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ABSTRACT BOOK

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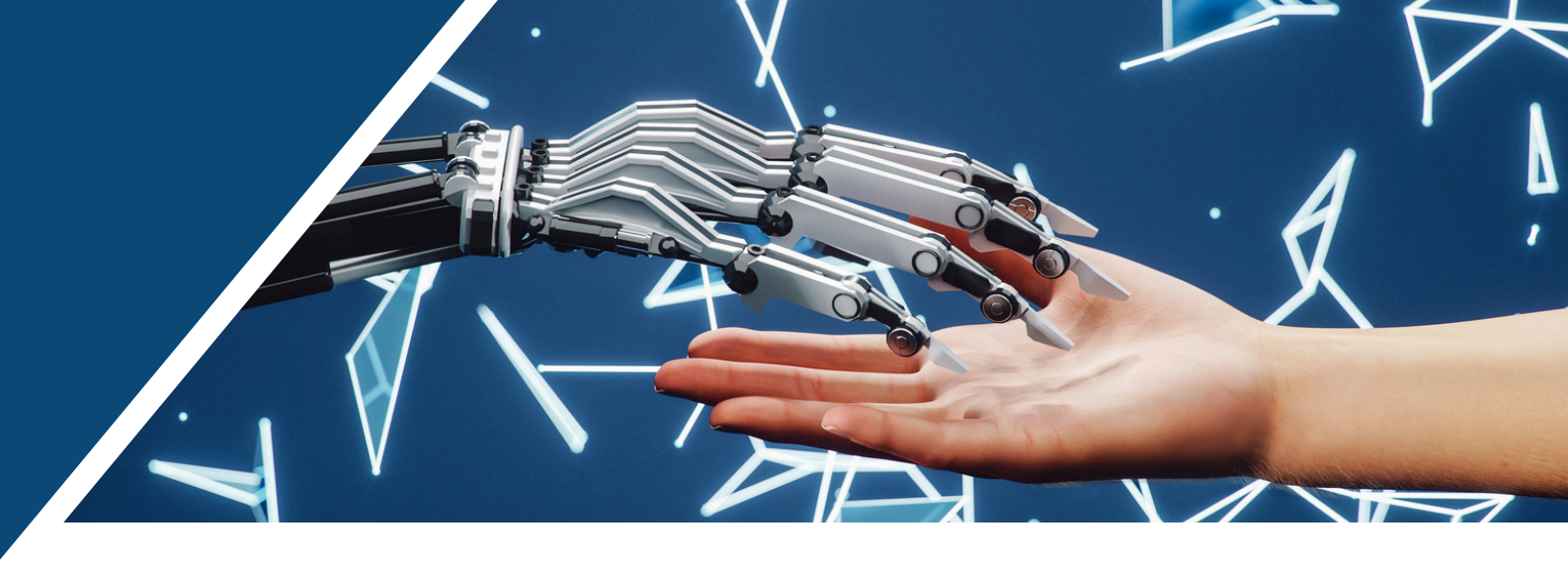

Implementation of Support Vector Machine Algorithm in a Real-time BLDC Motor Bearing Fault Classification with Discrete Wavelet Transform as Feature Extractor

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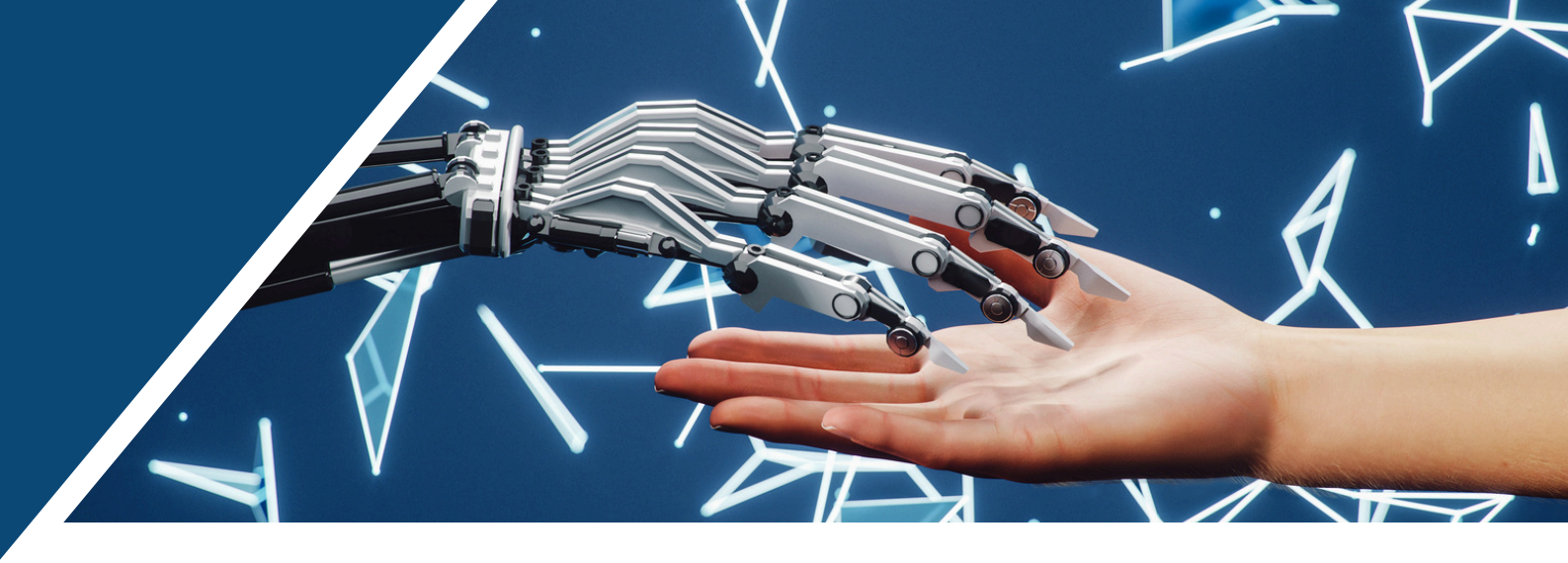
Abstract

Brushless DC (BLDC) Motors are integral to industrial operations. Continuous motor usage can lead to various faults with significant consequences if left unaddressed. These faults may impact the motor, its surrounding system, disrupt economic activities, and potentially result in catastrophic failures. This study introduces a methodology combining Support Vector Machine (SVM) for feature classification with Discrete Wavelet Transform (DWT) for feature extraction. Through machine learning techniques, voltage signals from multiple BLDC motor samples with diverse faults were examined. Performance metrics, including precision, recall, accuracy, and F-1 scores, were calculated to evaluate the algorithm's effectiveness. The Support Vector Machine, trained alongside the Discrete Wavelet Transform, achieved an accuracy of 96.98 percent during validation and 90.37 percent during real-time testing. These results highlight the practical application of the proposed algorithm for efficient motor fault diagnosis.

Keywords

Brushless DC Motor, Support Vector Machine, Feature Classification, Discrete Wavelet Transform, Feature Extraction, Wavelet Analysis, Haar Wavelet, Real-time Bearing Fault Diagnosis, Motor Fault Diagnosis, Arduino Programming, MATLAB Simulink



Implementation of Dynamic Image for Facial Expression Recognition on Indonesian Facial Expression Dataset

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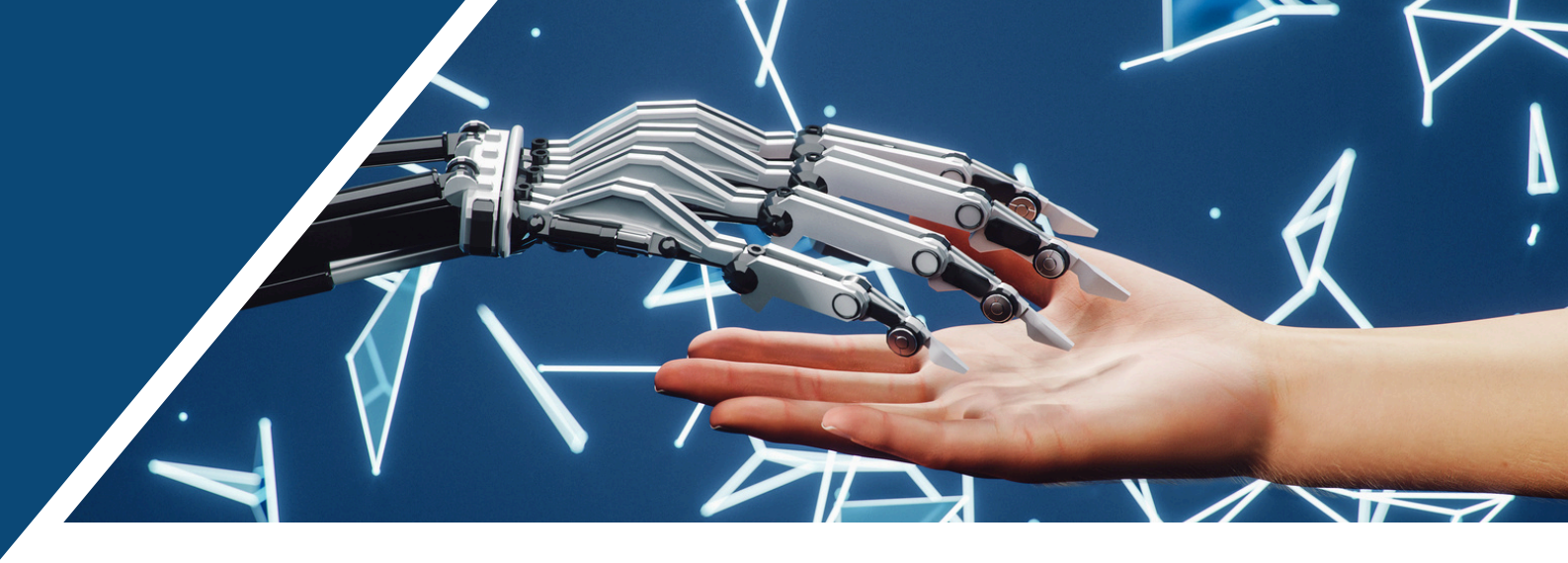
Abstract

In recent times, there has been considerable attention directed towards Facial Expression Recognition (FER) due to its extensive utility across diverse domains. However, the universality of facial expressions has been challenged by studies suggesting that cultural backgrounds significantly influence the perception and recognition of emotions. This paper addresses the need for culturally specific datasets in FER tasks, particularly in underrepresented regions like Indonesia. The study introduces dynamic images as an alternative input representation for facial expression recognition tasks, aiming to assess their efficacy using the Indonesian Mixed Emotions Dataset (IMED). Through experimentation using EfficientNet model, the performance of dynamic images is compared with static image and video inputs. Results indicate that dynamic images exhibit promising performance, with an accuracy of 94.28%. These results outperform static image datasets and nearly match the performance of video-based models, which achieved an accuracy of 97.93%, despite using fewer data. Nonetheless, challenges such as data imbalance and the quality of generated dynamic images persist, suggesting avenues for further research and model refinement. This study provides valuable insights into methodological advancements in FER, particularly in limited dataset conditions, laying the groundwork for future developments in dynamic image-based facial expression recognition algorithms.

Keywords

Facial Expression Recognition, Dynamic Image, IMED, EfficientNet



Self-Applicable Eye Strain Detection Through the Measurement of Blink Rate Using Raspberry Pi

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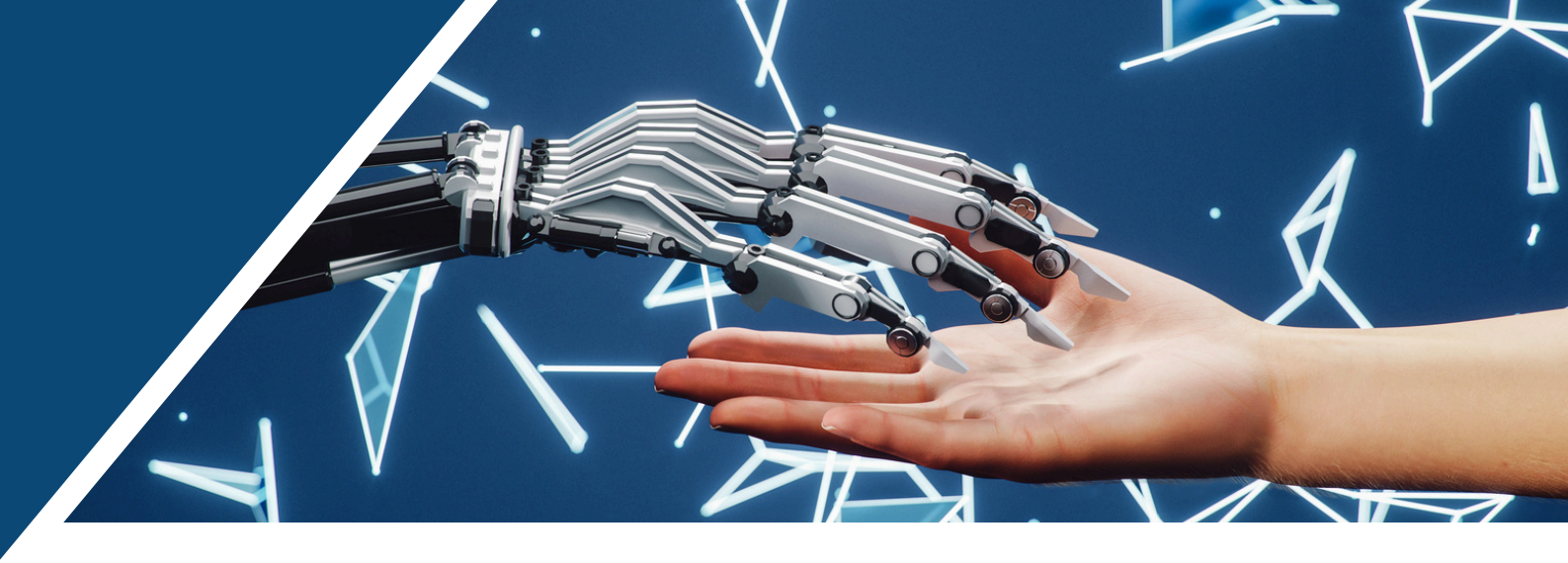
Abstract
You Only Look Once (YOLO) is a Convolutional Neural Network (CNN) used primarily for object detection models due to its high accuracy and reliable processing speed. In the study, YOLO was used to calculate the blink rate of an individual through a twenty (20) second recording. The model utilized YOLOv5, which was trained using one hundred (100) photos of faces obtained from the public dataset CelebFaces Attributes (CelebA). The system used a Raspberry Pi 3B+ and a 5MP Camera Module for video recording. Testing the model on 40 respondents (20 seconds each with 160 frames) yielded an overall accuracy of 85% when assessed using a confusion matrix. The paper benefits individuals who spend an increasing amount of time in front of a computer screen by helping them evaluate the stress level of their eyes. The results of the study can be used for future monitoring devices of eye strain.

Keywords
YOLOv5, Raspberry Pi 3B+, Eye Strain, Eye Detection, Machine Learning



A Feature Importance Method Based on Cosine Similarity and Metaheuristic Algorithm

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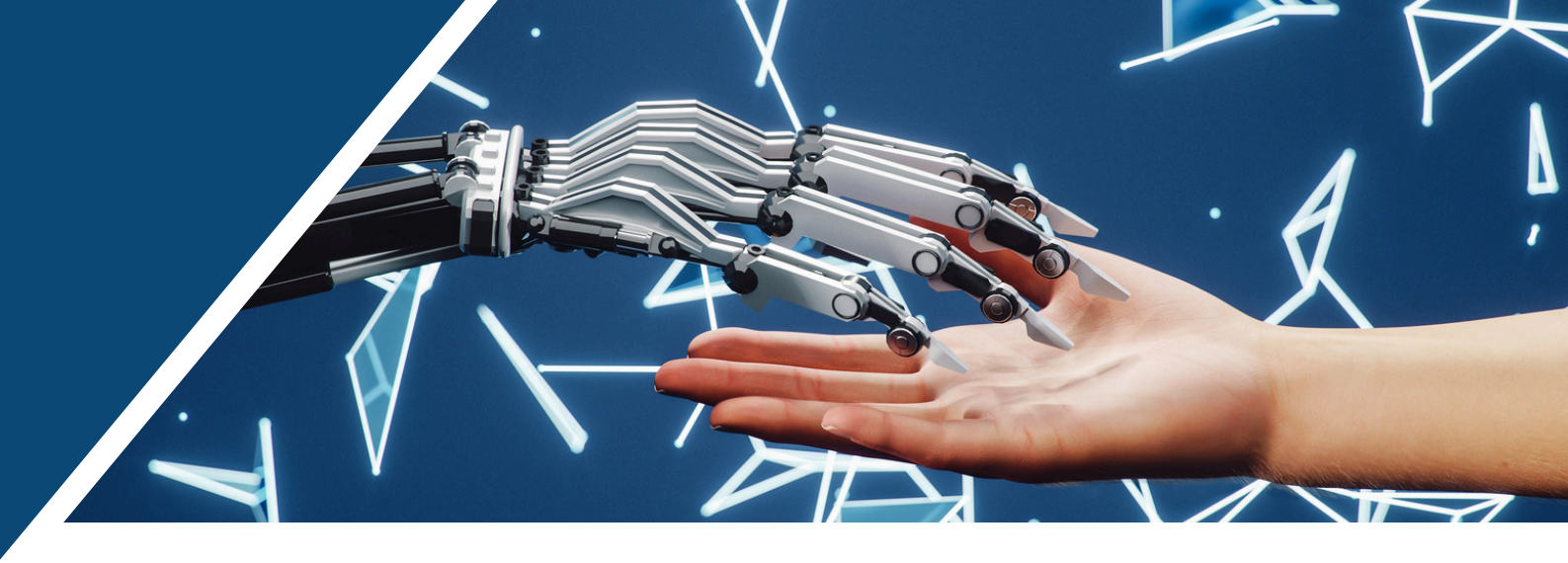
Abstract

Currently, there is a frequent generation of high-dimensional data in various domains. This study aims to present a novel way of lowering the number of features in datasets with large dimensionality, and not only. The analysis suggests a two-stage approach for selecting the most relevant features. Firstly, it will use cosine similarity in a pre-processing step to identify the most significant features ranking them according to the most important ones. Next, a hybrid metaheuristic, a combination of binary Volleyball Premier League and Antlion optimizer will be employed to reselect the most significant features detected in the initial phase. Various extracted features are utilized on selected datasets of Parkinson Disease to compare their results with the scenario when the hybrid metaheuristic employs all the features. The findings demonstrated notable advantages in terms of decreasing the time required for execution, with improvements ranging from 40.37% to a maximum of 91.57%. Additionally, there was a reduction in the number of features by 9.28% to 73.85%, while impacting the accuracy by a maximum of 4.47% in approximately 80% of the datasets.

