zulhamdy Ab Hamid, Kamarulazhar Daud, Zainal Hisham Che Soh, Muhammad Khusairi Osman, Iza Sazanita Isa, Mohd Shawal Jadin

Abstract— Solar photovoltaic (PV) panels are pivotal in renewable energy generation, yet their efficacy can be severely hampered by hotspots induced by various factors. This study introduces a pioneering approach for hotspot recognition in solar PV panels, harnessing the capabilities of the

You Only Look Once (YOLO), specifically the YOLOv9 [1] model, and integrating cutting-edge image processing techniques. The aim is precise hotspot identification and localization within PV panels, facilitating targeted maintenance and optimization strategies. By amalgamating the efficiency of the YOLOv9 architecture with sophisticated image processing algorithms, the method enhances hotspot recognition performance. Extensive experimentation and validation with real-world thermal imagery datasets demonstrate the effectiveness of the approach. Results showcase substantial enhancements in hotspot detection accuracy and localization precision compared to existing methods. Moreover, the incorporation of image processing techniques streamlines targeted region identification, ensuring precise hotspot localization within PV panels. Experimental findings underscore the method's efficacy in hotspot detection across diverse environmental conditions, boosting system reliability. In essence, this research enhances solar PV panels monitoring with efficient hotspot recognition and targeted region identification, aiding proactive maintenance for plant operators.

ID1026

Analysis of Logic Synthesis Results with various Technology Nodes for RISC-V Design

Siu Hong Loh, Yenn Nee Koay, Kim Ho Yeap, Jia Jia Sim

Abstract— This study investigates the synthesis process of a RISC-V processor with varying technology nodes (14nm, 32nm, and 90nm) and clock periods ranging from 0 to 5 nanoseconds. The problem statement is to address the limited availability of processor designs using the RISC-V ISA in undergraduate study, even though the RISC-V community is growing rapidly. This shortage is due to the relatively recent development of the ISA. The analysis initiates by considering design constraints, such as clock frequency, area limitations, and timing requisites specific to each technology node. Utilizing the Design Compiler tool, the Register Transfer Level (RTL) description of the RISC-V processor is transformed into a gate-level netlist. Performance metrics including clock period requirements, and slack margins across technology nodes are scrutinized. Power consumption of the processor is assessed at various clock intervals to gain insights into its power profile. Additionally, to enhance designs for each technology node, processor area consumption is thoroughly examined. This paper delineates an approach applicable to VLSI design courses at the undergraduate level.

ID1028

Optimizing Stand-Alone Photovoltaic-Battery System Sizing through Meta-Heuristic Optimization Algorithms

Iman Zulhakeem Shuhaimi, Nur Atharah Kamarzaman, Intan Rahayu Ibrahim, Nor Adni Mat Leh

Abstract— Stand-alone photovoltaic (SAPV) systems, comprising PV panels and lithium-ion battery, offer promising solutions for sustainable energy. However, their widespread adoption is hindered by challenges in achieving optimal sizing, which is crucial for enhancing system reliability. Meta-heuristic-based artificial intelligence (AI) has emerged as a promising tool for addressing the complexity in PV system sizing. By leveraging advanced algorithms like Particle Swarm Optimization (PSO) and Wild Horse Optimization (WHO), this approach can optimize the system to be more efficient and reliable. This study aims to develop sizing algorithms and find the optimal sizing for system components using data from PV arrays, batteries, controller and inverter. Through the analysis, the study demonstrates the effectiveness of WHO in optimizing the system resulting in improving system reliability. By contributing to Sustainable Development Goal 7, this study promotes the adoption of cleaner and more accessible energy technologies.

ID1030

An Optimized Harris Hawks Algorithm for Enhancing ANN Performance in Prediction Tasks Applied in Sales Domain

Bibi Aamirah Shafaa Emambocus, Muhammed Basheer Jasser*, Shou Heng Tan, Samuel Mofoluwa Ajibade, Hui Na Chua, Richard T. K. Wong, Ahmad Sahban Rafsanjani

Abstract— Sales prediction, the process of predicting future sales performance based on past information, offers valuable information to businesses, allowing them to make informed and profitable decisions. This can be done using machine learning, specifically Artificial Neural Networks (ANNs) which have proven to be effective for prediction tasks. A requisite process before using ANNs as prediction models is its training which is commonly done using back-propagation algorithms. Recently, it has been noticed that swarm intelligence algorithms are better training algorithms for ANNs than backpropagation. In this paper, we propose to employ a high-performing swarm intelligence algorithm, Harris Hawks Optimization (HHO) for the training of ANNs applied to the prediction of iPhone sales in Malaysia. Moreover, we propose an optimized Harris Hawks algorithm and apply it for training the same prediction models. Both the original and optimized HHO algorithms are found to be able to better train the prediction models compared to the usual backpropagation algorithm. Furthermore, the proposed optimized HHO algorithm is found to have higher effectiveness than the original HHO as the ANNs trained by the optimized HHO can achieve a root mean square error of 89.6789 during the training as compared to 112.2448 by those trained using the original HHO.

ID1032

Impact of Dust Deposition on PV Performance and Hotspot Generation: I-V and Thermal Analysis with SEM and UV-VIS-NIR

Md. Imamul Islam, Mohd Shawal Jadin, Ahmed Al Mansur

Abstract— Dust accumulation on solar photovoltaic (PV) panels can significantly hinder their performance and promote the formation of hotspots. The present research aimed to explore the interplay between dust deposition, deterioration of panel output, and the emergence of hotspot regions in field-operated PV modules. Electrical characterization through I-V curve analysis revealed a decline in key parameters such as short-circuit current (Isc), open-circuit voltage (Voc), maximum power (Pmax), and fill factor (FF), indicating reduced performance attributable to dust accumulation. Thermal imaging inspections identified multiple localized hotspot areas coinciding with regions of substantial dust buildup on the panel surfaces. Spectroscopic analysis using UV-VIS-NIR techniques demonstrated that the dust exhibited strong ultraviolet light absorption, moderate absorption in the visible range around 450 nm wavelength, and relatively low absorption in the near-infrared region. Morphological examination through scanning electron microscopy (SEM) unveiled irregularly shaped dust particles with varying size distributions, while energy-dispersive X-ray spectroscopy (EDS) identified carbon, oxygen, aluminum, and silicon as major elemental constituents contributing to light absorption and scattering effects. The collective impact of these dust properties hindered efficient light transmission to the solar cells, culminating in diminished power generation capacity. This comprehensive investigation sheds light on the detrimental consequences of dust deposition on PV performance and hotspot formation, underscoring the necessity for implementing dust mitigation strategies to sustain optimal efficiency in solar power plants operating in dusty environments.