Keywords

Cosine Similarity, Feature Importance, Hybrid Metaheuristic, Feature Selection, High-dimensional Dataset



Application of Pose Recognition for Suspicious Activity Detection Alarm System

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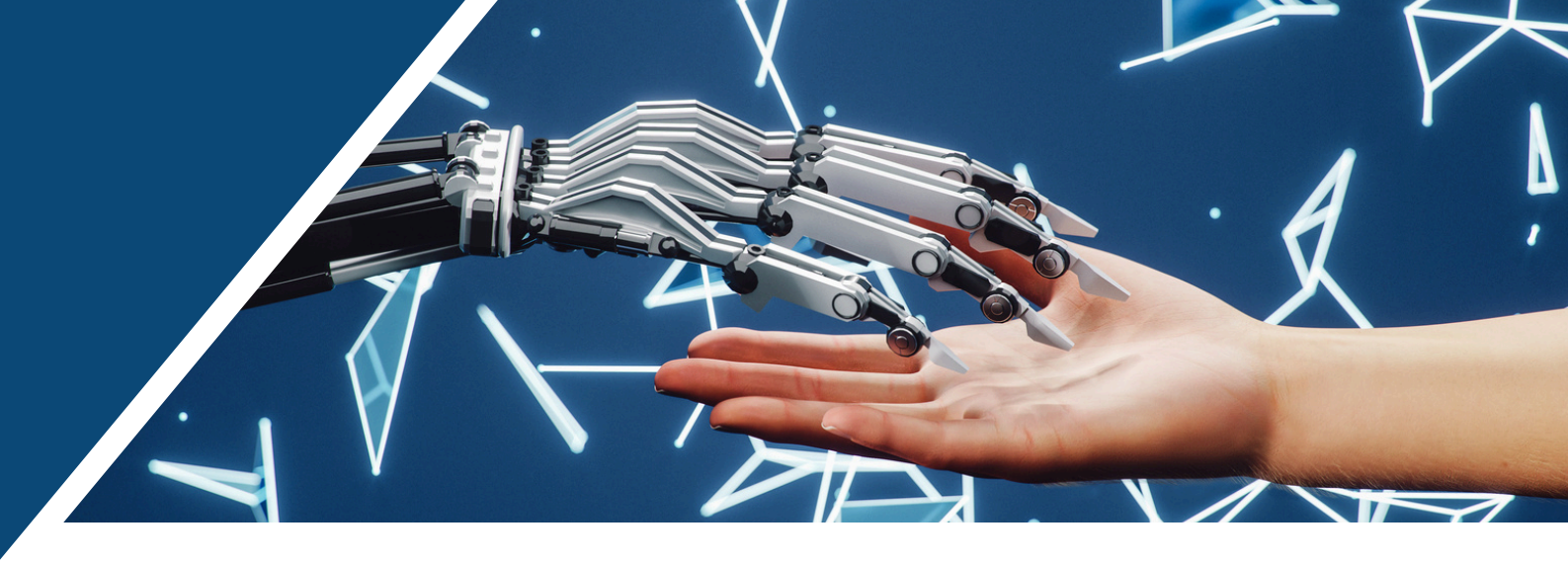
Abstract

In response to the constant threat of forceful invasions targeting residences, businesses, and institutions, the researchers developed a Suspicious-Activity Detection system that integrates real-time human pose detection using skeletonbased recognition. The system employs the PoseNet algorithm to locate the key body points and accurately identify the subject's pose. Loitering and lockpicking were the considered parameters for differentiating an intruder from a homeowner, if suspicion is detected, the alarm will be triggered, and an RFID tag is needed to disable the alarm. The system showed 100% accuracy in loitering detection with no false positives or negative results. While lockpicking detection achieved an average accuracy of 73.33%, which still met the system requirements. Thus, this study was able to demonstrate a significant potential in advancing surveillance technology for residential security.

Keywords

PoseNet, Pose Detection, Suspicious Activity, Home Alarm System, CNN



User Authentication with Keystroke Dynamics: Performance Evaluation in Neural Network

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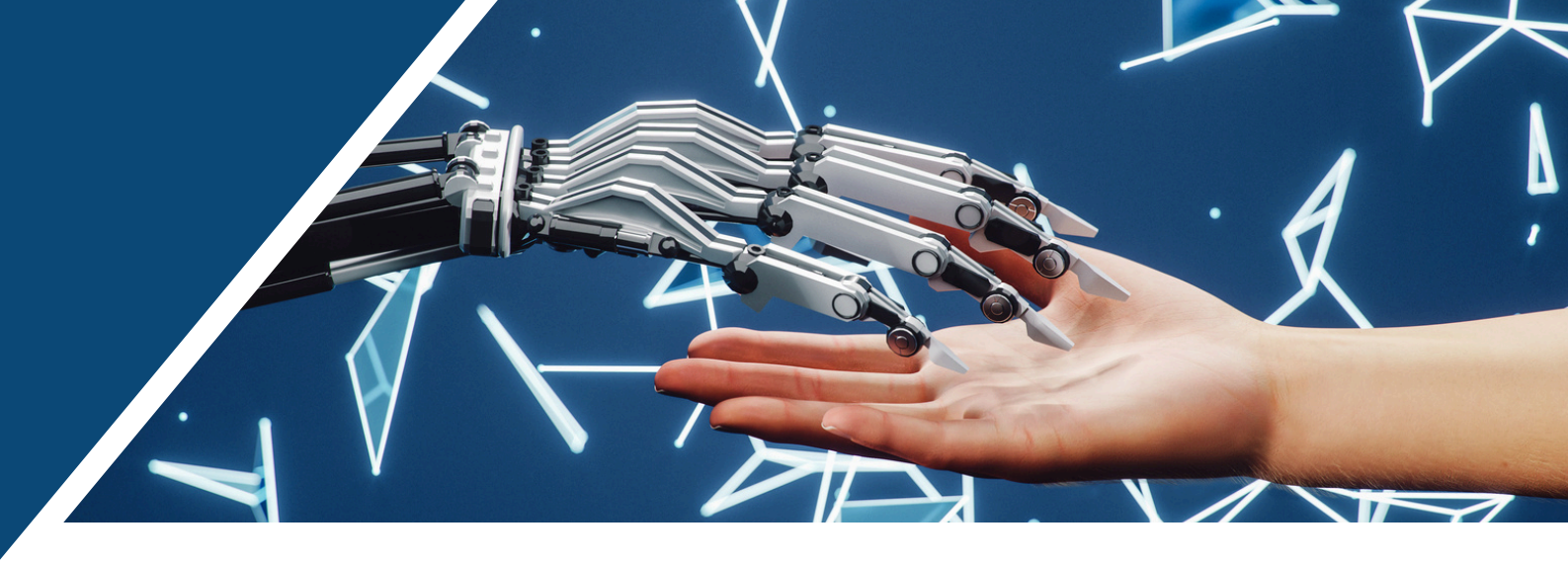
Abstract
In the current context of research, it investigates user authentication through keystroke dynamics using the neural network model which focuses on Convolutional Neural Network (CNN), Gated Recurrent Unit (GRU) and Long Short-Term (LSTM). As of above, four distinct experiments were conducted: (1) evaluating 3 different algorithms, (2) layering configuration for CNN and GRU fusion, (3) number of filters and neurons as hyperparameters, (4) assessing combinations of events counts and classes. In justification, the final outcome demonstrates an achieved accuracy of 87%. Based on the experiments that were carried out, optimal hyperparameters were identified: window size of 40, 256 for the number of filters and neurons and 2500 as the optimal number of events with 30 as the number of classes. These findings underscore a significance of considering diverse combinations of a number of events and classes by providing insights into the determination of optimal hyperparameters for keystroke dynamics in performance evaluation.

Keywords
Keystroke, CNN, GRU, LSTM, Authentication



A Neural Network Learning Approach Using ConvNet Models to Consolidate Corneal Ulcer Detection in Ophthalmology

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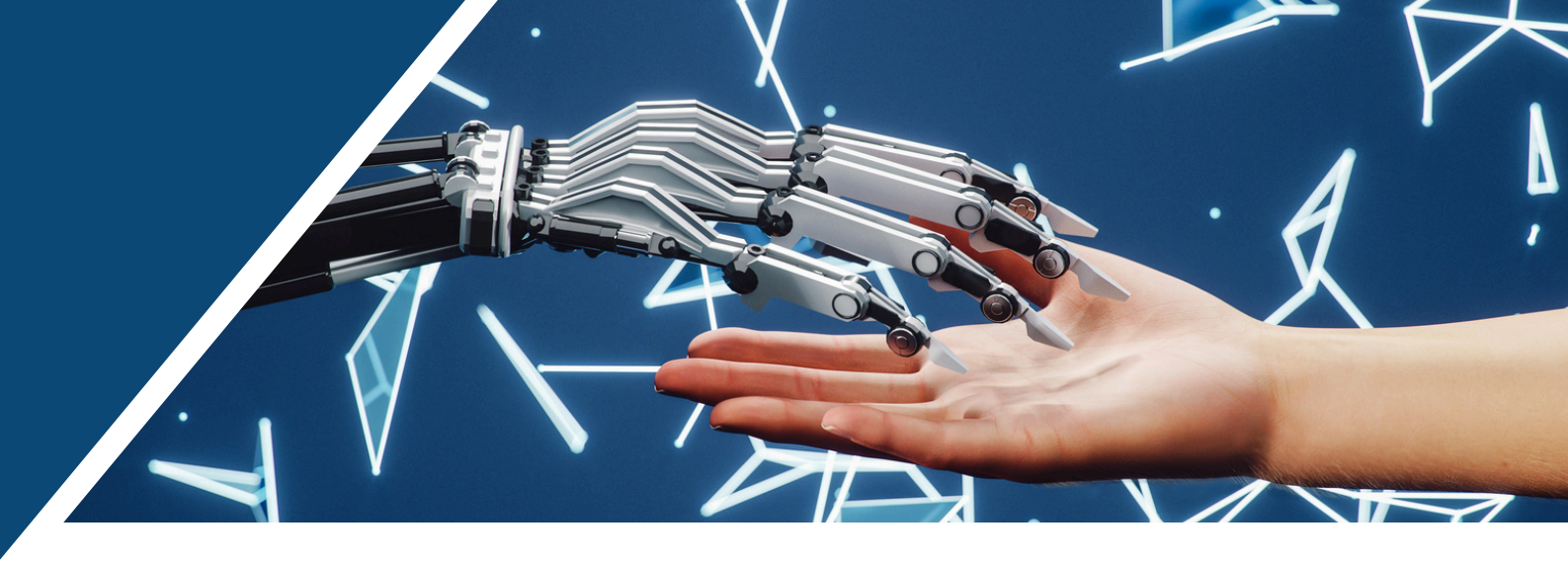
Abstract

Corneal Ulcer is an infection induced medical condition in which the patients get open sores in their eyes. In this paper, we investigate the use of deep learning in the automated classification of such ulcers using the SUSTechSYSU dataset, released by the Zhongshan Ophthalmic Center at Sun Yat-sen University. The dataset consists of 712 pictures of patients with different kinds, degrees, and classifications of corneal ulcers. After fluorescein staining, the dataset is collected and utilized to improve deep learning models. Pre-trained models for Eye Corneal Ulcer (ECU) image categorization are trained using the deep learning Convolutional Neural Networks (CNN) architecture, and a customized model is created to improve test accuracy and validation. 7,200 training photos, 1,800 validation images, and 3,000 testing images are included in the dataset for assessment. The modified model employs an Adam optimizer for multi-class classification and categorical cross-entropy as the loss function in a sequential architecture for feature extraction and classification. The validation set is used to perform hyperpa-rameter tuning, which maximizes model performance. Training accuracy is 99% and validation accuracy for the customized model is 90%. The goal of this research is to create an automated system for classifying corneal ulcers, which could increase the efficiency of ophthalmologists in the diagnosis and treatment of corneal infections.

Keywords

Convolutional Neural Network, Data Augmentation, Image-DataGenerator, Conv2D, Max-pooling, Flatten, Dense Layers, Hyperparameter, ReLu, VGG-16



Precoding-assisted FDMA Transmission Scheme: A CP-available FBMC Technique

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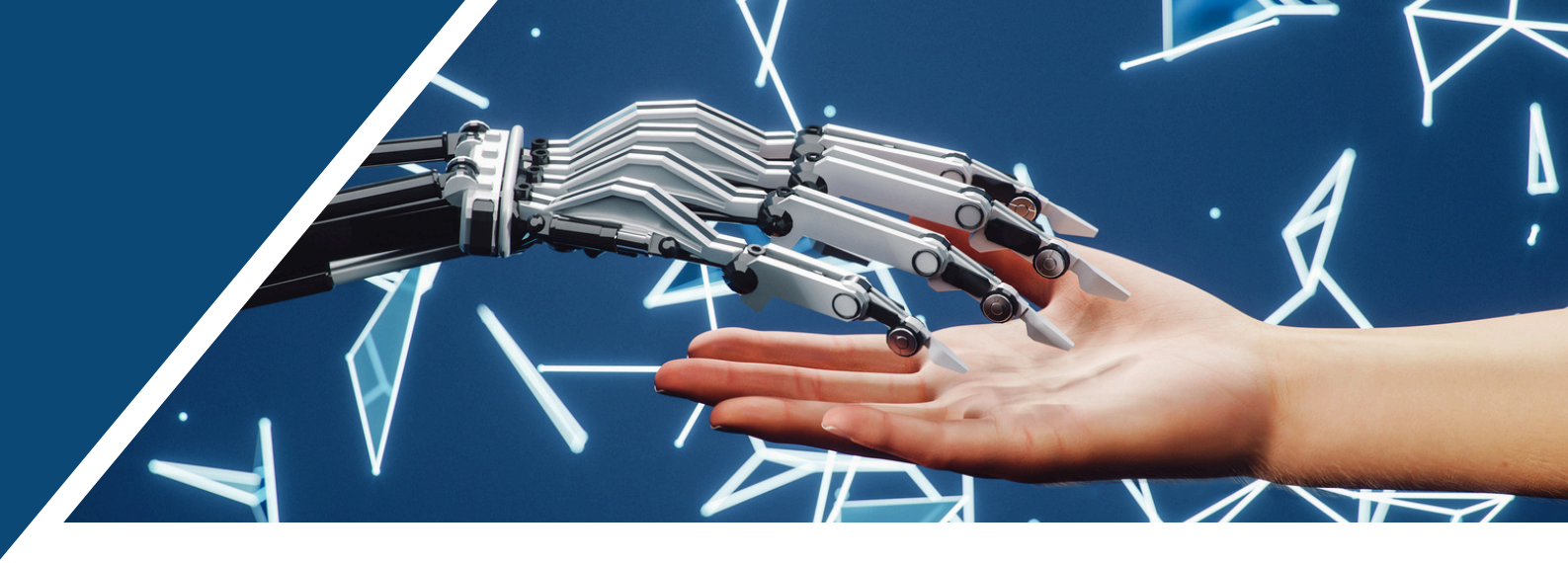
Abstract

Offset Quadrature Amplitude Modulation-based Filter Bank Multi-Carrier (FBMC) system provides superior spectral properties over Orthogonal Frequency Division Multiplexing. However, seriously affected by imaginary interference, its performances are hampered in many areas. In this paper, we propose a Precoding-Assisted Frequency Division Multiple Access (PA-FDMA) modulation scheme. By spreading FBMC symbols into the frequency domain and transmitting them with a precoding matrix, the impact of imaginary interference can be eliminated. Specifically, we first generate the coding presolution matrix with nonuniform Fast Fourier Transform and pick the best columns by introducing auxiliary factors. Secondly, according to the column indexes, we obtain the precoding matrix for one symbol and impose scaling factors to ensure that the power is approximately constant throughout the transmission time. Finally, we map the precoding matrix of one symbol to multiple symbols and transmit multiple data frames, thus achieving frequency-division multiple access. Additionally, observing the interference between adjacent frames, we mitigate them by adding frequency Cyclic Prefixes (CP) and evaluating them with signal-to-interference ratio. Note that PA-FDMA can be considered a CP-available FBMC technique because the underlying strategy is FBMC. Simulation results show that the proposed scheme has better performance compared to Single Carrier Frequency Division Multiple Access (SC-FDMA) etc.

Keywords

PA-FDMA, SC-FDMA, FBMC, Nonuniform Fast Fourier Transform



Ornamental Plant Classification System Using Image Processing and Machine Learning

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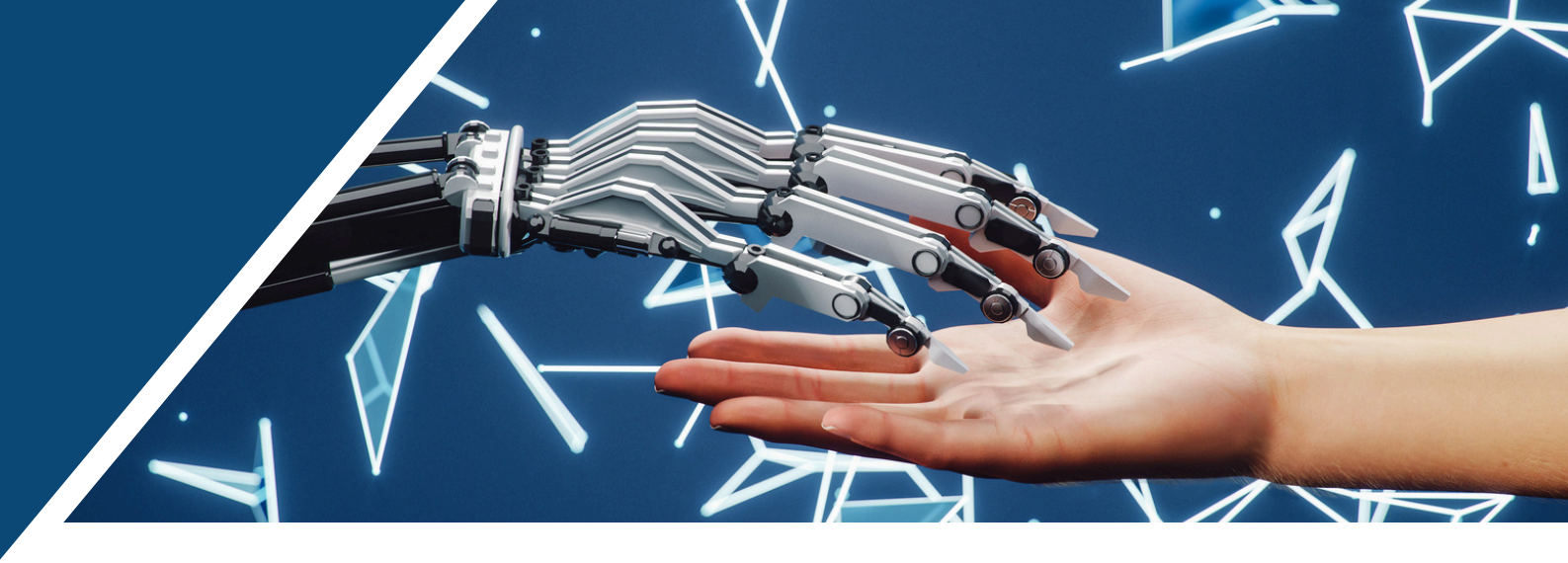
Abstract

Convolutional Neural Networks (CNNs) have been extensively studied for plant classification. Previous research primarily focused on herbs, plant diseases, and flowers. However, a limited amount of research specifically addresses the classification of ornamental plants based on their species. This study developed a classification system using a Residual Network with 50 layers (ResNet-50) implemented on a Raspberry Pi 3B. The system utilized a Raspberry Pi camera module for image capture and employed transfer learning with a pre-trained model from Keras. The model was trained in 6 classes, including Aglaonema commutatum, Dieffenbachia compacta, Spathiphyllum wallisii, Dracaena bacularis, Dracaena trifasciata, and unknown, using a dataset of over 200 images per class. Testing the model on 120 samples (20 per class) yielded an overall accuracy of 93.33%, as assessed by a confusion matrix. This paper is intended to aid the Bureau of Plant Industry for the benefit of research and development in the plant industries. This study also benefits plant retailers and buyers by ensuring accurate plant identification.

Keywords

CNN, Ornamental Plants, ResNet-50, Raspberry Pi 3B, Transfer Learning



YOLOv5-Based Image Processing for Pineapple Rind Defect Detection

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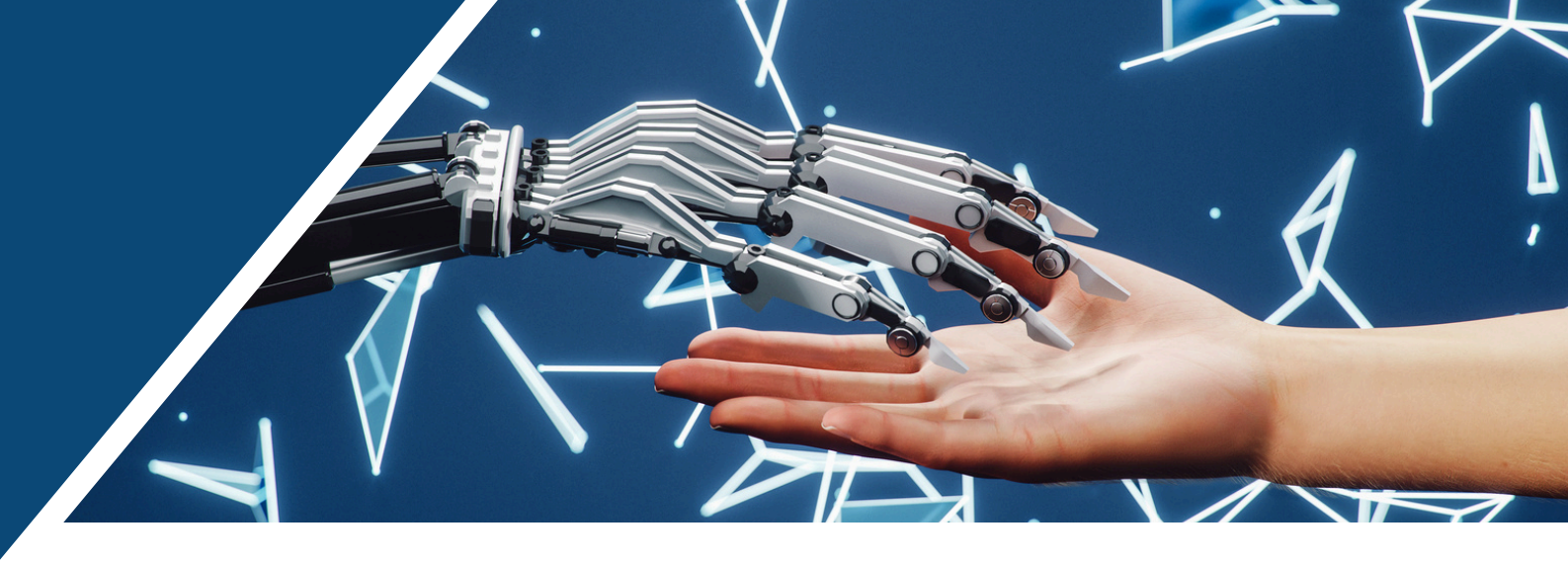
Abstract

This study implemented YOLOv5 (You Only Look Once) as its algorithm to detect pineapple rind defects using known image processing techniques such as preprocessing and augmentation. Python language was used to integrate the YOLOv5 algorithm, and a Graphical User Interface (GUI) was designed to allow the system to communicate with the user. Using the 5MP OV5647 Camera, the software can process source inputs such as image capture and video. The dataset contents follow, where 70% of training data (350) images, 20% of valid (100) images, and 10% of testing (50) images have been used to create the dataset. Additionally, the dataset had undergone preprocessing and augmentation to maximize the convergence rate of the model. As the system has been implemented and tested throughout the 40 images of pineapples that overall contain 20 rind defects and 20 with no rind defects, the trained model can identify pineapple rind defects at a default confidence threshold of 0.60. With that, the proponents obtained an accuracy score of 88.10%, which can be considered an ideal and capable model for capturing and detecting pineapple rind defects.

Keywords

YOLOv5, Raspberry Pi 4, Image Preprocessing, Image Augmentation, GUI



Predicting Student's Success in Programming Courses: A Decision Support System for Admission in Computer Science and Information Technology Programs

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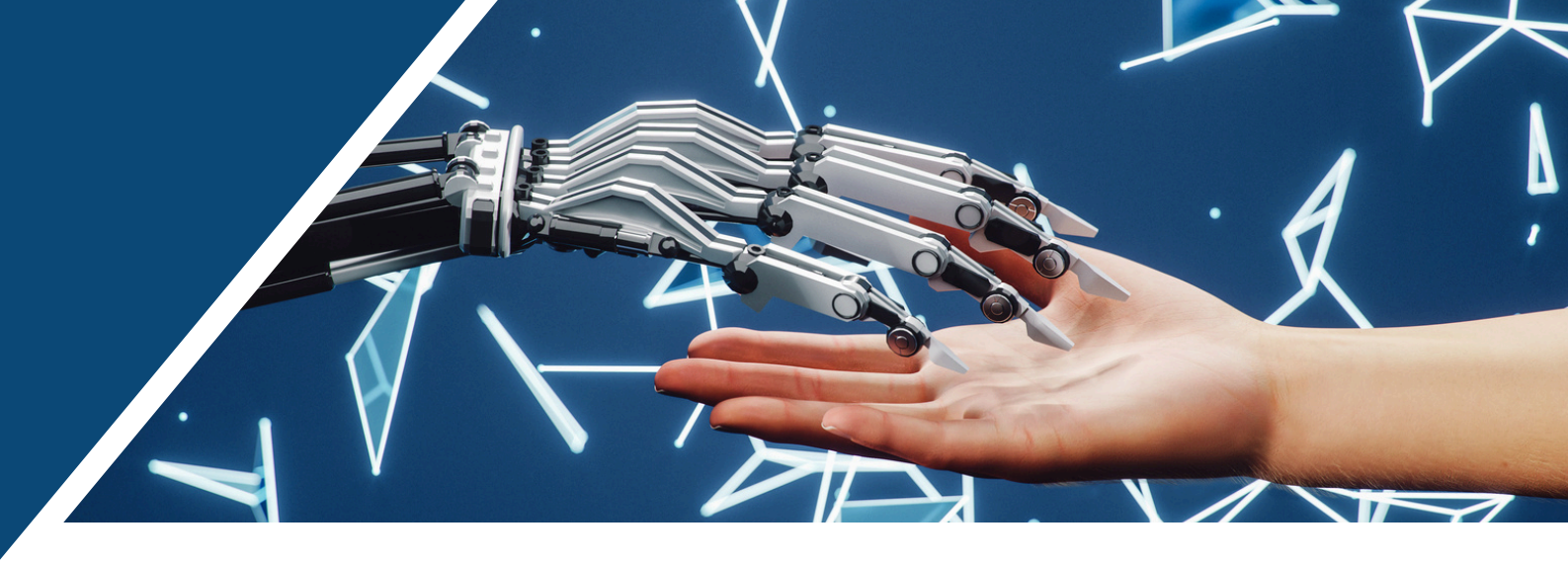
Abstract

Predicting students' success prior to their admission to computer-related degree programs is challenging due to diverse educational backgrounds and varying skill requirements. Educational Data Mining (EDM) can be used to optimize the college admission process by selecting only well-equipped students for the program. The attrition rate of the College of Computing Studies at Western Mindanao State University remains high despite the rigorous admission process for the Computer Science and Information Technology programs. Many students fail programming courses, causing them to leave the program. This study developed a decision support system and ensemble models by combining Support Vector Machine, Decision Tree, and Neural Network models using learning techniques such as voting, bagging, and stacking. The goal is to automate the admission of pre-qualified students based on their likelihood of success in programming courses. Factors such as SHS GPA, CET score, class rank, and specific personality traits significantly influence academic success. The combined models, particularly using stacking techniques, emerged as the most reliable and effective model for predicting unseen data compared to standalone classification models. Students and faculty members evaluated the functionality, reliability, and usability of the decisionsupport system. The feedback indicated a positive reception, affirming its potential as a valuable tool in the college's admission process. Future enhancements may include incorporating multiple intelligence and grit tests and exploring additional ensemble methods to improve predictive capabilities.

Keywords

College Admissions, Decision-support System, Educational Data Mining, Ensemble Models, Programming Performance Prediction



Smart Agriculture with Enhanced Accuracy for Fruit Detection Using Conv2D

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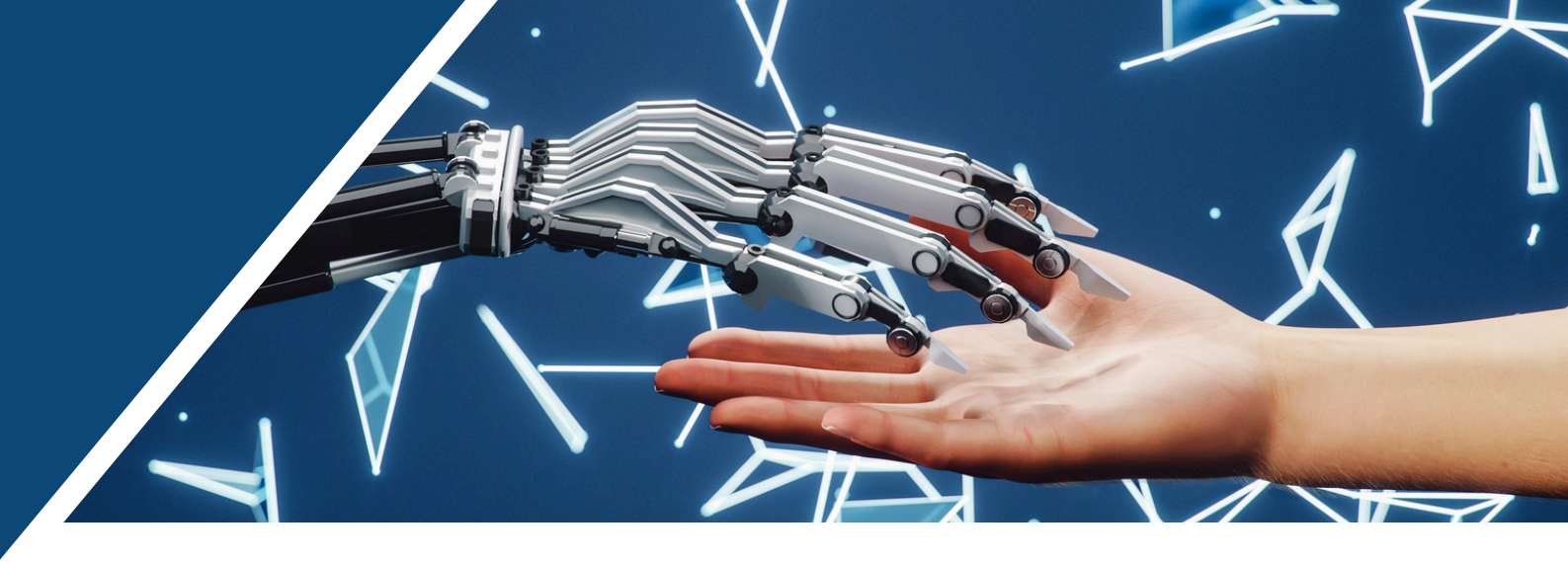
Abstract

With the rise of Deep learning and Machine Learning, immense breakthroughs in the area of agricultural automation have now become possible. Most importantly, it is the kind of fruit ripeness that may be the main issue as it touches both the retailing and farming sectors. In this paper, Convolutional Neural Network (CNN) approach and 2- Dimensional Convolution (Conv2D) model is applied as a main part of differentiating between ripe and unripe fruits because of their main distinguishing feature. The model is refined through the use of image processing techniques like resizing and normalization, which make its generalization ability more robust. Using the Adam optimizer and the binary cross entropy loss function, the model is tuned for the binary classification task which we deal with. The results of the model can be observed through fruit maturity classification with training accuracy 99 percent and validation accuracy reaches 84 percent, Area Under curve (AUC) equals 0.92.

Keywords

AUC, Binary Classification, Conv2D, Deep Learning, Fruit Classification, Image Processing



MoodWave Music Matcher: An Exploration of AI Driven Music Curation Based on Facial Analysis

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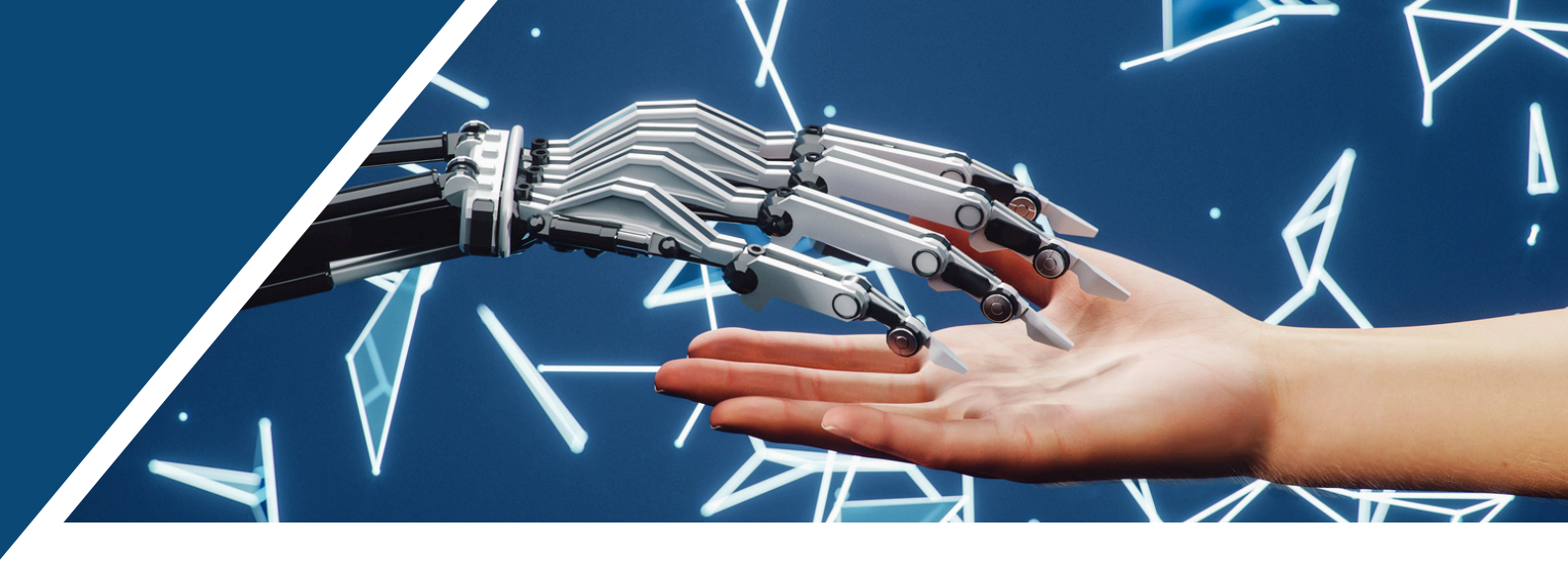
Abstract

MoodWave Music Matcher merges current era with human emotion to redefine the song listening revel in. Our method encompasses statistics series, preprocessing, function extraction, set of rules layout, gadget implementation, assessment, and moral considerations. We curate a numerous dataset of facial pix with emotional labels, preprocess them for consistency, and hire deep getting to know techniques for emotion recognition. Music features are extracted the use of sign processing and system studying. Our set of rules integrates emotion popularity models with recommendation techniques for personalized playlists. The implementation makes use of the MERN stack for scalability. Findings display an 83% accuracy fee, indicating MoodWave's efficacy in supplying customized and emotionally resonant song recommendations. Ethical considerations prioritize user privateness and algorithm transparency, ensuring a sincere system. Overall, our methodology and findings underscore MoodWave's potential to transform tune listening into an interactive and emotionally enriching enjoy

Keywords

MERN, Artificial Intelligence and Machine Learning, MoodWave, Music Recommendation



Development of a Baybayin Words Recognition System Using Support Vector Machine

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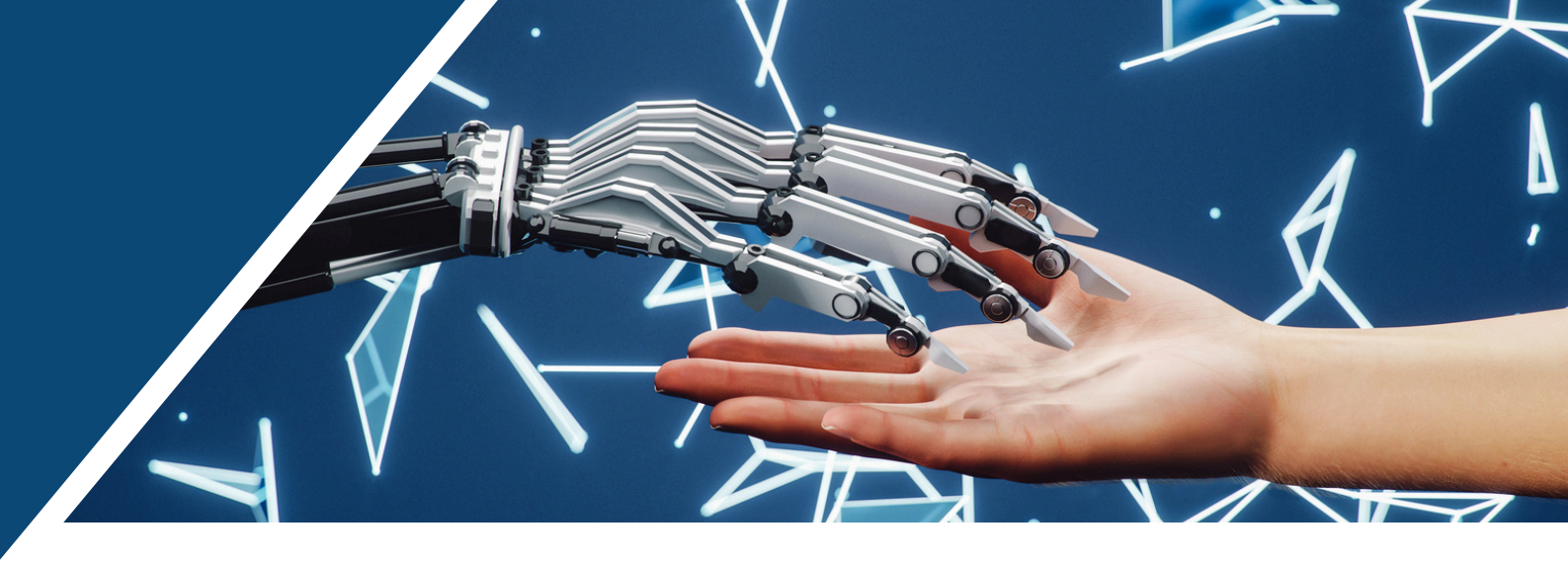
Abstract

Ancient scripts like Baybayin hold immense cultural heritage yet remain inaccessible in modern digital applications. This is due to optical character recognition (OCR) systems struggling to recognize Baybayin characters accurately due to their rather complex structure. This research develops a Support Vector Machine (SVM) system that recognizes and converts Baybayin words into their respective Tagalog representation. The linear and RBF kernels enhanced character prediction, improving accuracy and robustness. An overall accuracy score of 96.88% was obtained for the RBF kernel on the more straightforward Baybayin characters and 93.59% for the Linear Kernel on the more complex Baybayin characters. The processed images are classified into central character bodies and accent signs; the characters are predicted and combined before changing into their respective character equivalents from the accents. Characters are recombined after accent modifications to form the predicted Baybayin word. Testing on a dataset of 120 sample words of varying words written in Baybayin achieved 90.83% accuracy in word recognition. This indicates SVM's capability to distinguish the intricate strokes and variations of the Baybayin script. The optical recognition system provides an advancement towards digitally archiving and revitalizing the Baybayin cultural heritage.