ID1033

Impact of Class Labeling on Myocardium Segmentation using Cascaded Deep Learning for Improved Myocardial Infarction Segmentation

Dayang Suhaida Awang Damit , A'isyah Nadiyah Hilmi, Siti Noraini Sulaiman, Muhammad Khusairi Osman, Noor Khairiah A. Karim, Nor Adni Mat Leh

Abstract— Myocardial infarction is a leading cause of death and illness globally which necessitates early detection and characterization of the infarcted tissue for treatment planning and prognosis. Accurate and fast segmentation of this tissue is crucial for quantifying disease severity. CNNs have shown promise in this area. However, the non-differentiable contrast in Late Gadolinium Enhancement (LGE) MRI poses a challenge for infarcted tissue detection. Additionally, network architecture significantly impacts segmentation performance. Our study proposes a cascaded Deep Learning approach for automatic myocardial infarction segmentation in short-axis LGE cardiac magnetic resonance imaging (CMR). We investigate two cascaded network models (Q and R) that differ in class labeling approaches; single and multi-class labeling. These models specifically search for infarcted tissue within the myocardium, effectively restricting the search area. Notably, Model R achieves slightly better performance with median Dice Score different about 3.51% for infarcted tissue segmentation in the second stage compared to model Q.

ID1034

Influential Factors Shaping Purchase Intentions Among Malaysian Generation Z Consumers During Flash Sales Promotions

Jia Jia Sim, Yoke Teng Saw, Ley Hui Tin, Siu Hong Loh

Abstract— This study employs the Theory of Reasoned Action (TRA) to elucidate the relationship between key factors and the purchase intentions of Malaysian Generation Z consumers during online flash sales promotions. The research framework posits utilitarian value (UV) and hedonic value (HV) as components shaping consumer attitudes, while informational influence (II) and normative influence (NI) contribute to subjective norms. Additionally, perceived perishability (PP) and perceived scarcity (PS) are considered to capture the effects of flash sales strategies. Subsequently, six hypotheses are formulated. A quantitative approach is adopted, involving the distribution of questionnaires to 280 respondents within the 16-25 age range, representative of Generation Z in Malaysia. Preliminary findings from this study indicate the viability of the research, with data analysis conducted using SmartPLS software. Results reveal significant impacts of UV, HV, II, PP and PS on the purchase intentions (PI) of Malaysian Generation Z during online flash sales promotions. However, NI demonstrates no significant effect. This study offers valuable insights for both researchers and marketers, informing future endeavors aimed at optimizing online flash sales promotions.

ID1035

Assessing the Early Performance of Bifacial Floating PV System: A Comparative Study

Md. Imamul Islam, Mohd Shawal Jadin, Ruhaizad Ishak

Abstract— The increasing need for energy and the limited amount of land have made floating photovoltaic systems gain attention as a possible alternative. Although FPV systems have existed for more than ten years, their extensive use has gained significant traction in recent years. This research investigated the initial performance of a 157.20 kWp bifacial floating photovoltaic system located on Lake B at Universiti Malaysia Pahang Al-Sultan Abdullah, Pekan, Malaysia, utilising 2,574 m2 of lake waterbodies. The system was launched during the last week of November 2023. The data collection, which took place from December 2023 to April 2024, shows notable fluctuations in energy production and performance ratio, emphasising the impact of seasonal factors. To get a deeper understanding of the system, a comparative study was performed on real performance data

and the results from a PVsyst simulation model. The simulation model, using parameters similar to those of the operational system, projected greater energy yields and performance ratios than the actual observations in the field. The difference between simulation and real data highlights the difficulties in converting theoretical concepts into practical situations. Various factors might impact performance, including lower irradiation, potential-induced deterioration, temperature losses, and inverter inefficiencies. In addition, the simulation and comparison analysis of monofacial and bifacial FPV systems did not reveal any significant benefit of bifacial systems over monofacial systems. The findings of the study highlight the need for rigorous monitoring and assessment of FPV systems to close the disparity between theoretical expectations and actual results.

ID1037

Performance Evaluation of 10G-PON FTTH Access Networks

Sura Adil Abbas, Aya Hasan Abdulqader, Yaseen Naser Jurn

Abstract— 5G promises faster speeds and ubiquitous coverage, which requires a robust transport network. A Fiber to the Home (FTTH) access network based on 10 Gbps passive optical network (10G-PON) technology can be an attractive and cost-effective way to support this transport. The design of a cheap and tunable transmitter in the central office (CO) is essential for 10G-PON FTTH. This manuscript has been prepared with the aforementioned goal in mind. To evaluate the performance of the 10G-PON FTTH, a design simulation model based on the transmitter is executed using OptiSystem simulation. The simulation results show that the best performance is demonstrated when phase shift equals 135°. The demodulated signal with a 10 Gbps downlink data stream is dropped after a 40 km transmission distance. This transmitter is economical and requires no additional components, such as a filter, which makes it an attractive candidate for next-generation G-PON FTTH Access Networks.

ID1038

Analyzing Model Order Estimation in Industrial Hydraulics System using Open Loop Identification

Nur Husnina Mohamad Ali, Rozaimi Ghazali, Nayli Rahzani, Hazriq Izzuan Jaafar, Muhammad Fadli Ghani, Chong Chee Soon

Abstract— This paper employs system identification to characterize Industrial Hydraulics System (IHS) system using an open-loop method. It utilizes a black box approach for estimating the model and parameters of the system using MATLAB System Identification Toolbox. The paper presents three data sets and validates the estimated model using statistical methods such as percentage best fit, Root Mean Square Error (RMSE), histogram analysis, and correlation analysis. The process began by obtaining the input-output data from the experimental work. The validation results obtained from the input-output data reveals an average best fit percentage for the three data sets is approximately 85%. The data sets show small RMSE values, histogram analysis reveals a Gaussian distribution and strong evidence of the validity of the IHS model in the correlation analysis. Various orders of analysis were conducted, with the results indicating that a third-order linear system offers the closest representation of the IHS. The IHS has been modeled and validated using black box system identification has proven successful as there is no significant disparity in the outcomes.