Keywords

Support Vector Machine, Baybayin Recognition, Word Recognition Model, Machine Learning, Kernel, Character Recognition, Optical Character Recognition



Predictive Analysts and Time Series Forecasting Using Different Algorithm Machine and Deep Learning for Financial Market

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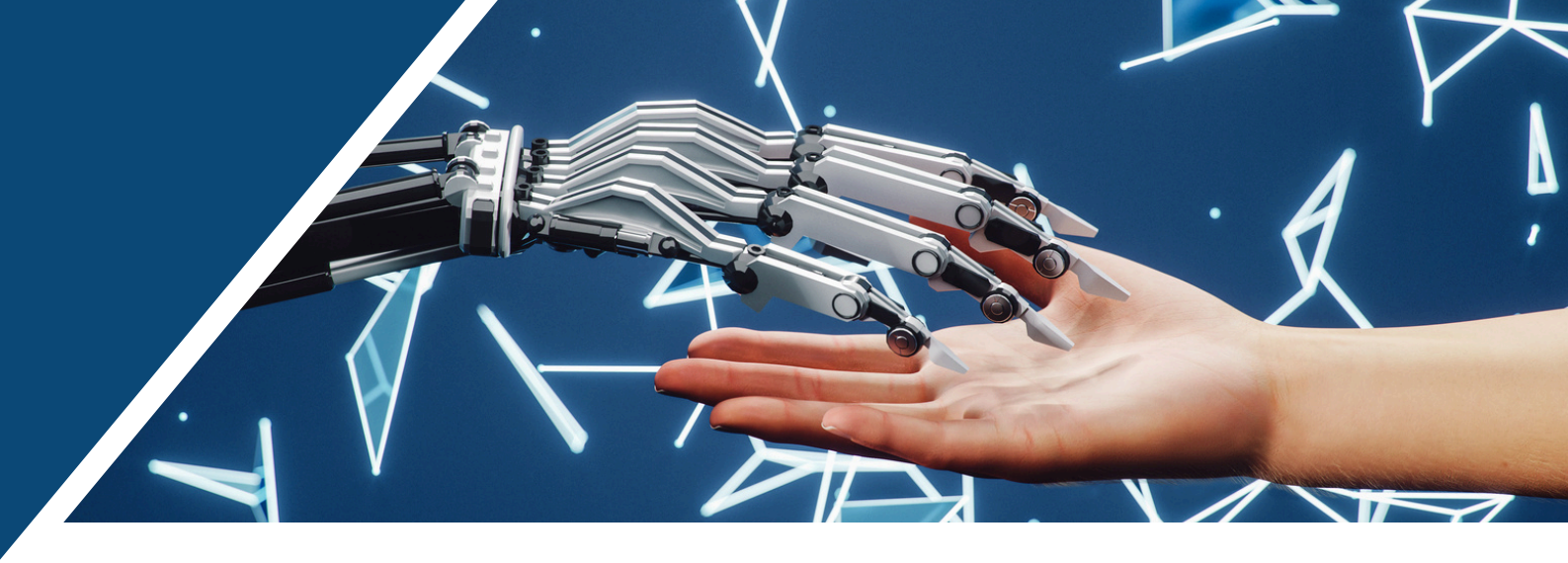
Abstract
Stock market (SM) analysis is a hot area of research for scientists and inventors. Financial markets today represent the nerve that drives the economy in any country, because of the frameworks and means they provide that bring together those who control the transferred values with those who search for them, and direct funds towards productive investment. This research aims to choose the best machine or deep learning algorithm to help the investor make a decision. In this study, data were collected for two Iraqi banks listed on the financial market for a period of 12 years. After reviewing previous studies on the most efficient and best algorithms in terms of predicting stock prices in the financial market, algorithms such as ridge regression, K-Nearest Neighbors, Decision Tree Regression, long short-term memory, and ensemble algorithm were applied. The comparison between these algorithms was studied and the results were analyzed. The study concluded that the group's algorithm is the best in terms of prediction and accuracy of results for financial market stocks.

Keywords
Stock Prediction, Machine Learning, Deep Learning, Ensemble Method



Bridging Visual Representation and Efficiency for Resource-Constrained Devices

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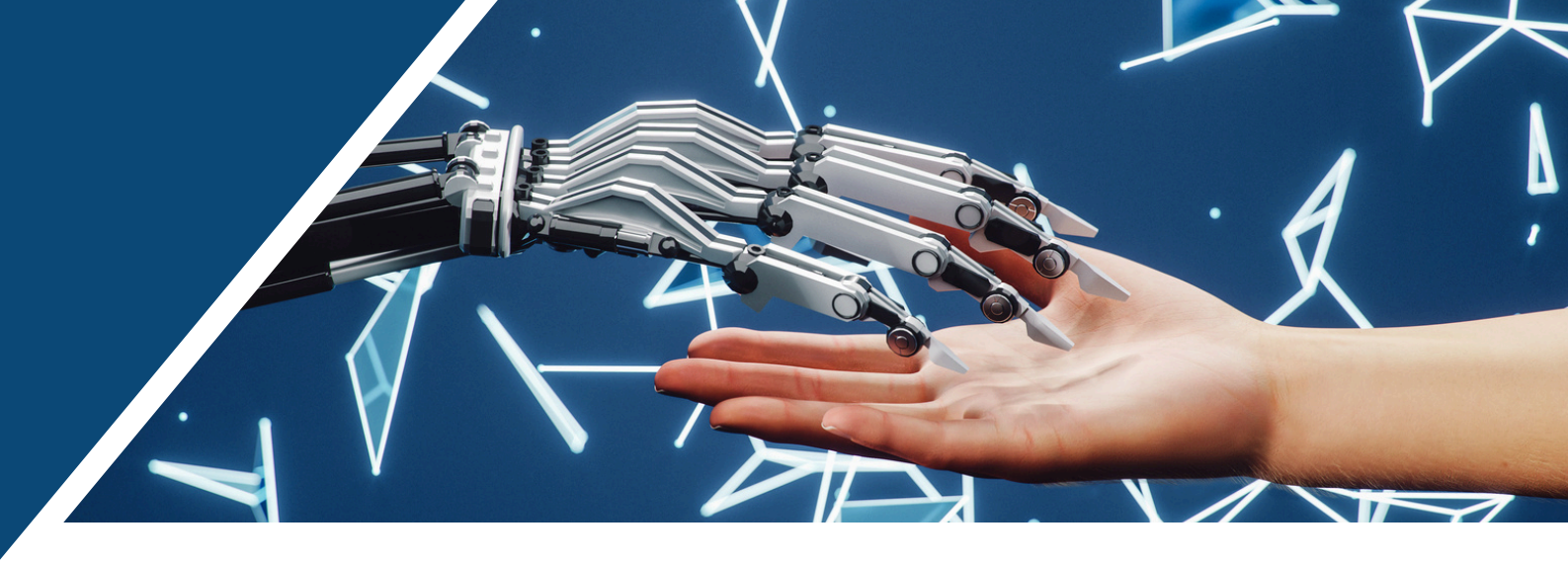
Abstract

Transformer models have transformed computer vision and natural language processing, setting new standards of performance on benchmark datasets. However, these models are not optimized for resource-constrained devices like mobile and edge devices. This paper introduces CLIP-Mobile, an efficient approach for enhancing mobile visual representation learning by aligning image features with textual annotations. Inspired by CLIP-Lite, CLIP-Mobile requires only a single negative imagetext pair per positive pair during contrastive learning, significantly reducing the required batch size compared to CLIP. CLIPMobile employs a mobile-centric architecture with MobileNet as the image encoder and the lightweight Lite Transformer for the text encoder. Evaluations were carried out to measure CLIPMobile's efficacy. Despite being pretrained on only 10% of the MS-COCO dataset, it achieves zero-shot top-5 accuracy close to a CLIP model trained on the same subset of data. The findings highlight CLIP-Mobile's potential as a robust and resourceefficient framework for advancing visual representation learning for mobile and edge devices, enabling real-world applications in constrained computational environments.

Keywords

Zero-shot Learning, MobileNets, CLIP



DarkNet Traffic Recognition Using Meta-Learning

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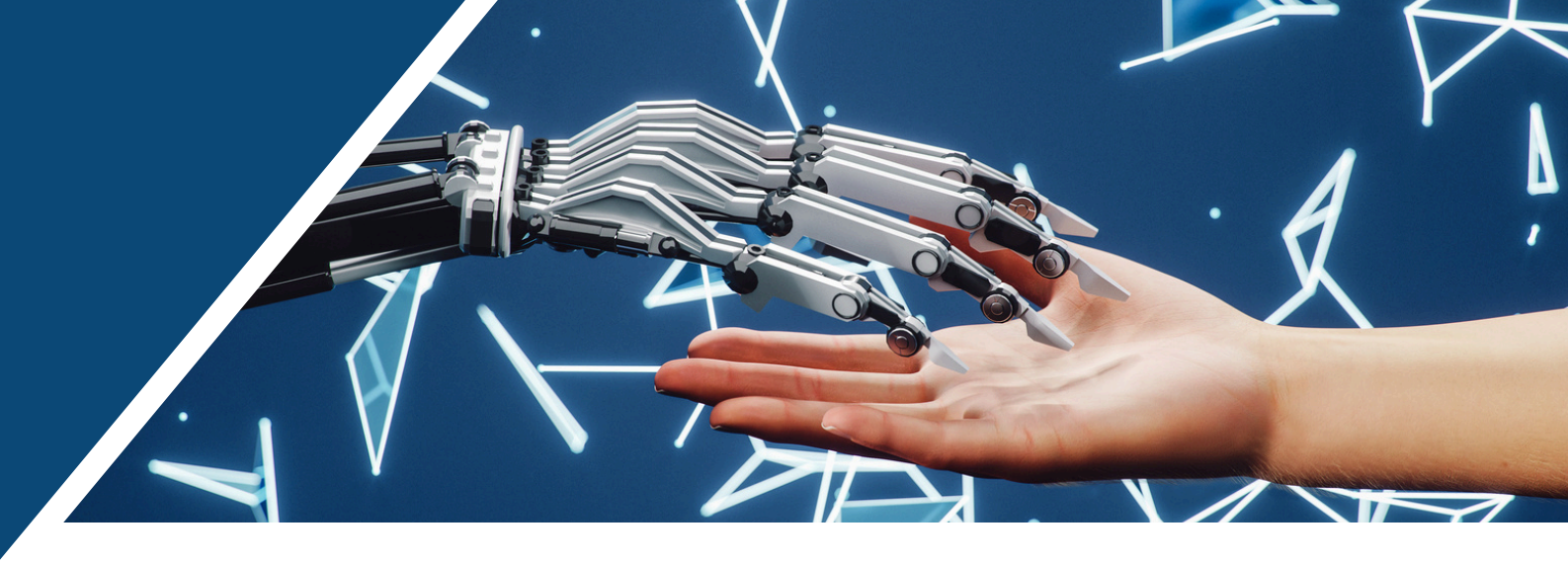
Dept. Information Technology, Technical College of Duhok, Duhok Polytechnic University, Duhok, Iraq

Abstract

Darknet is a private network where communication between peers occurs only over communications protocols and non-standard ports. Darknets differ from distributed peer-topeer networks in that they are anonymously shared, meaning that the IP address is not generally shared. Transaction is done through specialized tools such as TOR, allowing anonymity of the activities taking place. This paper proposes DarkNET traffic detection using ensemble learning and proposes an ensemble learning architecture based on stacking. The CICDarknet2020 dataset is the primary tool on which the models are built and tested. The comparative results showed the superiority of group learning and that the suggested model, which reached 98.8% accuracy, was the most accurate, which confirms the importance of using it in modeling network traffic data and distinguishing the DarkNET.

Keywords

DarkNet, Ensemble Learning, Traffic Recognition, Stacking



Vehicle Detection Based on Improved YOLOv8

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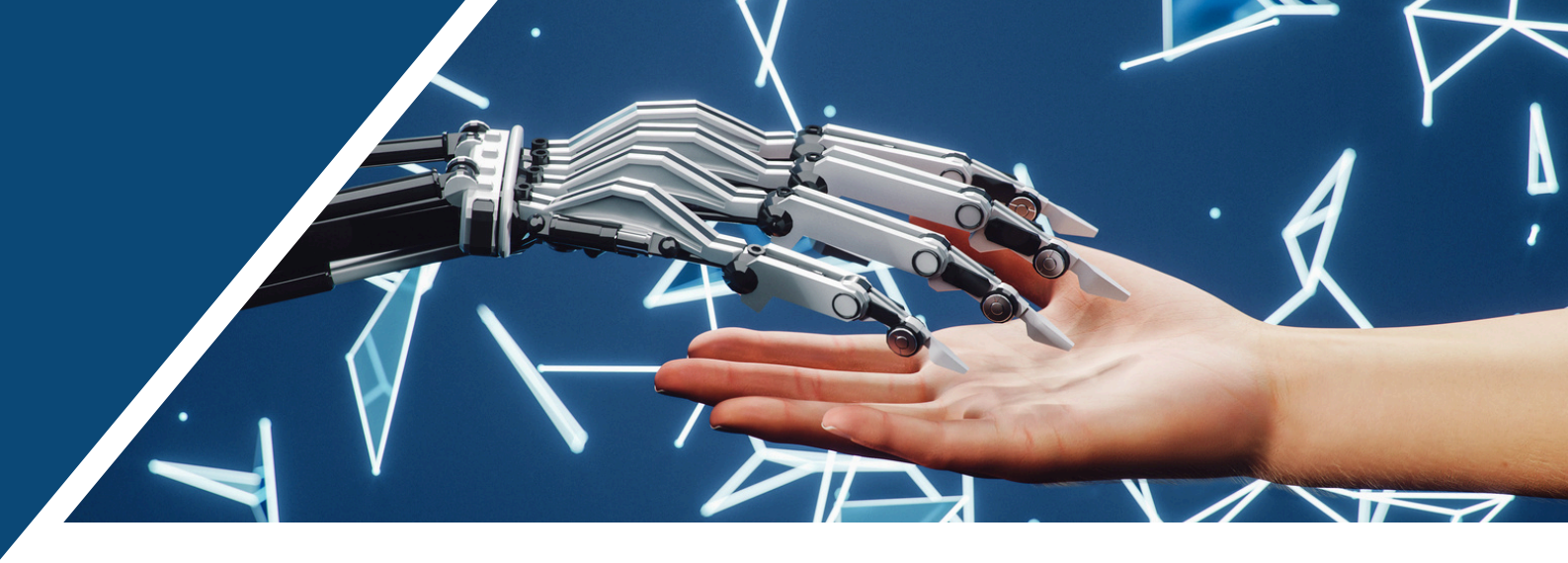
Abstract

Vehicle detection is a crucial component of Intelligent Transportation System (ITS). With the advancement of deep learning and computer vision, state-ofthe-art algorithms such as You Only Look Once version 8 (YOLOv8) have been developed to address the real-time detection challenges. However, during the experimentation process, we observed a class imbalance problem in the selfcollected Malaysian traffic dataset. In this paper, we analyse this problem in detail and propose a Simplified Variant of Oversampling (SVO) method to mitigate it. By applying the proposed method, we can ensure that the detection algorithm performs consistently across all classes, thereby improving the overall accuracy and dependability of the system. The measurements used in this paper are mean Average Precision (mAP), precision and recall. The oversampling approach improved mAP50 and mAP50-95 by 16.91% and 29.43%, respectively. Additionally, different attention mechanisms for instance Triplet Attention, Squeeze and Excitation Networks (SE) and Large Selective Kernel Network (LSKNet), were integrated into the backbone of the detection network to further enhance performance. Among these, the LSKNet attention mechanism achieved the best performance, further improving the mAP50 and mAP50-95 by 2.46% and 2.70%, respectively.

Keywords

Vehicle Detection, Computer Vision, YOLOv8, Class Imbalance, Attention Mechanism



A Neural Network Approach to Enhance Data Quality and Network Lifetime in IoT-based Smart Agriculture

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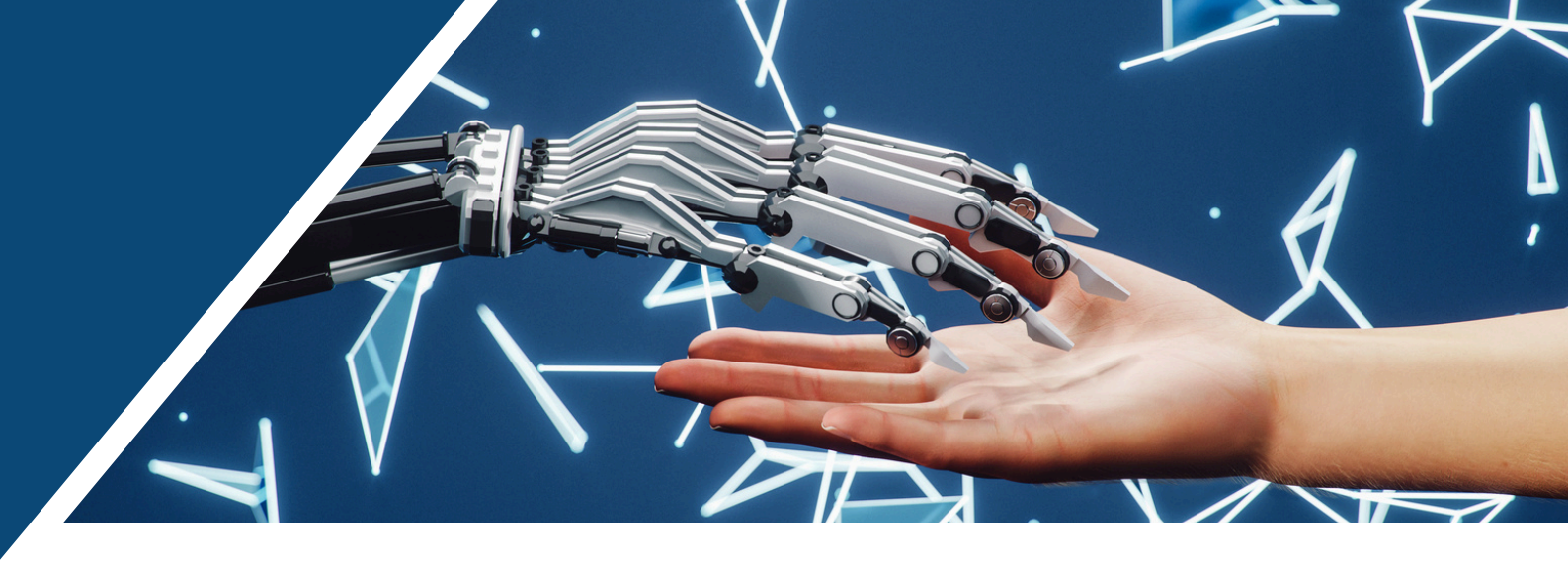
Harcourt Butler Technical University, Kanpur, India

Abstract

This paper tackles the critical challenge of redundant data and outliers within the Internet of Things (IoT) networks deployed for intelligent agriculture. These issues demonstrably compromise network efficiency. We propose a novel data aggregation method designed to enhance energy efficiency, reduce network traffic, and extend the operational lifespan of an IoT network. Our novel approach leverages a specialized neural network for robust data categorization, effectively eliminating redundancies and outliers—furthermore, the method clusters sensor nodes based on data similarity, facilitating streamlined processing. To achieve superior outlier detection, the system incorporates machine learning techniques. Subsequently, only the refined data is transmitted to a central station. Rigorous simulations demonstrate that our method surpasses existing approaches in data classification, outlier detection, and energy efficiency, leading to a significantly enhanced operational lifespan for IoT networks.

Keywords

Data Aggregation, Radial Basis Function Neural Network, Isolation Forest, Multivariate Outliers Detection, Wireless Sensor Network



Defect Classification of Green Coffee Beans Using YOLOv8

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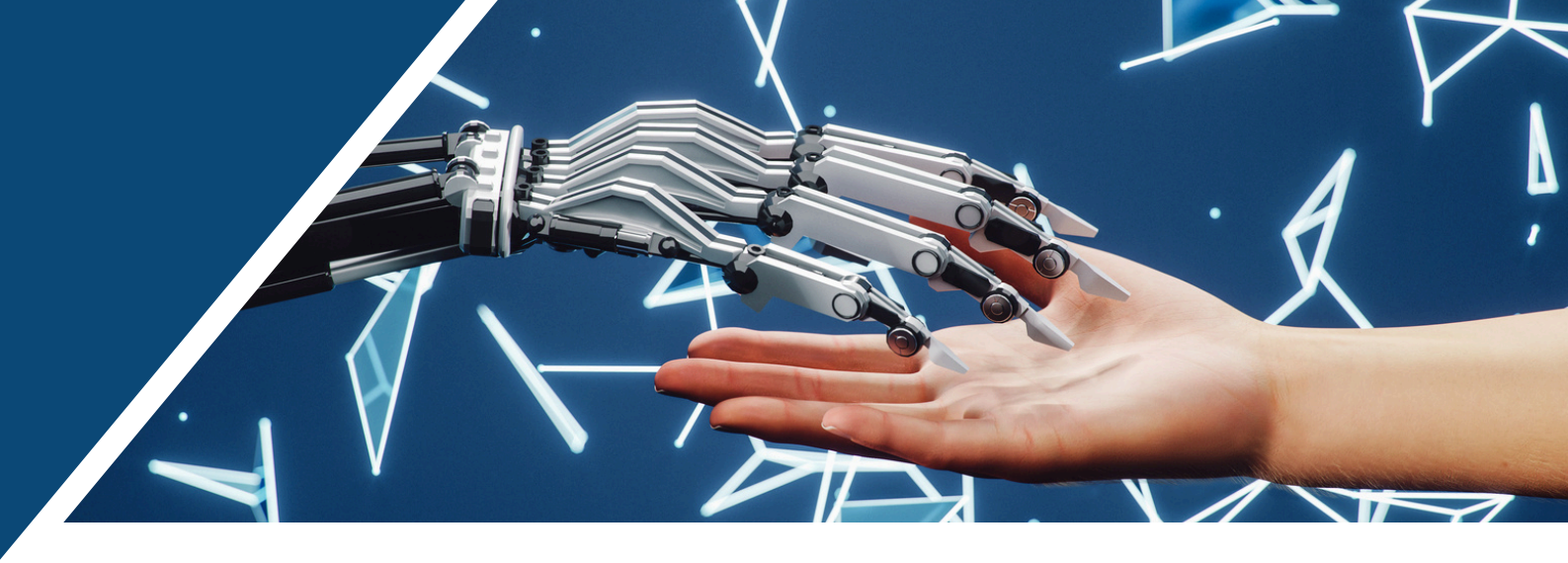
Abstract
Green Coffee beans are one of the known agricultural products worldwide. These beans are grown in specific areas in varying climates and altitudes. However, these areas are not free from insects or harsh weather conditions which will harm the green coffee beans in production and will yield some defects. Coffee Farmers and Producers must sort out which of the green coffee beans they have gathered after processing them. With copious amount of green coffee beans, not all defects will be sorted out from the non-defective ones. To mitigate that, the researchers developed a Raspberry Pi System, capable of accurately detecting which green coffee beans are defects. The Philippine National Standards of Green Coffee Beans is the basis of the detected defects of the developed system. The System utilizes an image processing algorithm known as the YOLOv8 or You Only Look Once v8. The overall accuracy of the system in classifying the type of green coffee bean is 93.20%. This research shows that the developed system can accurately detect the said defects using YOLOv8 and how it can be useful for coffee farmers and producers with their sorting process.

Keywords
YOLOv8, Defects, Green Coffee, Raspberry Pi, Classification



Long-Term Load Forecasting Based on Hybrid CEEMDAN-SSA-BiGRU-Attention Model

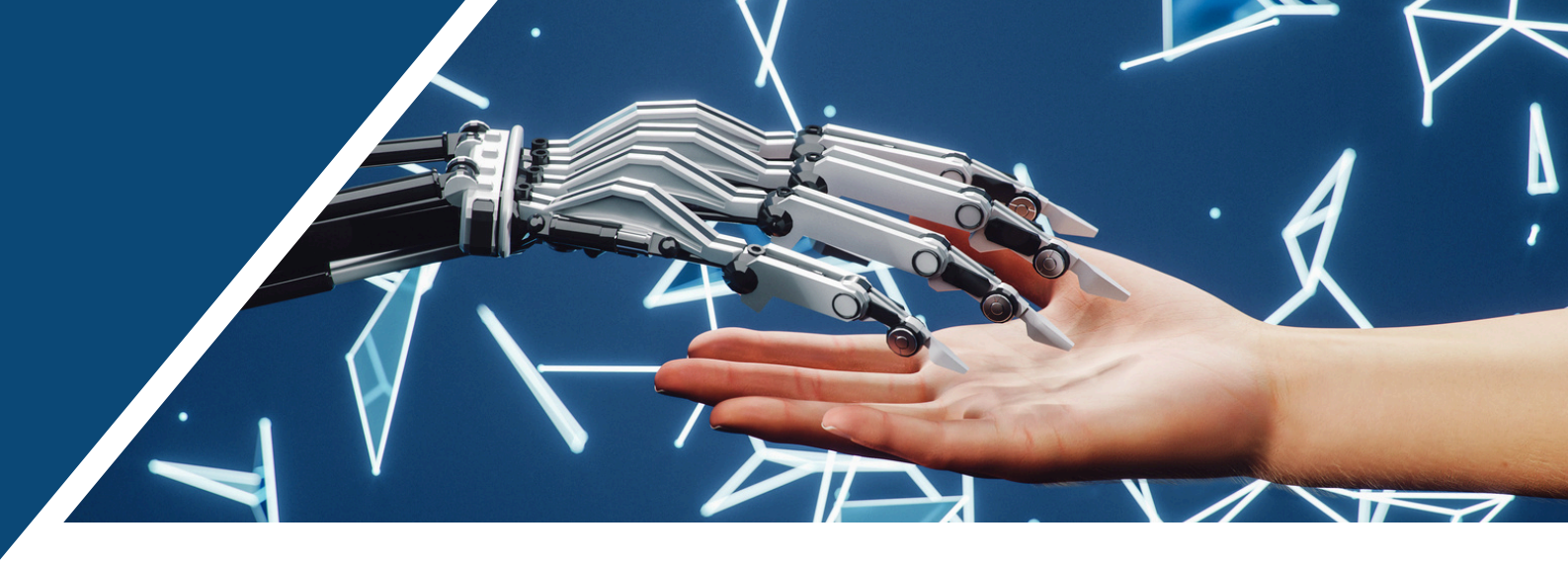
Jiajian Lin, Lit Yen Yeo, Yuting Sheng, Mehran Motamed Ektesabi, Jalal Tavalaei, Hadi Nabipour Afrouzi
Faculty of Engineering, Computing and Science, Swinburne University of Technology, Kuching, Malaysia
Department of Engineering Management, The Eleventh Metallurcial Construction Group CO., LTD, Liuzhou, China
School of Science, Computing and Engineering Technologies, Swinburne University of Technology, Hawthorn Victoria, Australia

Abstract

Electric load is characterized by uncertainty, randomness, and volatility, so accurate prediction will be challenging. This paper thus comes up with a hybrid prediction model called CEEMDAN-SSA-BiGRU Attention to predict the load. First, it preprocesses the load data from a selected power grid in Chicago, USA, from 2012 to 2015. Then, the load data is divided into a series of IMF sequences combined with the original data, shaping a new feature set using CEEMDAN (Complete Ensemble Empirical Mode Decomposition with Adaptive Noise). SSA (Sparrow search algorithm) optimized the hyperparameter of the BiGRU Attention network, and the network processed the new feature set to make predictions. The results from the experiments show that the judgment coefficient (R-square, R^2) of the model, the root mean square error (RMSE), and the mean absolute error (MAE) are 90.2%, 51618, and 39470, respectively. The three indexes are much better than other models and have a higher forecast precision degree and stable ability, which shows the model's superiority in long-term load forecasting.

Keywords

Machine Learning, Deep Learning Models, Electric Power System, Long-term Load Forecasting



An Encoded Double Auxiliary Pilot Channel Estimation Method for Intrinsic Interference Cancellation in FBMC/OQAM Systems

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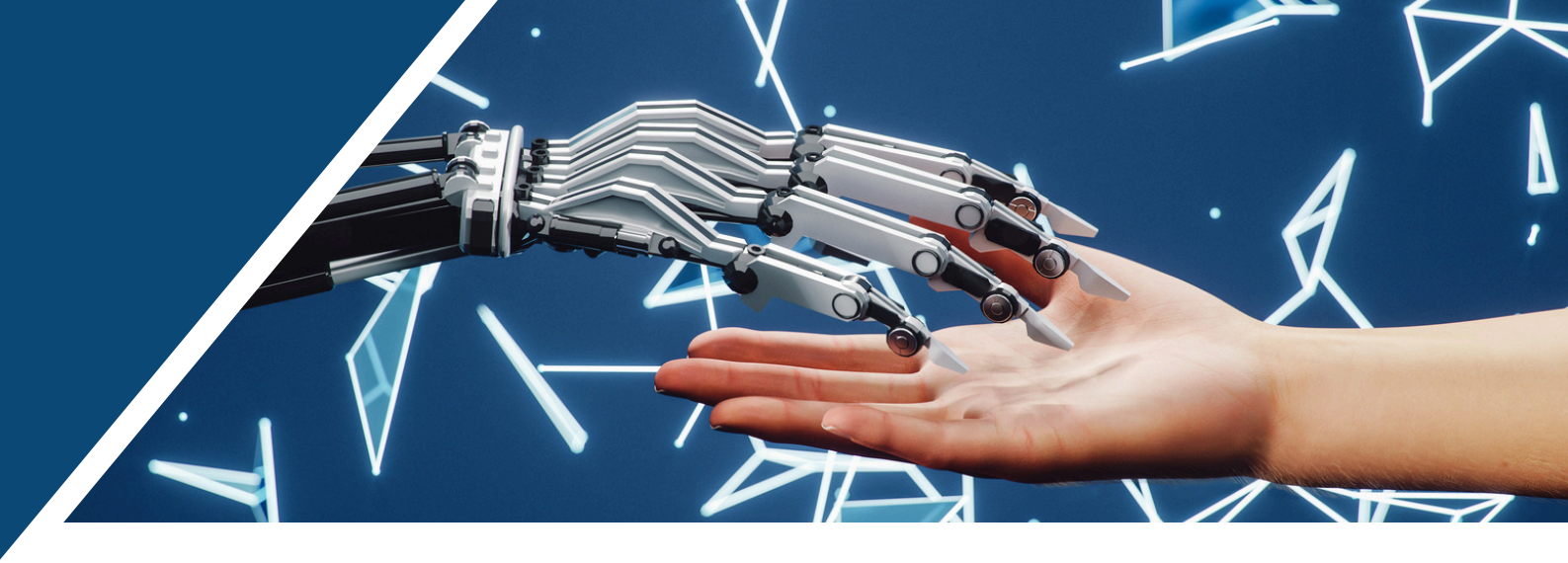
College of Information and Communication Engineering, Harbin Engineering University, Harbin, China
Key Laboratory of Advanced Ship Communication and Information Technology, Harbin Engineering University, Harbin, China
Agile and Intelligent Computing Key Laboratory, Chengdu, China

Abstract
Filter bank multicarrier technique (FBMC) is considered as a promising modulation technique suitable for future communications. However, the presence of intrinsic interference prevents the efficient implementation of techniques such as channel estimation. This paper presents a encode double auxiliary pilot channel estimation method （ EDAP ） for filter bank multicarrier offset quadrature amplitude modulation (FBMC/OQAM) systems. In order to eliminate the intrinsic interference, we add auxiliary symbols around the pilot, and at the same time perform a precoding process to minimize the auxiliary pilot energy loss and computational complexity. In order to validate the above method, the OQAM/FBMC system is modeled. Theoretical analysis and numerical results show that the method improves the channel estimation accuracy by 2.15-3.22 dB in double selective channels while maintaining low power consumption and low complexity.

Keywords
FBMC/OQAM, Intrinsic Interference, Channel Estimation, Auxiliary Pilot



A Multilingual BERT Embeddings Approach in Identifying Factors Influencing Employability Among Pre-University Students

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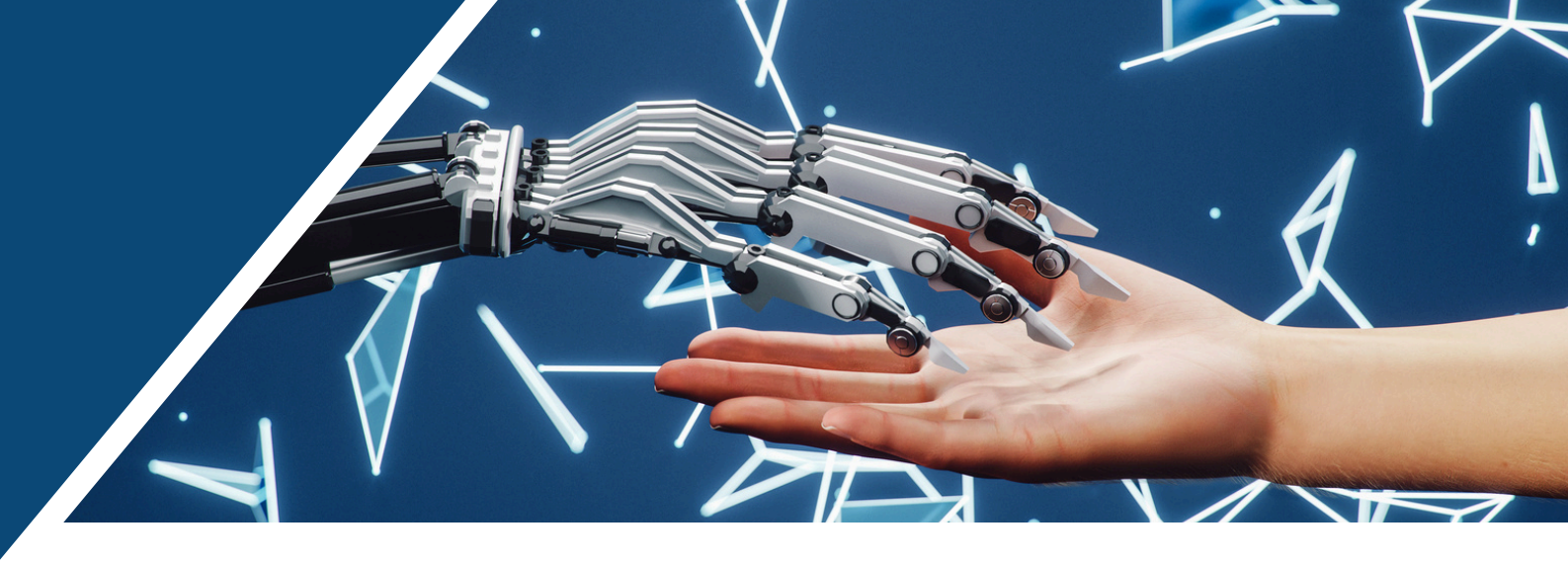
Abstract

Identifying the important factors influencing employability among the pre-university students is a non-trivial task due to the multifaceted educational data. By leveraging Machine Learning techniques, researchers have investigated various important factors influencing employability, but it remains challenging when existing feature encoding increases the data dimensionality and misrepresentation due to a greater number of nominal values. Therefore, this study has aimed to (i) identify the important factors influencing employability among pre-university students, (ii) explore the effectiveness of feature embeddings in identifying employability compared to existing feature encoding methods, and (iii) evaluate the important factors influencing the ability in identifying employability among pre-university students. The dataset is collected from 4007 graduates of a university from the years 2021 and 2022 with 27 variables. To study the effectiveness of feature embeddings, multilingual Bidirectional Encoder Representations from Transformers embeddings are generated after tokenizing the feature values. By applying Boruta and feature embeddings, home state, district, race, gender, disability, date of birth, program description, faculty domain and description, entry eligibility, the grades of Malay Language, Mathematics and Malaysian University English Test were identified. With these important variables, predictive models were constructed and evaluated. The findings revealed that the important variables identified has improved the model performance in identifying employability based on accuracy, precision, recall, F1-score, and Area under the Curve. Moreover, Logistic Regression, Gaussian Naïve Bayes, and Random Forest achieved an improvement of Geometric Mean with 60.80%, 63.40%, and 64.00% respectively, showcasing the superiority of feature embeddings with Boruta compared to existing feature encoding methods.