ID1039

Microcalcification Detection for Digital Breast Tomosynthesis Images Using Faster-RCNN

Nur Athiqah Harron, Siti Noraini Sulaiman, Muhammad Afiq Iqmal Mohammad Nizam, Noor Khairiah A. Karim, Adi Izahar Che Ani, Syafiqah Aqilah Saifudin

Abstract— The transformative impact of Digital Breast Tomosynthesis (DBT) in breast imaging, highlights its three-dimensional reconstruction capabilities to address tissue overlap issues. The emphasis is on the critical importance of accurate microcalcification detection in DBT images for

early breast cancer diagnosis. This study investigates the application of deep learning, specifically Region-based Convolutional Neural Networks (RCNN) to enhance microcalcification detection in Digital Breast Tomosynthesis (DBT) images. The study proposes leveraging deep learning in conjunction with DBT to enhance microcalcification detection, capitalising on DBT's unique capabilities. The study aims to address existing gaps in microcalcification detection within DBT and evaluates the potential advantages of a DBT CAD system. The model's performance is thoroughly evaluated across diverse image scenarios, encompassing both noisy (blur) and clean (non-blur) datasets. A comprehensive comparative analysis is conducted, assessing overall performance, detection confidence, and training progress between the two datasets. Results and outcomes showcase the remarkable flexibility and improved microcalcification detection confidence of the RCNN model, even in the presence of image noise. The comparative analysis provides valuable insights into the model's performance under different imaging situations, aiding in informed decision-making for diagnostic purposes. The findings emphasize the critical role of image clarity in improving detection performance and offering valuable insights for future developments in the field.

ID1040

Lightning Protection Scheme Induced Current for Large-Scale Solar Photovoltaic Systems

Mohd Najib Mohd Hussain, Kanendra Naidu Vijyakumar

Abstract— The reliability and safety of large-scale solar photovoltaic (LSSPV) systems are crucial for effectively harnessing renewable energy. With the increasing adoption of solar energy in lightning-prone regions of Malaysia, understanding and enhancing protection mechanisms is essential. This study examined an induced current protection system for LSSPV using an early streamer emission (ESE) air terminal in Malaysia. Two systems, ESE and Franklin lightning rod types, were deployed in a 50 MWp PV power plant covering 260 acres, installed on the lightning arrester to ensure adequate protection. The Franklin rod system included 763 pieces and was constructed according to the Council of Engineer standards (Thailand). The ESE rod system comprised 68 pieces and was built following the NFC17102 standard (France). A 150 kA direct lightning impact on the PV power plant was then simulated using MATLAB/Simulink. The ESE lightning protection system (LPS) effectively protected and prevented damage from the lightning strike. Additionally, the Franklin rod system had more significant shading effects and higher installation costs (USD 10,026,800 vs. USD 8,026,800) compared to the ESE rod system. These results demonstrated the suitability of the ESE LPS for PV power plant implementation. The findings of this study could also help optimize lightning protection technology for large-scale PV power plants.

ID1042

A Review of RF Based Drone Detection, Direction of Arrival and Identification Techniques

Yaseen Naser Jurn, Zeyid T. Ibraheem, Nashwan Dheyaa Zaki

Abstract— In this review, different drone detection methodologies based-RF techniques are presented and discussed. Where, the drone RF-techniques are depended on communications signals between drone and its controller for controlling of flying or for video transmission signals. On the bases of these detection methodologies, a lot of researcher proposed different methods to determine the direction of arrival (DOA) of the presence drone in the protected area. Some of these methods have been discussed and compared in this paper. Also, the identification techniques based on drone fingerprint are discussed and evaluated. Finally, a universal comparisons for different methods and techniques are presented for the purpose of present an efficient summary useful for next researchers working in this field, as well as propose a new methodology for both detection and identification of drone.

ID1043

Current Landscape of Generative AI: Models, Applications, Regulations and Challenges

Yue Hern Tan, Hui Na Chua, Yeh-Ching Low, Muhammed Basheer Jasser

Abstract— Generative AI models have witnessed remarkable advancements, blurring the lines between human creativity and machine generation. This paper concisely reviews the current Generative AI landscape, exploring its diverse applications across various domains. We delve into the capabilities of these models, from creating images and music to generating creative text formats. Furthermore, the paper examines the real-world applications of Generative AI, highlighting its potential to revolutionize industries like design, marketing, education, and scientific discovery. However, while existing research extensively explores specific aspects of Generative AI, an analysis of the technology's landscape, encompassing its capabilities, applications in content creation, and regulatory considerations, remains limited. This paper strives to bridge this gap by delivering a more holistic landscape of GenAI. Our analysis of the GenAI landscape pinpointed user behavior research and responsible development practices as key to user-centric AI creation. Through this study, we aim to stimulate discussion and collaboration between researchers, developers, and policymakers to ensure this powerful technology is harnessed responsibly for the benefit of industry and society.

ID1044

ROS Integration and Evaluation for Robot Navigation in a Narrow-Path Indoor Environment

Lilian Wei Fang Ung, Richard T.K. Wong, Kok Seng Eu, Muhammed Basheer Jasser, Bayan Issa

Abstract— This project explores the implementation of ROS for the robot navigation in an indoor environment with narrow pathways typically found in a grocery shop or library. The study discusses the design of the integration of different components including hardware such as sensors and actuators, and algorithms in ROS. The system uses LiDAR to first map the real-world environment to determine the static components of the environment. The purpose of the project is to determine the optimal system integration to achieve obstacle detection and avoidance specifically on dynamic obstacles in environments with narrow pathways. The results show 100% collision-free navigation either through avoiding the obstacles or re-routing to an obstacle-free course.

ID1046

A Low Cost and User Friendly Graphical User Interface for Programmable and Flexible FES

M.A.M.A.Halim, E.Noorsal, Z.Hussain, S.Z.Yahaya, A.N.A.Rashid, Y.M.Ali, S.Z.M.Saad, S.Arof

Abstract— This paper presents the development and testing of a Tkinter-based graphical user interface (GUI) for controlling a functional electrical stimulation (FES) system. The FES device, which is used for individuals with spinal cord injuries or neurological disorders to aid muscle re-education, prevent atrophy, and improve circulation, is crucial in rehabilitation exercise. The existing FES devices in the market often lack a user-friendly interface, require complex settings to generate stimulus pulse, and are costly. This study develops a low-cost, user-friendly GUI using Python's Tkinter, which communicates with an Arduino microcontroller via a COM port, allowing users to adjust various waveform types and parameters. Validated using Proteus simulation, the system demonstrated accurate data transfer and correct waveform generation. Results highlight the Tkinter-based GUI's effectiveness in providing an intuitive and efficient interface for biomedical applications, with potential future enhancements in real-time data visualization and advanced waveform customization.

ID1047

CNN-Based Classification of Acute Myeloid Leukemia Blood Samples

Abdul Rahim Ahmad, Nuramirah Aiman Zainudin, Muhammad Dinul Ikram Mohd Radzi, Nurul Hazwani Abd Halim, Muhammad Khusairi Osman, Zuraidi Saad

Abstract— Acute Myeloid Leukaemia (AML) diagnosis is often hampered by a lack of technology and time-consuming procedures. Manual interpretation of blood sample images by radiologists is error-prone and time-consuming. The objective of this research is: i) to develop a CNN model for AML classification, addressing challenges in obtaining high-quality training datasets. To predict and classify normal WBC and AML cells from microscopic peripheral blood cell images, a CNN classifier with AlexNet, SqueezeNet, MobileNetV2, and ResNet18 is used. Each classifier's efficacy is assessed using evaluation metrics, confusion matrices, and ROC curves. ResNet18 outperformed the other models, identifying normal WBC and AML cells with an accuracy of 97.191% and F1-score of 0.97. This study demonstrates CNNs' potential in AML diagnosis, including accurate classification and improved patient care.

ID1049

Brainwave Patterns and Anxiety Symptoms Among Young Adult Females: An Exploratory Study

Mei-Yi Wong ,Soon Keng Cheong, Poh Foong Lee**

Abstract— There exists an urgent need for practical biomarkers to aid in the diagnosis and treatment of mood disorders. Understanding the neural underpinnings of early depressive and anxiety symptoms carries significant diagnostic and therapeutic potential. Recent studies have highlighted the influence of gender on the neural correlates of mood disorders, yet the specific mechanisms for it remain unclear. Based on previous research that has highlighted the unresolved nature of how gender differences manifest in EEG neural patterns of emotions, this study aimed to investigate the EEG characteristics of the relationship between alpha frequency brainwaves and mood disorders, focusing specifically on females. Resting-state EEG recordings (eyes closed) were obtained from 10 female young adult subjects (mean age = 21.80 ± 0.79). Additionally, all participants completed self-report measures assessing symptoms of depression, anxiety, and stress. EEG power spectral measures in the alpha frequency band (8 to 12 Hz) were analyzed for 32 electrode locations across the scalp. Bivariate analysis revealed a significant negative correlation between occipital alpha activity and anxiety scores. However, contrary to expectations, no significant correlation was found between alpha activity and depression scores. These results suggest that lower occipital alpha activity is linked with higher anxiety scores in young adult females. This study provides preliminary evidence for the potential use of resting-state EEG occipital alpha power as an indicator of anxiety symptoms. Future research with larger samples and longitudinal designs is needed to validate these findings and clarify the neural mechanisms involved.

ID1050

Letters Recognition System by Deep Convolutional Neural Network

Duaa Mowafak Hameed, Raid Rafi Omar Al-Nima, Mustafa Ali Malla, Khalil A. K. Al-Maqsood

Abstract— This paper proposes a new system to address challenge for reading accessibility through the development of a Character Recognition System (CRS) for blind people. This system has reading solution for aiding blind individuals by accessing printed letters. This paper introduces useful hardware for capturing images of printed letters using a manual printed machine and webcam, where a paper can be provided and moved in order to acquire its printed letters. So, a big dataset is collected for the printed English letters (a-z), it is named the Printed English Letters (PEL) dataset. After the acquisition, the input images are prepared, segmented and resized. Then, they are sent to a Deep Convolutional Neural Network (DCNN) for letters recognition. At the end, the recognized letter is suggested to be converted into audible speech, character-to-speech, in order to make the

system more useful in helping blind persons. The main results were impressive and superior. That is, values of statistical metrics were recorded as 99.44%, 92.77%, 92.77%, 99.71% and 92.77% for the accuracy, precision, sensitivity, specificity and f1_score, respectively.

ID1051

Automated CNN-based Semantic Segmentation for Thermal Image of Solar Photovoltaic (PV) Panel

Nurul Huda Ishak, Iza Sazanita Isa, Muhammad Khusairi Osman, Kamarulazhar Daud, Mohd Zulhamdy Ab Hamid, Mohd Shawal Jadin

Abstract— Driven by the growing worldwide need for sustainable energy sources, the utilization of solar photovoltaic (PV) panels has significantly increased in many applications. However, monitoring solar PV panels using thermal imaging significantly impacts panel efficiency and performance. To address this, thermal imaging offers a promising technique for monitoring and diagnosing these issues using computer vision and intelligence methods. This study proposes an automated semantic segmentation approach based on CNN to segment solar PV panels' thermal images. The proposed method used U-Net and ResNet as CNN-based models for segmenting two different regions, solar panels and the background of thermal images. This segmentation approach leverages the power of deep learning to analyze thermal images, effectively highlighting precise results that facilitate prompt maintenance and optimization of PV panel performance. The model's performance and pixel are evaluated using Intersection over Union (IoU) metrics and accuracy. The result, which showcases the potential of the proposed method, reveals that the proposed method using ResNet 50 has achieved superior performance compared to ResNet 18 and augmented U-Net, with an IoU score of 0.9383 and an accuracy of 97%. In conclusion, semantic segmentation based on the CNN model significantly impacts thermal image pattern recognition in solar PV pattern recognition.