Keywords

Employability, Pre-university, Machine Learning, Feature Selection, Multilingual BERT



Noise Detection and Removal for Underground Communication Systems Based on L2 Normal Inner Product

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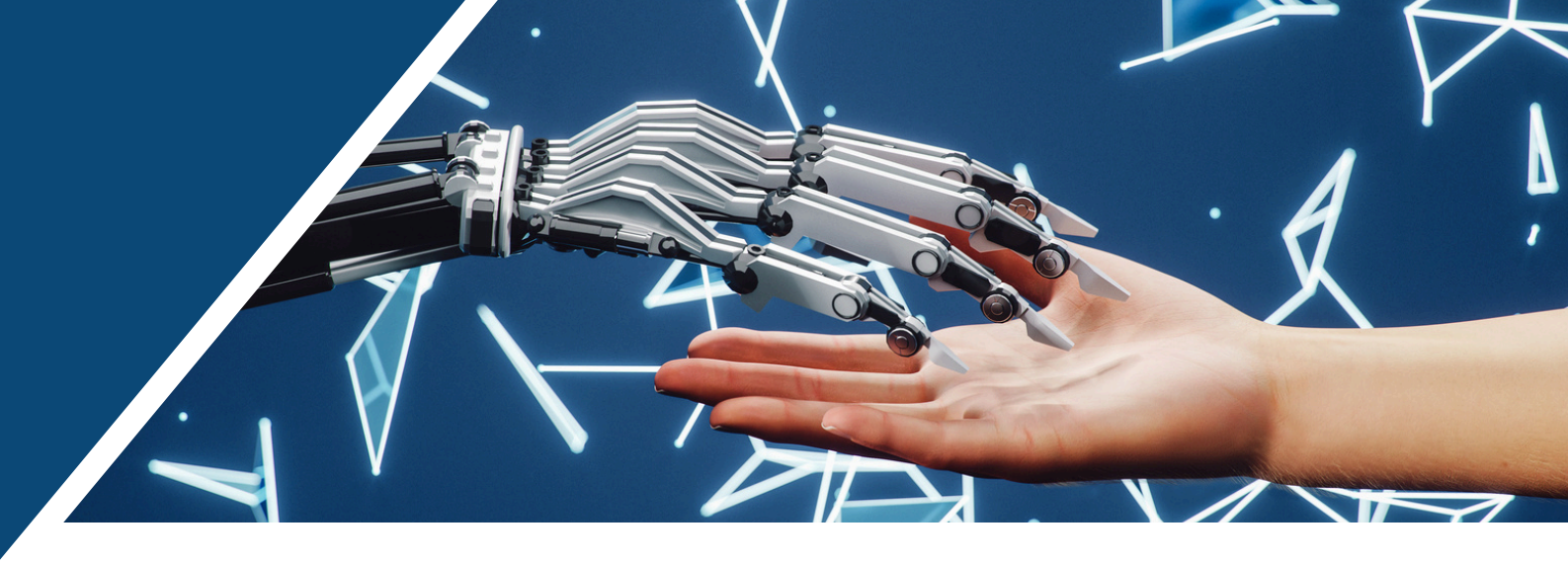
Key Laboratory of Advanced Ship Communication and Information Technology, Harbin Engineering University, Harbin, China
Sichuan Key Laboratory of Agile Intelligent Computing, Chengdu, China

Abstract
In underground communication systems, continuous mud pulse signals are susceptible to pump noise during transmission, resulting in a high bit error rate(BER). In this paper, a Normal Inner Product Orthogonal Matching Pursuit(NIPOMP) algorithm is proposed for the transmission characteristics of continuous waves in the underground. First, a cyclic prefix(CP) is added in front of the sent data. Then the observation vector is obtained by making a difference between the CP of the latter set of data and the CP of the former set of data. Then, the columns of the sensing matrix that are most correlated with the observation vectors are selected as candidate support sets by calculating the L2 norm. The least squares method was used to solve for the previous set of pump noise estimates. Finally, the pump noise is reconstructed using the correspondence between the time and frequency domains. This paper establishes a complete underground communication system. We discuss the noise characteristics of pump noise and analyze the denoising performance of the NIPOMP algorithm in depth. Simulation results show that the algorithm significantly reduces the system BER in complex channel environments with more drastic fading, including gasphase, liquid-phase, gas-liquid two-phase, and liquid-solid twochannel environments.

Keywords
Underground Communication, Pump Noise, NIPOMP Algorithm, Candidate Support Set, Bit Error Rate



Tackling Marine Pollution with IoT and Conditioned Diffusion

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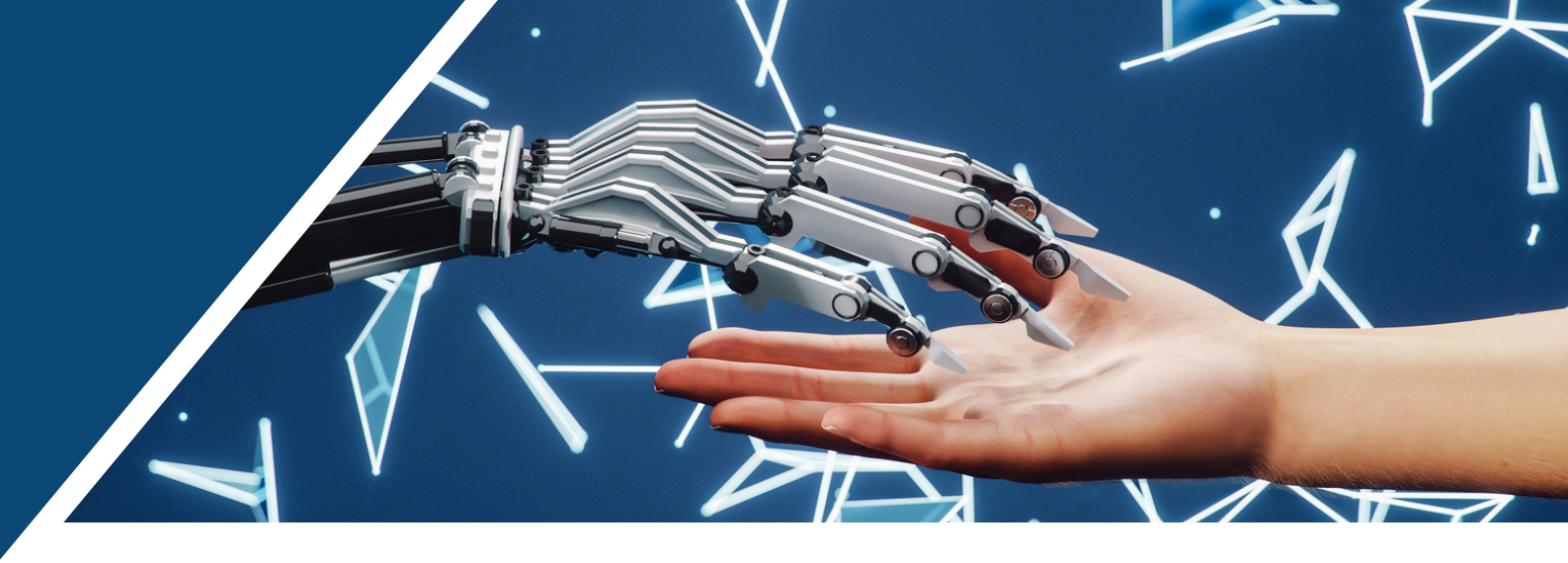
Abstract

Marine litter, 85% of which is plastic, is projected to triple by 2040. Addressing this growing challenge, we utilize the surge of COVID-19 masks in waterways as a case study to develop an innovative framework for adaptive pollution modeling. We leverage two novel systems for marine debris monitoring and origin tracking. Firstly, PROMPTCUE is a novel generative AI pipeline that swiftly generates over 60,000 high-quality marine debris images, accommodating diverse conditions from underwater to aerial perspectives. Secondly, we introduce PiDAR, a Raspberry Pi-based computer-vision sensor that detects marine debris like surgical and N95 masks with high precision (mAP>0.99) in less than 40 milliseconds per image. PiDAR is cost-effective (under $100) and can be reconfigured for new debris types within hours using PROMPTCUE datasets, setting new standards in rapid, adaptable environmental monitoring.

Keywords

Marine Pollution, PiDAR, PROMPTCUE, IoT, YOLO, Computer Vision, Stable Diffusion, ControlNet



Vision Transformer-Based Breast Mass Diagnosis in Mammography Using Bilateral Information

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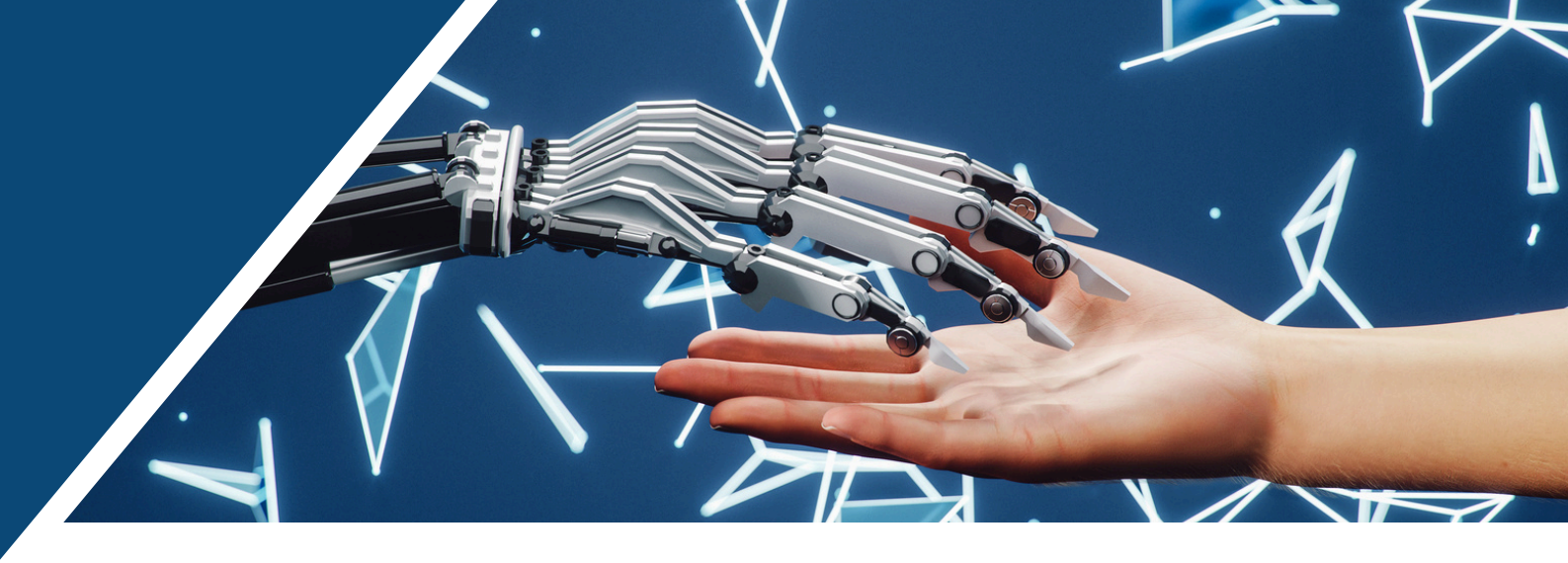
Center for Data-Driven Science and Artificial Intelligence, Tohoku University Sendai, Japan
Department of General Engineering, National Institute of Technology, Sendai College Sendai, Japan

Abstract

In response to the high incidence of breast cancer and the need to enhance automatic diagnosis to assist radiologists, there is an urgent need to develop a system that can aid in the accurate diagnosis of breast cancer. Computer-aided Diagnosis systems have been proposed for the task of breast cancer detection; however, they often encounter challenges in effectively utilizing bilateral images for accurate diagnosis of breast masses. To address this limitation, this study introduces a novel method that leverages a vision transformer to fuse information from both breasts to classify cancerous and normal mammograms. Our study contributes by utilizing bilateral information to diagnose the presence or absence of masses, thereby enhancing the sensitivity and accuracy of disease diagnosis, using the rich breast imaging data in the Digital Database for Screening Mammography. Compared with traditional convolutional neural network-based models, our method improves diagnostic performance and shows better robustness in avoiding registration problems. Experimental results show that our proposed method achieves satisfactory accuracy and reliability in breast mass diagnosis. This improvement leads to more valuable results for clinical decisionmaking and enhances the diagnostic capabilities of computeraided diagnosis systems.

Keywords

Breast Cancer, Vision Transformer, Bilateral Information, Attention Mechanism



COLREGs Inspired Decentralised Path Planning for Multi-Agent System

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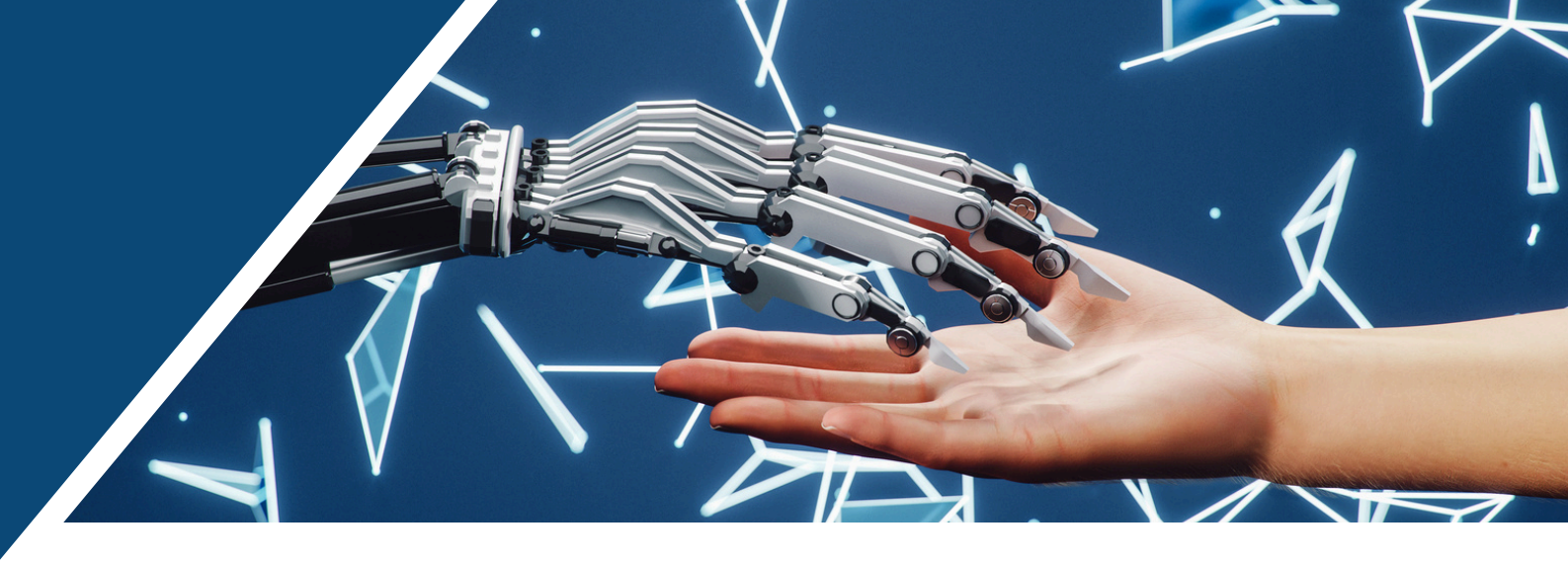
Department of Engineering Design, Indian Institute of Technology, Madras Chennai, India

Abstract

Multi-agent systems are being widely used for robotic applications in the domains of search and rescue, surveillance, and mapping. Traffic handling for collision free navigation is one of the major requirements for effective use of multi-agent systems. Within this domain, decentralised approaches have gained popularity in recent years owing to inherent scalability and fault-tolerant capabilities. In spite of the above advantages, effective decentralised planning that ensures consensus among the different agents remains a research problem. This paper proposes a decentralised multi-agent planning approach that complies with the International Regulations for Preventing Collisions at Sea (COLREGs). Under the proposed approach, each agent plans its global path to goal independent of other agents. During navigation, agents within a threshold distance of each other would communicate their future actions with each other to check for possible collisions. Upon detecting a potential collision, each agent will apply the COLREGs rules. Based on the outcome, the agent may re-plan its path locally or continue on its previously planned global path. A major advantage of the proposed approach is that it is deterministic and ensures consensus among agents, unlike learning or optimisation based approaches. The proposed approach was validated in multiple simulated and realworld conditions, with varying number of robots. The results demonstrated that the proposed approach allows for effective decentralised planning for multi-agent systems, while significantly reducing the computation and re-planning required from each individual agent.

Keywords

Multi-agent System, Path Planning, Mobile Robot



Development of a Drone with Human Detecting Capabilities Using Thermal Camera for Landslide Search Operations

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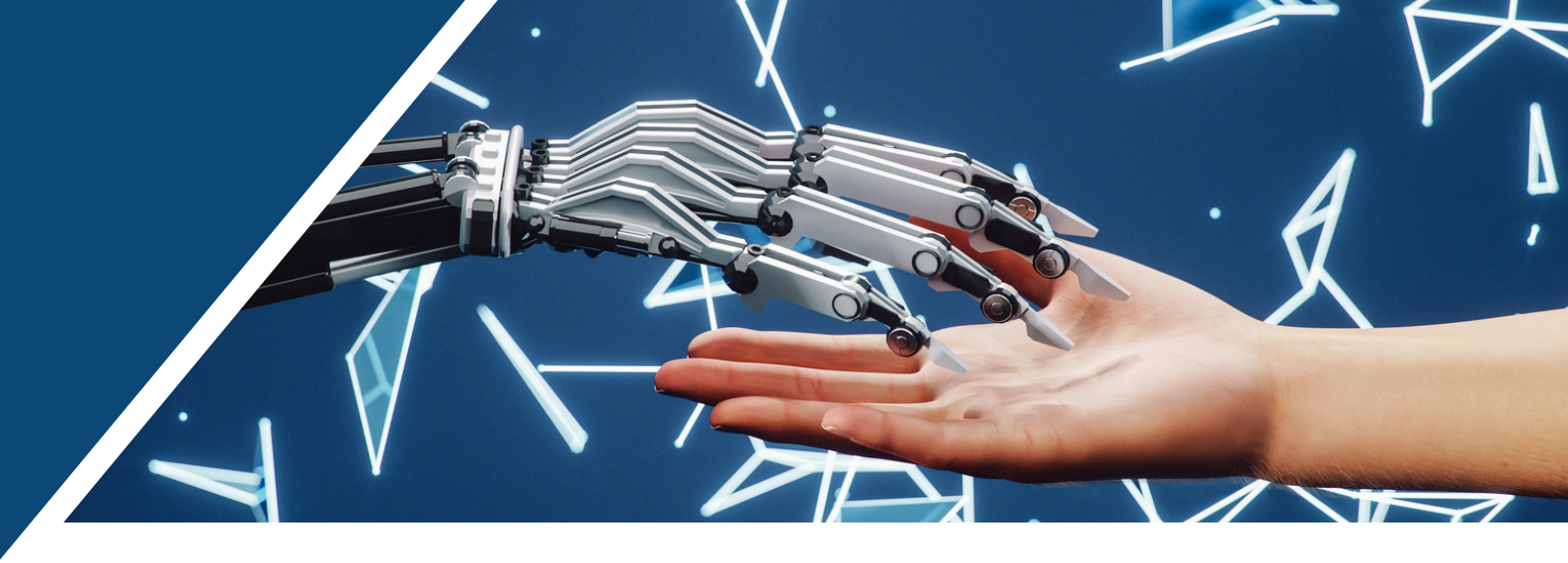
School of Electrical, Electronics, and Computer Engineering, Mapua University, Manila, Philippines

Abstract
In an occurrence of a disaster specifically a landslide, human-led search operations are the first line of action done to looking for people with casualties and missing persons. However, this kind of operations could constitute more danger. With that in mind, development of a drone that can detect humans with thermal readings is essential and could help search operations locate more people without entailing more casualties. Moreover, the drone will incorporate the use of Lepton FLIR 2.5 thermal camera module that will gather the thermal heat of the people.