ID1052

Dysgraphia Handwriting Image Augmentation for CNN Model Classification

Nurhani Harun , Iza Sazanita Isa , Siti Azura Ramlan , Muhammad Khusairi Osman , Mohd Ikmal Fitri Maruzuki

Abstract— Dysgraphia affects a person's ability to write consistently and properly especially among school children. It is a challenging condition as it needs effective intervention to help the affected children succeed academically and socially. With the advancement in technology in artificial intelligence (AI), various methods and approaches have been developed using convolutional neural networks (CNN) model to overcome several limitations to assess dysgraphia symptoms. However, there are major concerns about the difficulties of getting large data of dysgraphia handwriting images for CNN attributes model. Thus, this study is aimed to develop dysgraphia handwriting recognition model based on augmentation method. In this study, image augmentation is addressed by creating new data by using rotation and brightness technique to generate a set of synthetic images. The augmented data is trained and tested using CNN classification model to classify four classes of dysgraphia handwriting. The results show a significant improvement with 77% accuracy using augmented as compared to without augmented data only 73%. This study indicated that augmentation method is significant for inclusion in CNN classification model particularly for dysgraphia potential risk recognition. This study is further recommended to implement intelligence-based augmentation method which can be incorporated into a computer-assisted dysgraphia screening system to provide a rapid, accurate, and unbiased dysgraphia detection.

ID1053

A Lightweight Convolutional Neural Network for Rice Diseases Classification

Mohd Aniq Ismail, Mohamad Rahmat Rashid, Khairul Azman Ahmad, Samsul Setumin, Siti Juliana Abu Bakar, Adi Izhar Che Ani

Abstract— Rice, also known as Oryza Sativa, is widely recognized as an important source of food crops and a primary source of nutrients for human beings as it is rich in carbohydrates, providing a high-energy food. The United Nations General Assembly stated that rice is the staple food of more than half the world's population. However, pests and disease outbreaks are the major problems for farmers as this rice crop is susceptible to fungi and viruses. Leaf Brown Spot, Leaf Blast, and Leaf Hispa are among the most well-known diseases that affect the rice crop. Accurate and fast classification of these diseases is essential for implementing timely and targeted approaches to mitigate crop losses. This paper investigates the feasibility of our proposed lightweight model to be used for the classification task with a limited number of training samples. The images were preprocessed to enhance the color and edges. The K-means clustering method was used for image segmentation to separate the affected regions from the background. The proposed convolutional neural network model was made from scratch to have only three convolutional layers. The results demonstrate that the proposed model outperforms the VGG-16 model for overall performance with 90% and 85% for both batch sizes.

ID1054

Remote Monitoring Surveillance System via LabVIEW employing the use of Hybrid Renewable Energy

Nor Salwa Damanhuri, Nur Sobrina Mahalel, Intan Rahayu Ibrahim, Nor Azlan Othman, Belinda Chong Chiew Meng, Rozan Boudville

Abstract— Hybrid renewable energy consist of two or more types of energy generation to provide electricity particularly for rural or remote areas. On the other hand, surveillance system is well known not only for preventing and detecting crime, but also an effective tool for strengthening security measures and also gives the public confidence in community safety. However, a surveillance system faces a limitation for getting power directly from a conventional electrical grid when it comes to rural and remote area. Hence, the surveillance system especially in remote areas requires the source of energy from hybrid renewable energy sources in order for the system to work efficiently. Thus, in this paper, it aims to develop a surveillance system powered by hybrid renewable energy with a combination from solar photovoltaic (PV) and wind energy. The surveillance monitoring system is developed via LabVIEW software with a cloud platform, ThingSpeak which can be assessed remotely especially when applied at a remote area such as offshore, as the utilization of the power consumption is more constant and produces a higher energy capacity. The monitoring system is able to acquire, store and display the monitoring system and battery management system data in real time and can be assessed remotely by the user. The data collected are measured by using sensors, National Instruments (NI) USB-6009, LabVIEW software and ThingSpeak. The advantages of the system are that the surveillance system can be utilized by powering from the hybrid renewable energy with battery storage system to be used for monitoring purpose virtually and remotely where the data can also be retrieved on-line. Furthermore, this remotely monitoring system allows the flexibility of system to be extended with bigger scale of renewable energy plant.

ID1057

Optimizing Photovoltaic Systems for Power Losses Reduction under Time-Varying Loads: A Coyote Optimization Approach

Siti Salwa Mat Isa, Mohammad Nizam Ibrahim, Anuar Mohamad @ Ahmad, Nofri Yenita Dahlan, Hanis Farhah Jamahori, Shahilah Nordin

Abstract— Integrating photovoltaic (PV) systems into power grids is essential for mitigating power losses and improving grid stability, especially under conditions of significant time-varying loads. This research examines the optimization of the placement and sizing of PV systems to minimize power losses under these dynamic conditions, contrasting with previous studies that utilized constant load models. The research employs the Coyote Optimization Algorithm (COA) using real-world load and PV generation data, focusing on industrial, residential, and commercial loads. The results indicate that COA reduces power losses by 13.45%, 20.03% and 31.27% under industrial, residential and commercial loads respectively compared to the base case PV system. The optimal PV location was consistently found to be at bus 6, while the optimal PV size varied across load types. Additionally, there is a notable improvement in voltage profiles across all load types. This research offers valuable insights into developing efficient and reliable grid-connected PV systems, highlighting the potential of COA in enhancing system performance through load-specific optimization strategies.

ID1058

Development of IoT-based Headwater Phenomenon Monitoring and Warning System

Rozan Boudville, Jamilah Binti Mat Tapah, Ahmad Akif Farhan Bin Mohd Yuzi, Nur Ain Izzaty Binti Ahmad Johan, Muhammad Imran Bin Daing, Ariff Naqiuddin Bin Abd Rahman

Abstract— Headwater occurrences are defined by abrupt increases in water velocity and level as well as changes in water clarity. These events can seriously jeopardize infrastructure, human life, and ecosystems. Fatal accidents due to headwater phenomenon often occurs but no serious attention is given to develop headwater monitoring and early warning systems. The goal of this project is to provide a dependable Internet of Things (IoT) tool for headwater monitoring and early warning system. The system uses a pair of water level sensors to detect river water level and the flowrate of the river. The sensors were developed using mechanical micro limit switches as a sensor to monitor water levels. As for the cloud platform, Firebase and Google Sheets were used to store real-time data and automates it with Google Apps Script. LCD displays are used to display off-site warnings, and buzzers are used to deliver on-site alerts. This configuration improves safety by providing users with fast alerts and dependable data processing. It works well in scenarios involving high water levels since it gathers data accurately and notifies users in a timely manner

ID1059

Optimizing Photovoltaic Systems with an Incremental Conductance Algorithm

Muhammad Haziq Haiqal Yahaya, Ahmad Asri Abd Samat, Samshul Munir Muhamad, Muhammad Nabil Afiq Nor Azari, Mohamad Adha Mohamad Idin, Mohd Muzafa Jumidali

Abstract— The primary objective of this study is to develop and evaluate an Incremental Conductance (InC) technique for Maximum Power Point Tracking (MPPT), in conjunction with a boost converter, to enhance the power generation efficiency of photovoltaic (PV) systems. The research aims to evaluate the performance of the InC technique under different amounts of sunlight to replicate real-world situations. The objective is to identify and improve the disadvantages of traditional MPPT approaches by developing a more flexible and responsive approach to environmental fluctuations. The project utilises MATLAB/Simulink to simulate a dynamic system that regulates a DC-DC boost converter's duty cycle to optimise power output. The core findings demonstrate significant improvements in efficiency and flexibility, as the InC MPPT technique effectively tracks the maximum power point (MPP) and keeps consistent performance despite

varying conditions. This indicates the potential for improved dependability and durability in photovoltaic installations, promoting broader use in renewable energy initiatives.

ID1060

Sizing and Cost Analysis of a Hybrid PV and Battery Energy Storage System for Residential and Commercial Buildings Employing Net Energy Metering Scheme

Intan Rahayu Ibrahim, Ericson Jilum Anak Kilat, Nur Atharah Kamarzaman, Ahmad Asri Abd Samat

Abstract— The Net Energy Metering scheme is one of the incentives provide by Malaysian government to promote the usage of renewable energy in Malaysia. Customers are encouraged to co-generate electricity under this initiative. The scheme allows consumers to produce energy for their self-consumption first, before selling any excess energy they produce to the utility service provider. Photovoltaic (PV) systems are still thought to be costly, despite a recent decline in the cost of installation. Furthermore, the traditional technique of sizing PV systems necessitates oversizing some components, which results in needless additional costs. Using actual energy requirement data, the research presents an optimum sizing strategy for a hybrid PV and battery energy system. To study the effectiveness of the developed method, real load and solar irradiance data of residential and commercial buildings are used as case studies. The effectiveness of Net Energy Metering (NEM) scheme in reducing cost, power losses and decarbonation have been evaluated. The new method of sizing reduces installation costs by 40 %. It is observed that by employing NEM, the electrical bill will be reduced by almost 80%, with Return on Investment (ROI) of less than 7 years.

ID1061

Predicting Energy Consumption in Educational Buildings: A Comparative Study of Machine Learning Models

Siti Solehah Md Ramli,Mohammad Nizam Ibrahim,Anuar Mohamad @ Ahmad,Kamarulazhar Daud

Abstract— The increasing energy consumption in educational institutions underscores the need for accurate predictive models to enhance energy management and sustainability. This study compares the effectiveness of multiple linear regression (MLR), artificial neural networks (ANN), deep neural networks (DNN), and support vector regression (SVR) in predicting energy consumption in educational buildings. The dataset included variables such as humidity, temperature, occupancy, and power consumption. Each model's performance was evaluated using key metrics, and optimal configurations were identified. The results show that DNN models, with their superior ability to capture complex patterns, achieved the highest predictive accuracy, followed by SVR, ANN, and MLR. The study also highlights the significant impact of the number of neurons in ANN and DNN models, as well as the regularization parameter and kernel parameter in SVR models. These findings demonstrate the potential of advanced machine learning techniques to improve energy consumption predictions and contribute to more efficient energy management in educational buildings. Future research should focus on further optimizing these models and exploring hybrid approaches for enhanced predictive accuracy.

ID1062

Enhancing Output Smoothness in AC-AC Converters: THDv Reduction with Bidirectional Exclusive Switches

Mohd Shafie Bakar *, Nurul Amira Ibrahim, Abu Zaharin Ahmad, Mohd. Shawal Jadin

Abstract— The AC-AC converter is a converter that is frequently utilised in the industrial sector nowadays because of its ability to convert AC electricity at high frequencies. Even though the AC-AC converter is widely utilised in industry, it has issues delivering smooth output. The presence of excessive Total Harmonic Distortion in voltage (THDv) at the output of an AC-AC topology has a negative impact on a system's output. By replacing the Silicon-Controlled Rectifiers (SCRs) with two

bidirectional exclusive switches, this study shows a better solution to address the existence of high THDv on AC-AC topologies. These switches offer superior controllability, faster response times, and reduced switching losses compared to SCRs. Integrating them into the AC-AC converter topology results in a significant reduction in 0.96% THDv for duty cycle at 30% under single-stage DC Modulated. While for double-stage DC Modulated the result performs at 2.28% THDv for duty cycle at 30%. Both, leading to a smoother output waveform.

ID1063

An Autonomous Wheelchair Vision System: Detection of Potholes for Outdoor Maneuvering

M. S. Mohd Ghazali, S.Z. Yahaya, K.A. Ahmad, M.F Abd Rahman, E. Noorsal, R. Boudville

Abstract— This work presents an implementation of a computer vision system intended for autonomous wheelchairs, primarily for the purpose of identifying and avoiding potholes when maneuvering outdoors. Wheelchair users need a solution for navigating around potholes in an outdoor environment to ensure safety, especially for those who have limited ability to control the wheelchair due to high degree of paralysis. The proposed system uses a combination of computer vision and machine learning algorithms to interpret visual input from a wheelchair-mounted camera. It uses a multi-phase method to precisely identify potholes. First, photo preparation methods are applied to reduce noise and enhance visual quality. Convolutional Neural Networks (CNNs), an object detection technique, are then used to determine the likely locations of potholes in the image. Then, using a feature extraction program, important visual characteristics are extracted from the designated places, enabling precise classification of potholes. The results of the experiment demonstrate how well the proposed vision system can identify potholes. With an average detection accuracy of over 80%, the technology significantly reduces wheelchair users' risk of discomfort and accidents. By advancing autonomous wheelchair technology, this study promises greater independence for those with limited mobility.