Keywords
Drone, Landslide, Search Operations, Thermal Heat



Optimizing Masked Face Recognition: A Tailored CNN Integrates with Different Classifiers

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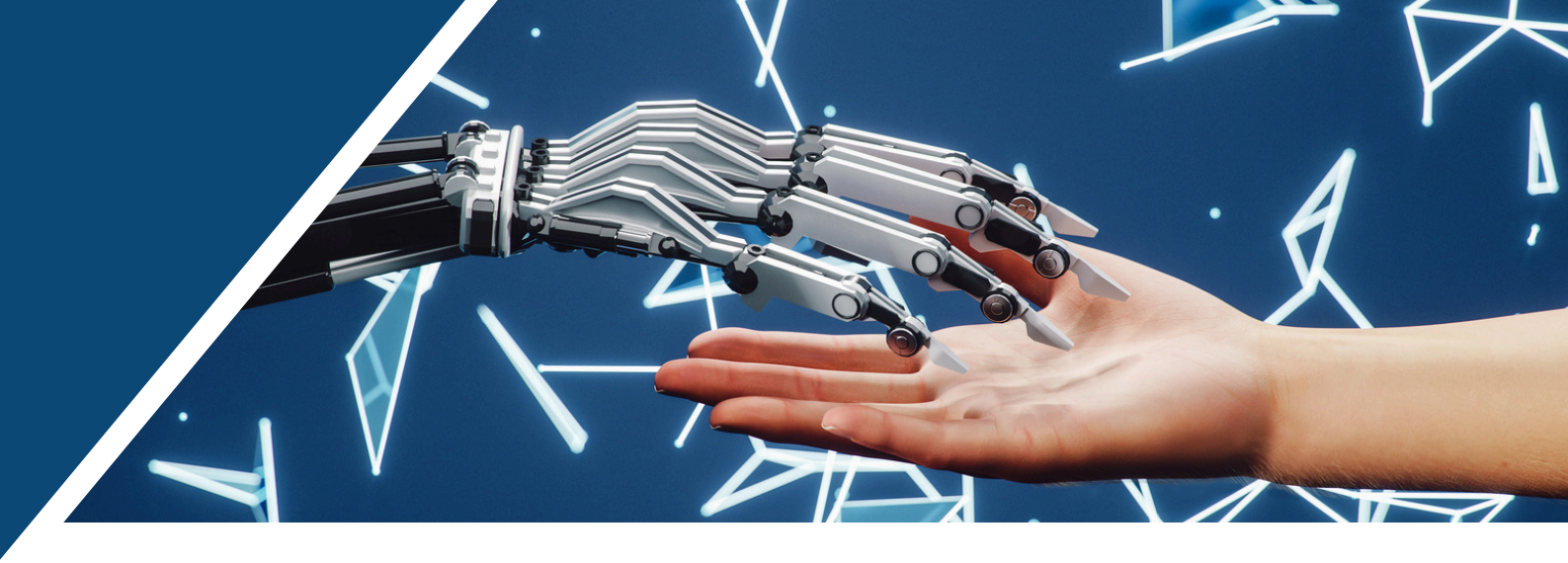
Abstract

The surge in research on masked face recognition highlights the need for more accurate and efficient systems as wearing masks has become routine after the COVID-19 pandemic. Despite CNN's success in computer vision and image processing tasks, it may still have weaknesses in recognizing masked faces. However, traditional machine learning techniques are commonly used to classify occluded face images which make their integration into the classification stage of CNN highly significant. Therefore, this paper aims to study on optimizing masked face recognition by integrating different classifiers with tailored CNN. Multiple different traditional machine learning techniques including SVM with RBF and linear kernel, k-NN, RF, MLP, GNB and QDA act as classifier and incorporate with the tailored CNN model. The result of the experiment shows that all the survey traditional machine learning techniques fit well with each other. Among of them, the tailored CNN + k-NN method can recognise masked face images of both LFW-SMFRD and RMFRD by providing an outstanding performance that reaches 92.98% and 96.71% accuracy respectively.

Keywords

Masked Face Recognition, Tailored CNN, Deep Learning, Classifier, Machine Learning



Force Control and Slip Detection for aNon-backdrivable Robotic Gripper

Joseph Joshy, Bijo Sebastian, Asokan Thondiyath
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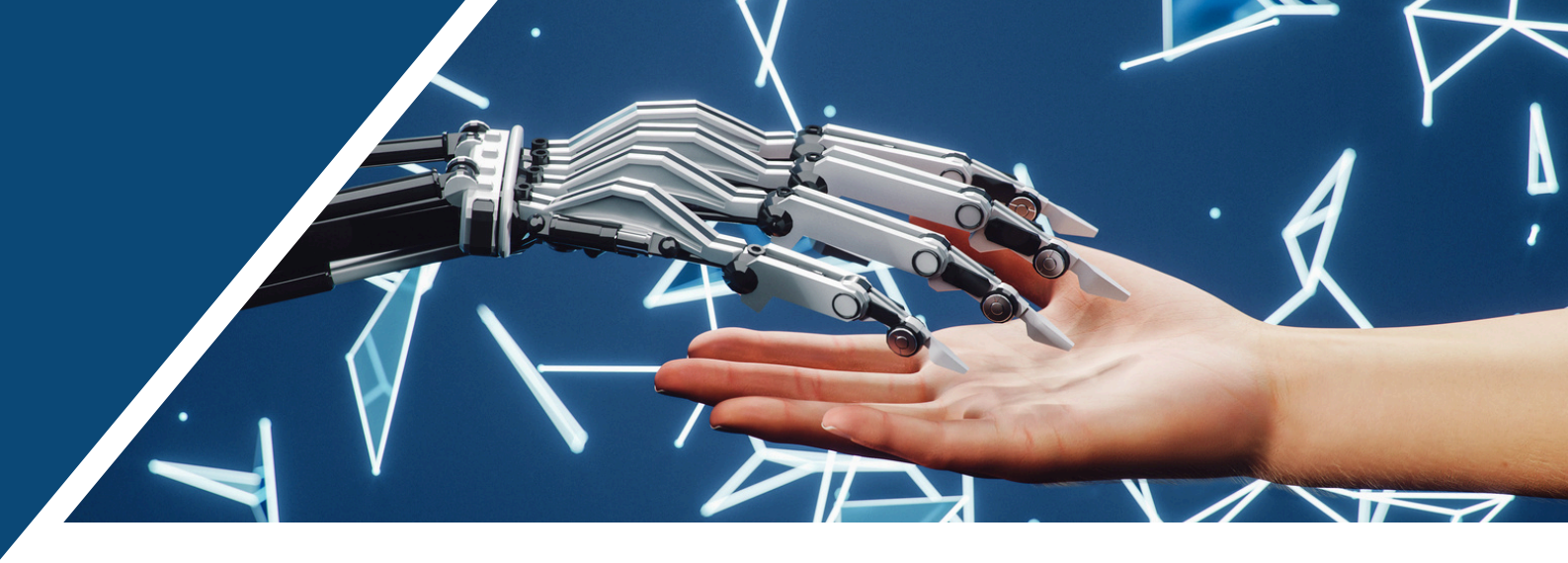
Abstract

Intelligent manipulation systems are now being used to automate various operations, including material handling, advanced manufacturing, food processing, chemical, and medical analysis. Stable grasping is one of the crucial capabilities needed for effective use of intelligent manipulation systems in above applications. High-fidelity force control is needed when grasping objects of different shapes, weights, and stiffness. Existing robotic grippers with large payload capacity are typically nonbackdrivable. Although these systems can limit the maximum grasp force applied to an object through current control, highfidelity force control is not possible at the individual finger level. To this extent, we propose a novel force control framework that takes feedback from Force Sensitive Resistors (FSRs) mounted with deformable pads on each finger of the robotic gripper. The proposed system allows for precise force control, as well as slip detection and counter action, resulting in a stable grasp, even when the object weight is unknown. While this work demonstrates implementation of the proposed techniques on a three-finger Robotiq gripper, they could be applied on any generic robotic gripper with backdrivable or non-backdrivable actuation system.

Keywords

Robotic Gripper, Force Control, Force Sensing Resistor, Pick-and-place Tasks, Slip Detection



Exploring MCMC Guided GAN and Comparative Analysis for Uneven Class Distribution

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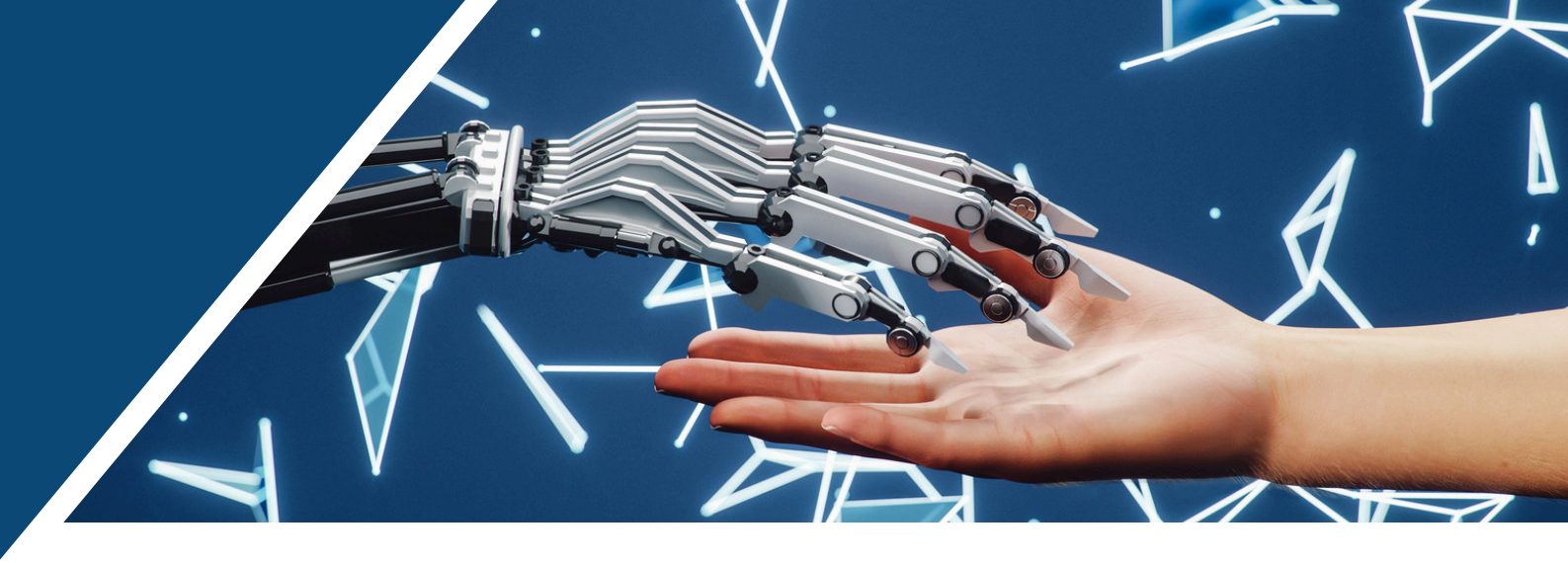
Abstract

Uneven class distribution in data sets poses a significant challenge in the classification model which causes the sub-optimal performance and a biased model towards the majority class. This paper investigates the sampling method of Generative Adversarial Network (GAN) on a Bayesian Framework utilizing Markov Chain Monte Carlo (MCMC) to enhance the sampling. MCMC is employed to explore the solution space effectively, while GAN generates synthetic samples to balance the class distribution. The integration of these two techniques aims to enhance the model's robustness and generalization capabilities. Experimental results demonstrate potential improvements in classification accuracy, highlighting the potential of the proposed method in handling uneven class distribution that is MCMC Guided GAN. This method along with other methods including Synthetic Minority Over-sampling Technique (SMOTE), Smotified-GAN, GAN and MCMC. The promising results obtained highlight the potential of the MCMC Guided GAN method as a valuable tool in addressing the challenges associated with imbalanced datasets. This research contributes to the advancement of techniques for more effective and equitable classification models.

Keywords

Generative Adversarial Network (GAN), Imbalanced Class Problem, Markov Chain Monte Carlo (MCMC), Bayesian Framework



A Combined Distance Metric Approach with Weight Adjustment for Improving Mixed Data Clustering Quality

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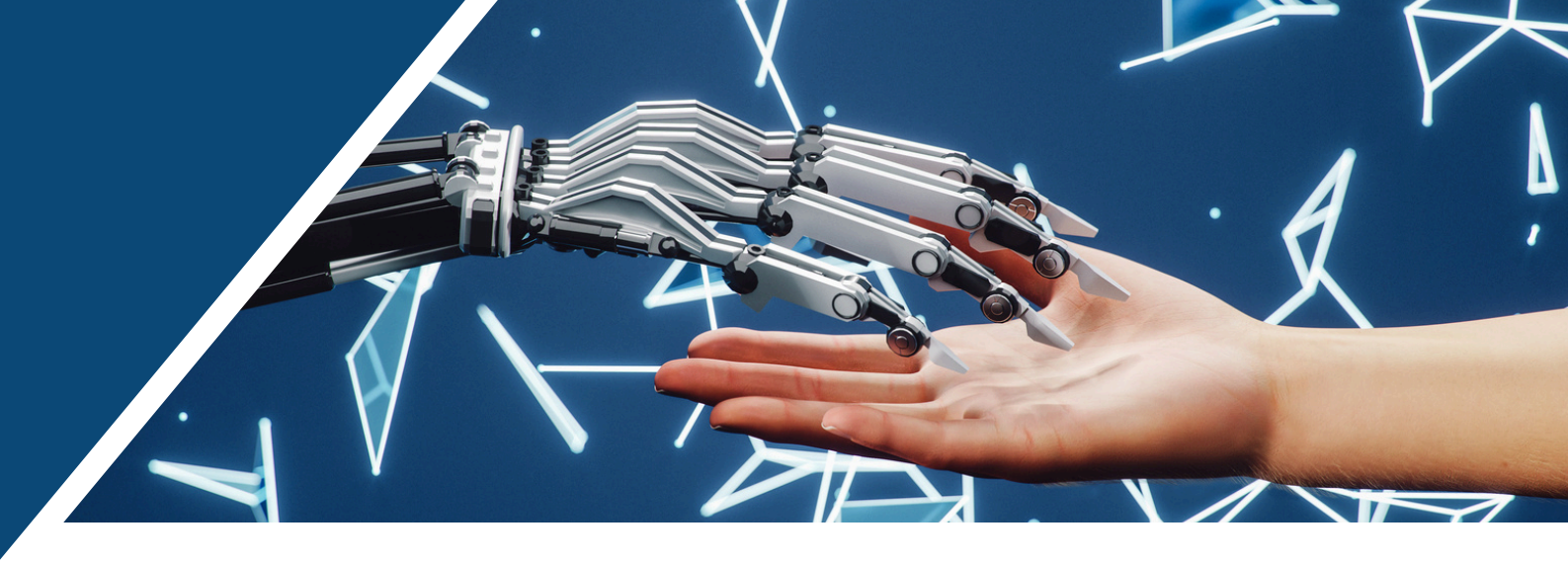
Abstract

Cluster analysis can be perceived as a problem of grouping data points according to their mutual similarity. Clustering quality largely depends on choosing an effective distance metric, especially when dealing with mixed data that contains both numerical and categorical features. This study introduces a Weighted Combined distance metric using Gower and sqrt-cosine distances to improve clustering quality for mixed data. By combining two individual distance metrics with weights, this unique technique generates an overall similarity score that can improve the clustering quality. Experiments have demonstrated that the Weighted Combined distance metric can yield superior clustering quality compared to individual distance metrics. These findings highlight the potential of this proposed method to effectively cluster mixed data and overcome challenges associated with mixed data clustering.

Keywords

Distance Metrics, Mixed Data, Hierarchical Clustering, Unsupervised Learning



Spam Review Detection in E-commerce Using Machine Learning

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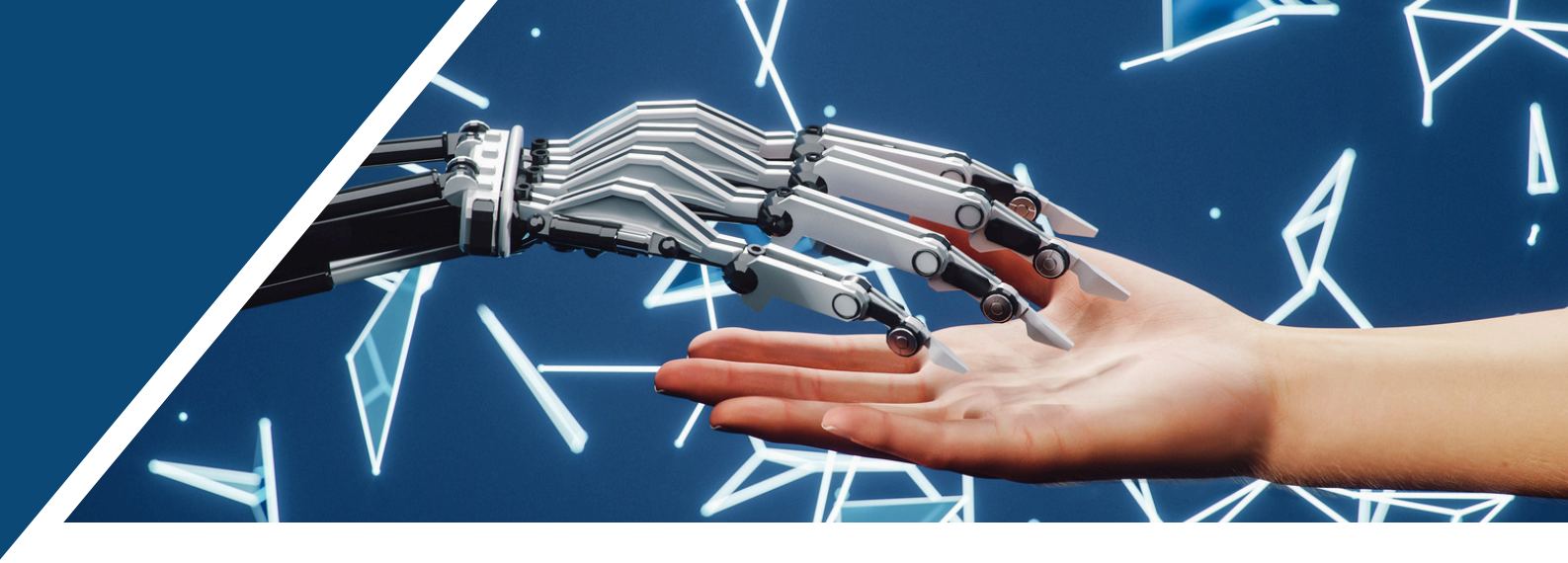
Institute for Pathology, Laboratory and Forensic Medicine, University Teknologi MARA, Sungai Buloh, Selangor, Malaysia

Abstract

Reviews pose a significant challenge for ecommerce platforms that rely on online reviews to attract customers. The reviews may contain spam that resembles actual genuine reviews while current spam detection methods lack integration of linguistic and behavioural features. In this study, we propose a machine learning-based approach for detecting spam reviews using classification techniques. We explore various feature extraction methods, including n-grams and sentiment analysis, to represent the textual content of reviews. We evaluate the performance of three classifiers, including Support Vector Machines (SVM), Random Forest, and Naive Bayes, on a dataset of Shopee reviews. Our results show that SVM performs the best in terms of accuracy, precision, and recall, achieving an F1-score of 0.96. We also investigate the impact of different feature extraction methods on classification performance and find that sentiment analysis provides valuable information for detecting spam reviews. Our approach offers a promising solution for automatically identifying spam reviews, which can help e-commerce to maintain the integrity of their online reputation and enhance customer trust.