ID1064

Machine Learning Model to Enhance the Quality of Software Development Risk Management

Mohamed Ahmed Hamada , Abu Dhabi university

Abstract— This research introduces a novel approach to software development risk management using machine learning. This approach is based on the analysis of historical data from previous software projects to predict and mitigate the risks in future software development efforts. This machine learning model considers various factors such as the size of development team, project complexity, software budget, and the other required factors to provide more accurate risk assessments and support the decision-making process to achieve an acceptable level of software quality development. The implementation and benefits of using a machine learning model for software development risk management are discussed, including improved efficiency, reduced risk, and increased predictability. The model is trained and showed good results. This article also highlights the potential challenges and limitations of the proposed approach and suggests areas for future research and improvement

ID1065

Innovative Kenaf-Brick Composite for Effective Microwave Absorption

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Abstract— A growing and intense interest in the technology of microwave-absorbing materials has come from the rapid development of electronic systems and telecommunications. Electromagnetic waves can penetrate a small building, leading to a significant decline in absorption ability and severely damaging human health. The composition of kenaf material as an absorbing material is

being studied to enhance the absorption performance of brick absorbers. Kenaf material can develop porous brick, thus affecting the absorption performance of the corresponding brick. Porous carbon materials demonstrate significant potential in absorbing electromagnetic waves. This is because of their ultra-low density, large surface area and great ability to lose dielectric. The brick absorbers are measured with two orientations, horizontal and vertical, representing different levels of wall thickness. The Arch space-free method from the Naval Research Laboratory (NRL) takes measurements from 1GHz to 12GHz.The results indicated that the vertical orientation performs better than the horizontal orientation. When assembled vertically, porous bricks can make a more complex and winding path for microwaves, maximising the ability for the waves to interact and be absorbed.

ID1066

PID-DTC Controller for Nonlinear Knee Extension Model with Time Delay Effect in Closed-Loop FES

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Abstract— Functional Electrical Stimulation (FES) is a crucial device in neuromuscular applications, facilitating restoring functionality of paralyzed muscles and limbs. However, its practical utilization encounters significant nonlinear challenges, predominantly arising from factors like muscle fatigue and time delay. These challenges impede the optimal performance of FES controllers, such as proportional-integral-derivative (PID), sometimes resulting in suboptimal outcomes or complete failure. The nonlinearities introduced by these factors necessitate system adaptability, but traditional controller retuning is often impractical due to its adverse effects on muscle performance. Moreover, introducing time delays can induce instability and oscillations in the system. This study explores the application of direct torque control (DTC) with PID controller to leverage FES-induced muscle torque for knee rehabilitation. Through a simulation model developed in MATLAB/Simulink, we empirically demonstrate the effectiveness of the PID-DTC approach in managing the knee extension model with nonlinear time delay in closed-loop FES. The results demonstrate the absence of oscillations, reduced overshoot, and minimal steady-state error, suggesting potential for successful real-world hardware implementation in rehabilitation applications.

ID1068

System Reconfiguration to Control Knee Extension with Time Delay Nonlinearity in Closed-Loop FES

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Abstract— Functional Electrical Stimulation (FES) assists individuals with neuromuscular impairments during rehabilitation exercises conducted in open-loop and closed-loop. Typically, during the design phase, the closed-loop FES system mainly consists of a feedback controller, a second-order model, or a knee extension model to represent the actual knee. Closed-loop FES or feedback controllers are generally better, but their performance drops in real-world scenarios due to nonlinear factors like fatigue, time delay, spasm, and spasticity. These lead to suboptimal performance of the feedback controllers and even failure, diminishing their effectiveness in assisting patients. In response to these challenges, this paper investigates four different techniques of system reconfiguration, which involves changing the closed-loop system structure to mitigate the adverse effects of time delay in real-world FES applications. To evaluate the effectiveness of the four techniques, a feedback PID controller, knee extension model or second-order critically damped system were developed and tested using MATLAB/Simulink software. The simulation results demonstrate that the first system reconfiguration technique improves system behaviour and enhances FES controller performance. This research marks a significant step towards improving the practicality and adaptability of FES technology for individuals with neuromuscular impairments.

ID1069

Road Image Deblurring with Nonlinear Activation Free Network

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Abstract— Current deblurring methods struggle with real-world scenarios where images are often blurred or noisy, posing significant challenges to existing pavement crack detection techniques. Thus, the aim of this research is to develop and evaluate a novel approach utilizing a nonlinear activation-free network (NAFNet) to address image blurring as a pre-processing step, with the primary goal of improving the reliability and accuracy of pavement crack detection in standard datasets and real-world pavement images under various challenging conditions. The scope of this study is to enhance pavement crack detection by developing a robust and accurate NAFNet designed specifically for road image deblurring, evaluated using standard pavement crack datasets. We adopt NAFNet, which innovatively replaces batch normalization with pixel-level layer normalization and utilizes a U-Net structure with skip connections and optimized the network with SGD (NAFNet-SGD). From the experimental results, quantitatively, the NAFNet-SGD model outperformed the others, achieving the highest PSNR of 32.8642 and an SSIM of 0.9605, while qualitatively, images processed with NAFNet-SGD exhibited the highest quality with superior visual clarity and sharpness. Thus, in conclusion, NAFNet-SGD outperforms other optimizers like Adam and AdamW in terms of both quantitative metrics and visual quality.

ID1070

A Novel Application of MLP Networks in Classifying L Band Eco-Friendly Microwave Absorbers

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Abstract— This paper presents an innovative approach to classifying the absorption performance of eco-friendly microwave absorbers in the L band using Multilayer Perceptron (MLP) networks. This project uses pyramidal absorbers coated with agricultural waste materials, such as empty palm oil bunches and coconut shells as carbon material to improve their absorption properties. The dataset consists of 87 absorption performance values of microwave absorbers obtained from experimental measurements using the NRL Arch Free. The objective of this study is to compare the effectiveness of three training algorithms which are Levenberg-Marquardt (LM), Resilient Backpropagation (RB) and Scale-Conjugate Gradient (SCG). The MLP network was trained using input parameters of frequency and absorption performance, and the performance of each algorithm was evaluated based on accuracy and mean-squared error (MSE). Results show that the LM algorithm with five hidden neurons achieved the highest training, validation and testing accuracy of 100% with the lowest MSE of 0.0455. These findings provide valuable insights for optimizing the design of microwave absorbers in the L band using eco-friendly materials.

ID1071

Microwave Absorption Performance of Multilayer Anti-Radiation Bricks for Sustainable Construction Materials

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Abstract— This paper investigates the microwave absorption properties of a multilayer anti microwave cement brick. The brick incorporates polyethylene terephthalate (PET) recycled plastic with agricultural waste, palm oil fuel ash (POFA). The brick consists of three layers with varying compositions of PET (5%, 10% and 30%) and a constant 10% and 30% POFA (MLB1 and MLB2) as partial replacements of sand and cement respectively. Measurement is carried out for the dielectric properties and resistivity of the mixtures. The microwave absorption performance across a

frequency range of 1 to 12 GHz was evaluated using the NRL Free Space Arch Method. MLB1 composition shows absorption reaching -47.98 dB at 11.66 GHz while MLB2 demonstrates consistent absorption across the entire frequency range. The compressive strength test shows MLB1 achieve average strength of 14.39 MPa. The research finding shows the developed brick can be effectively utilized in construction with electromagnetic absorption properties.

ID1072

A Bibliometric Analysis and Research Landscape of Artificial Intelligence in Education

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Abstract— This study examines the academic field of Artificial Intelligence in Education (AI-ED) by examining the publications and indexed documents in Scopus from 2010 to 2023. Consequently, we examined the publishing trends, exemplary articles, and the most engaged participants and funding institutions in the domain of AI-ED research. A bibliometric analysis was performed to examine the network of co-authorships, keywords, and citations in the domain of AI-ED research. The Scopus search resulted in the discovery of 10,474 published documents on AI-ED. Additionally, trends analysis indicated a significant increase of over 3,000% in publications between 2010 and 2023. Conference papers are the most often utilized document type, including 6757 publications or 64.5% of the overall amount. The ACM International Conference Proceeding Series is the primary source for published materials, accounting for 675 publications or 6.44% of the total publications on the topic. The most prolific researchers in the field of AI-ED are Breazeal, C and Chai C.S, each having published 18 documents. Additionally, the two institutions that have produced the highest number of published documents are Carnegie Mellon University (CMU) and the University of NC State University (NCSU). The output of the affiliations active in the topic is primarily attributed to the funders, specifically the National Science Foundation, which is the leading funding institution based in the United States and has contributed to 354 publications. An analysis of keyword co-occurrence revealed 6 main study areas that cover the essential tools, theories, methodologies, and socioeconomic and financial aspects of artificial intelligence in education (AI-ED). Future research in the field of artificial intelligence in education will focus on employing sophisticated deep learning, machine learning, and neural network algorithms to precisely predict students' learning patterns.

ID1074

Design of Digital System Identification Controller for a Nonlinear Knee Model in Closed-Loop Functional Electrical Stimulator (FES)

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Abstract— Functional Electrical Stimulation (FES) devices represent a valuable rehabilitation intervention for patients with spinal cord injury (SCI). SCI can result in significant functional impairments, including the loss of movement in the lower body. Currently, closed-loop stimulation strategies are preferred over open-loop systems, as the latter's trial-and-error approach can lead to premature muscle fatigue. However, while closed-loop systems offer promise, feedback controllers often exhibit inadequate performance when addressing nonlinear effects in knee muscles, such as stiffness, spasticity, and fatigue. To address these challenges, an adaptive feedback controller equipped with a system identification controller is crucial for accurately detecting these nonlinear parameters in knee muscles. This paper proposes the development of a digital system identification controller designed to detect nonlinear parameters from the knee extension model’s response. The system identification was implemented and simulated using hardware description language (HDL) Verilog code, with its performance evaluated through HDL co-simulation in MATLAB Simulink. The simulation results indicate that all nonlinear effects including stiffness, spasticity and fatigue are identifiable once the rate-of-change response stabilizes at 4 s.

ID1075

Personalized Food Recommendations: A Machine Learning Model for Enhanced Dining Choices

Mohammed Al-Hubaishi, Musab A. M. Ali

Abstract— This research introduces an innovative approach to enhance dining experiences through a personalized meal suggestion system. Our method leverages decision tree-based machine learning to predict user preferences by analyzing various attributes. The aim is to assist individuals in making optimal food choices at restaurants, thereby enriching their culinary journey. QR codes are integrated into an Android restaurant application, facilitating convenient access to the food menu. User inquiries are efficiently managed through a MySQL database accessible across multiple platforms, including a Java GUI, an Android app, and a dedicated website catering to both user and administrator roles.

ID1077

The Importance of Artificial Intelligence in Green Innovation

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Abstract— The study focuses on the importance of Artificial Intelligence in developing and enhancing green innovation. Artificial intelligence improves green innovation by enhancing productivity, accelerating environmentally friendly technological advancements, and facilitating better decision-making through energy optimisation, waste reduction, and smart infrastructure support. This research adopted a scoping review approach utilising the Scopus database as a source of analysed documents. The study highlights several aspects, such as publication trend by years, publication source and context analysis. The reviews included documents published from 2021 to May 2024. The method section is derived from the PRISM-ScR checklist table. The highest publications were by the Journal of Business Strategy and the Environment by WILEY, and the country with the highest publishing was China. In addition, the study recommends that more efforts should be exerted to increase companies' awareness of the importance of green innovation and the feasibility of developing green products.

ID1081

Evaluation of Turbidity Effect on Manganese Detection Based on Spectroscopy Approach

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Abstract— The presence of heavy metals such as manganese ions in water poses significant health risks to consumers, especially humans. Therefore, it is crucial to monitor the levels of manganese in the water. Currently, detection is based on optical sensing techniques such as spectrometers. In this process, turbidity always causes issues and affects the accuracy of optical measurements during in-situ experiments. Therefore, the ability to evaluate the effect of turbidity on manganese detection is significant in improving the accuracy of measurement, which become the objective of this work. In this work, 70 samples data were analysed using statistical analysis techniques such as normality test, correlation and regression analysis. For the normality test, a histogram and a Q-Q plot were used. Meanwhile, for the correlation, the Pearson correlation method was used to determine the strength of relationship between the deviation of absorbance measurement of manganese, ΔAbs for different concentration of turbidity, T. Finally, linear regression analysis was performed to obtain the regression equation of these variables. It is found that the resulting regression equation is $\Delta Abs = 0.004T-0.03$. This equation can be used to predict the amount of absorbance deviation under the influence of turbidity so that proper action can be taken to compensate the deviation and improve the accuracy of measurement.