Keywords

Spam Detection, Spam Review, Machine Learning, E-commerce



Comparative SHAP Analysis on SVM and K-NN: Impacts of Hyperparameter Tuning on Model Explainability

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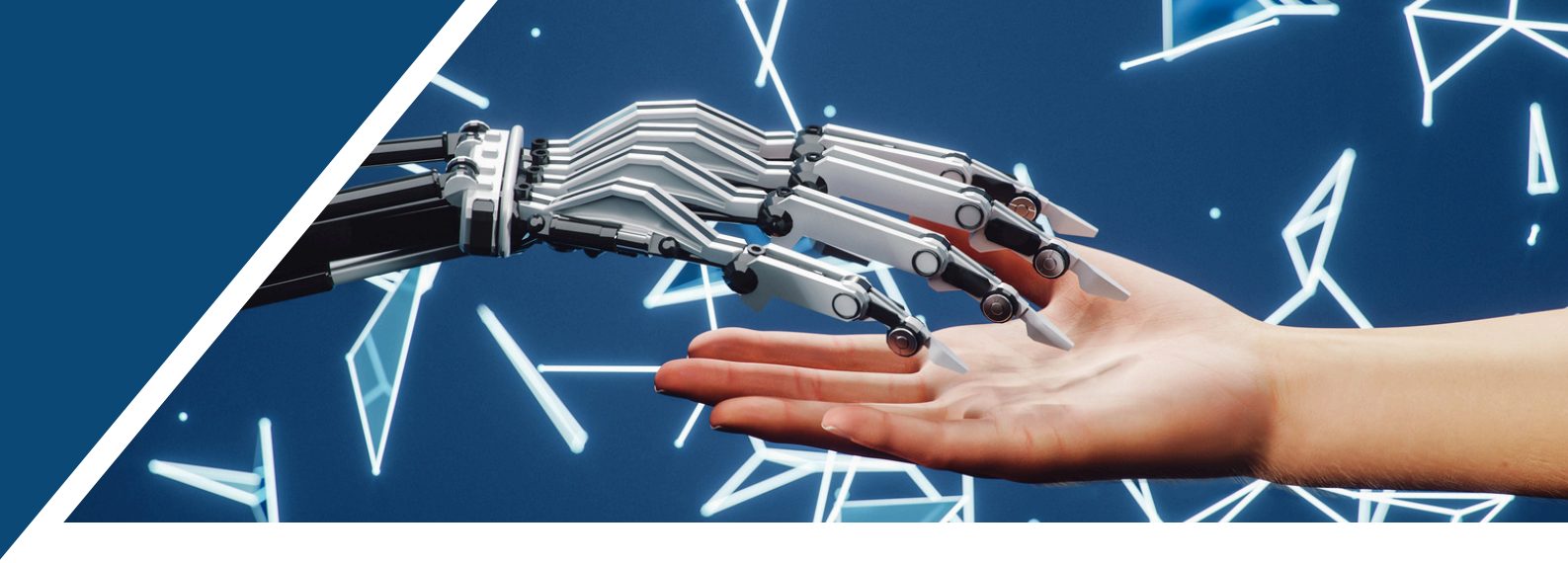
Abstract
Exploring the interpretability of machine learning models is important for establishing trust and facilitating their adoption in practical applications. This study utilizes the Shapley Additive Explanations (SHAP) framework to conduct a comparative analysis of the explainability of Support Vector Machines (SVM) and K-Nearest Neighbors (KNN) models. It focuses on how hyperparameters tuning affects these models. A case study on customer churn within the ecommerce sector, involving data from 5,630 customers and 20 descriptive features, demonstrates the impact of fine-tuning on model accuracy and feature importance. The results show significant improvements in accuracy after tuning, with SVM improving from an accuracy of 88.8987% before tuning to 94.1385% post-tuning. K-NN also showed enhanced performance, with accuracy increasing from 84.8135% to 92.7176% after tuning. The SHAP analysis reveals that while all models initially identify the same feature as the most important, subsequent shifts in the importance of other features underscore the distinct characteristics of each algorithm in predictive performance.

Keywords
Supervised Learning, Hyperparameters Tuning, Feature Analysis, K-NN, SVM, SHAP Analysis



Real-time Acoustic Based Anomaly Detection of Composite Specimen Using Convolutional Autoencoder

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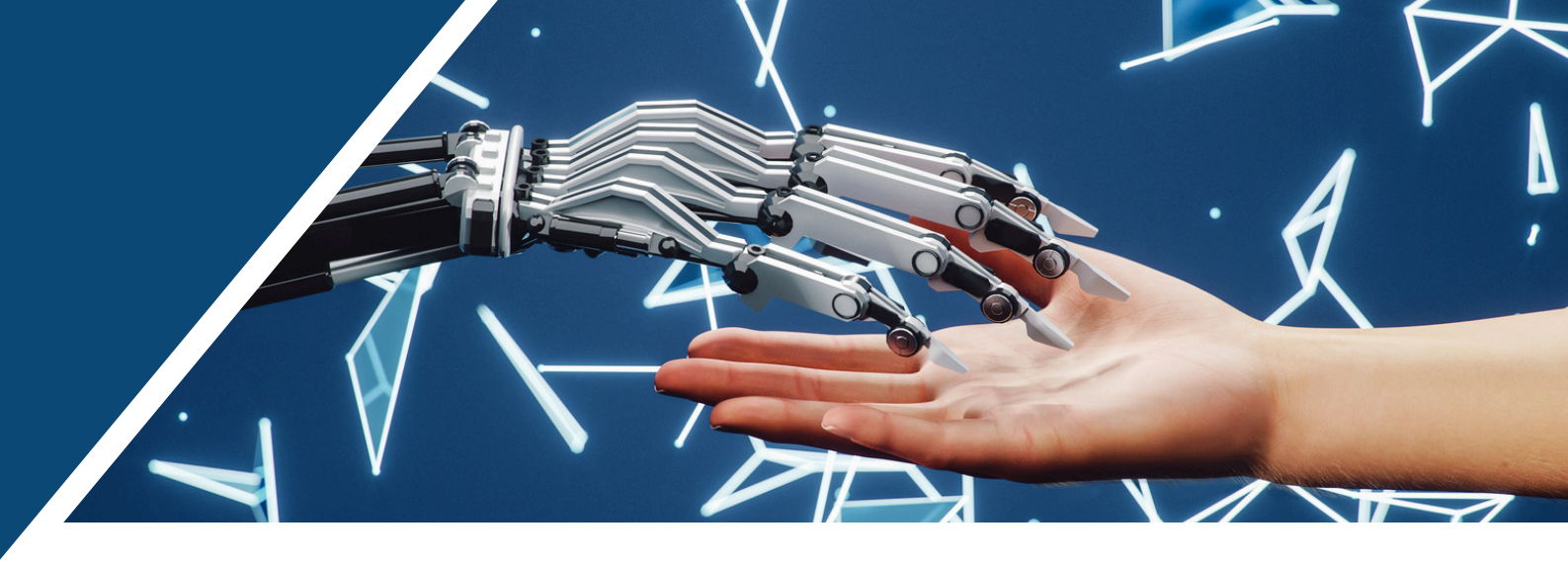
Abstract

The introduction of composite structures provides many benefits to the aerospace industry. However, composite structures are also prone to delamination, matrix crack and fiber matrix debonding. There have been several tools developed to detect the defects that are present in the composite structure. As more data is made available, better technology can be applied to develop better tools to improve accuracy and productivity during maintenance, repair, and overhaul. This paper proposes utilizing an automated tap testing system using a Convolutional Neural Network with nonlinear dimensionality reduction in the anomaly detection task. The author utilizes the Convolutional Autoencoder (CAE) on a single class of data representing a healthy composite specimen before testing it on defected parts that represent anomalous data. The accuracy and sensitivity of this model are measured and compared using the Structure Similarity Index (SSIM) and the Mean Squared Error (MSE) between the input data and the reconstructed output data. This paper demonstrates that automated tap testing can detect subtle anomalies coming from the defected specimen with a detection rate of as high as 91% with less than a second of real-time processing procedure.

Keywords

Convolutional Autoencoder, Anomaly Detection, One Class Classifier, Composite Specimen



Improved FBVANET Based on Hierarchical Stability Rate

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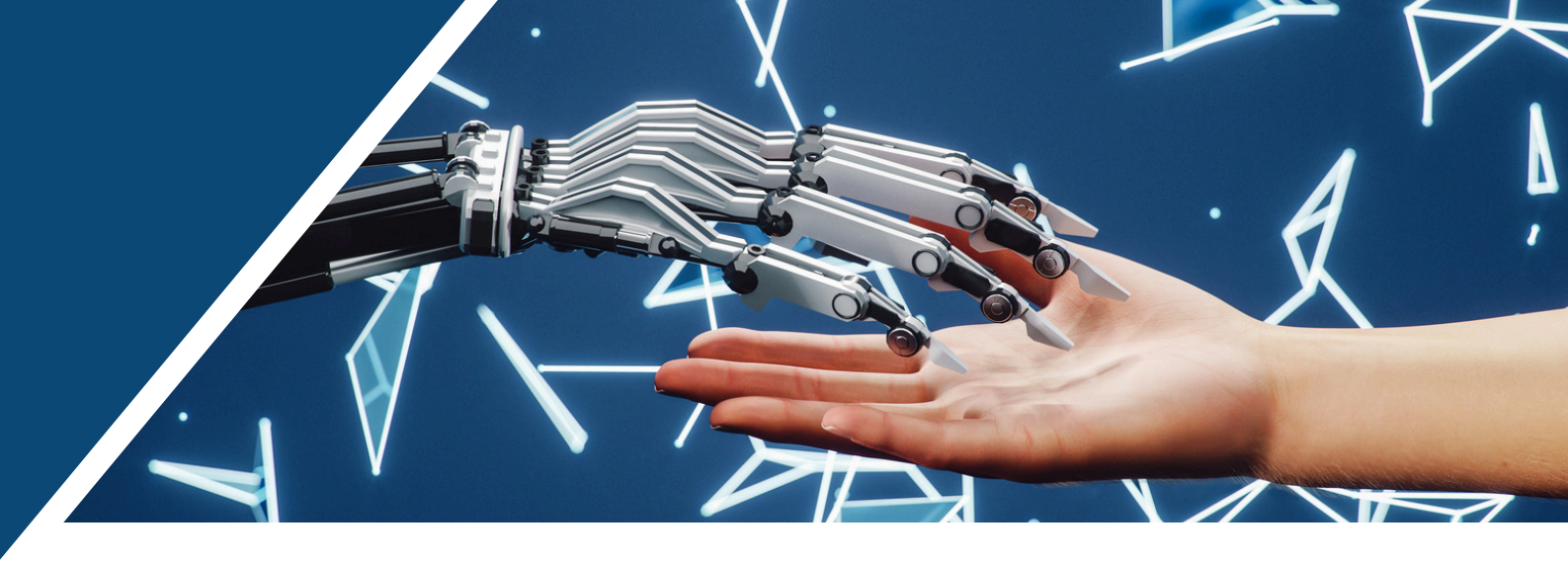
Abstract

A mobile wireless sensor network works such as those used in vehicle ad hoc networks differs from a static wireless sensor network in that the nodes are not affix to one singular location but can traverse within the set range within the network. This dynamically changing network topology poses a challenge where the connections between network nodes are not constant and thus require a more sophisticated approach in ensuring constant communication uptime within the network. Fuzzy Logic Based Vehicle Ad Hoc Network (FBVANET) proposes using fuzzy logic to measure arbitrary values instead of Boolean values to determine the best route for data packet transmission based on link stability rate between nodes. This approach however creates a bottleneck problem in the network as the ideal routes will be the ones with the highest stability rate. The preliminary study on the Improved FBVANET Based on Hierarchical Stability Rate proposes routing data traffic through these stable links based on hierarchical stability rate, where if a network congestion occurs on the link with the highest stability rate, the network will open an alternate path based on the second highest, then third, and so on until the network congestion recedes, where it will then close off the alternate routing paths from least stable to most stable link. Comparison studies conducted shows a positive improvement to the overall throughput of a network when introduced with a network congestion system, in turn supporting the hypothesis. In conclusion, a network congestion system based on hierarchical stability rate can provide a major boost to the FBVANET's overall throughput and performance with reduced packet loss incidences.

Keywords

Wireless Sensor Networks, Fuzzy Logic, Routing Protocols, Network Throughput



Identification of Urban Sounds with Haptic Feedback Using Raspberry Pi and LSTM-SVM

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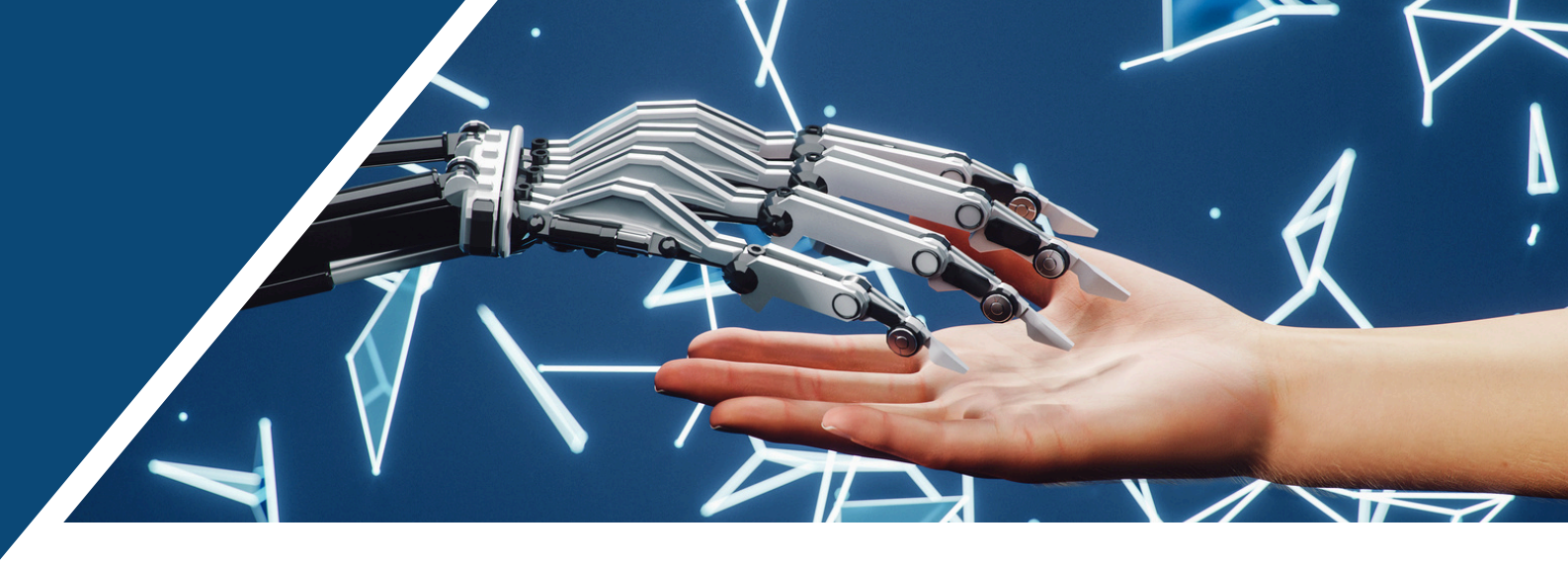
Abstract

Sound is a physical phenomenon in the form of vibration that contains information. This information is perceived by humans using auditory senses to contextualize their surrounding environment. There are different kinds of sound in which several studies utilized image processing as key feature information, such as spectrogram and MFCC, to classify them using deep learning or machine learning. This study focuses on non-image audio features to classify 5 different audio categories, namely, siren, bike bell, scream, car engine, and street music. The study focuses on the LSTM's ability to contextualize temporal data and SVM's overall ability to generalize information. With LSTM and SVM, the study was able to use Raspberry Pi 4B to run the model and display the prediction on LCD Display, utilizing microphone as the input, and vibration module as a haptic feedback output. The LSTMSVM model produced from this study was able to output an 84.80% accuracy where the SVM is supported by the activated neurons of LSTM.

Keywords

Urban Sound, LSTM, SVM, Audio Feature Extraction, Audio Classification, SVM Multiclass Classification



Score Function Design for Decision Making Using Conditional Kullback-Leibler Divergence

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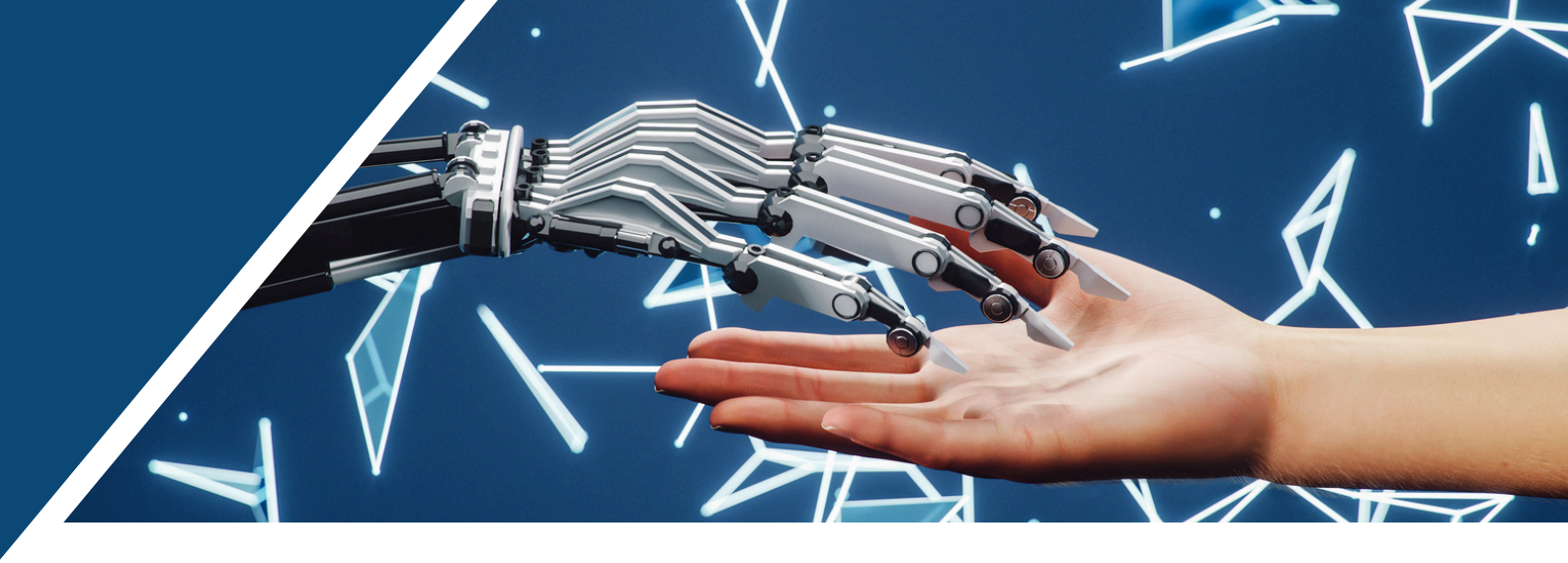
College of General Education, Kookmin University, Seoul, Korea

Abstract
This study processes a more discriminative score function or decision measure to address current decision outcomes. Drawing from the information theory, the Kullback-Leibler(KL) divergence is enhanced with additional knowledge; specifically conditional KL divergence. A modified KL divergence is introduced alongside Bayesian theory to inform decision making. The effectiveness of the proposed score function is validated through two examples: the Korean election and car sales problem involving multi-criteria decision-making. Computational examples demonstrate that the proposed score function yields favourable results compared to existing methodologies

Keywords
Decision Making, Relative Entropy, KL-Divergence, Information Theory



Ripeness Classification of Lycopersicon Esculentum Employing Faster Region-based Convolutional Neural Network with Inception Version 2

Shane Patrick A. Panilag, Jamie Eduardo C. Rosal, Apple Joy R. Tamayo, Juvy Amor M. Galindo, Cesar A. Tecson
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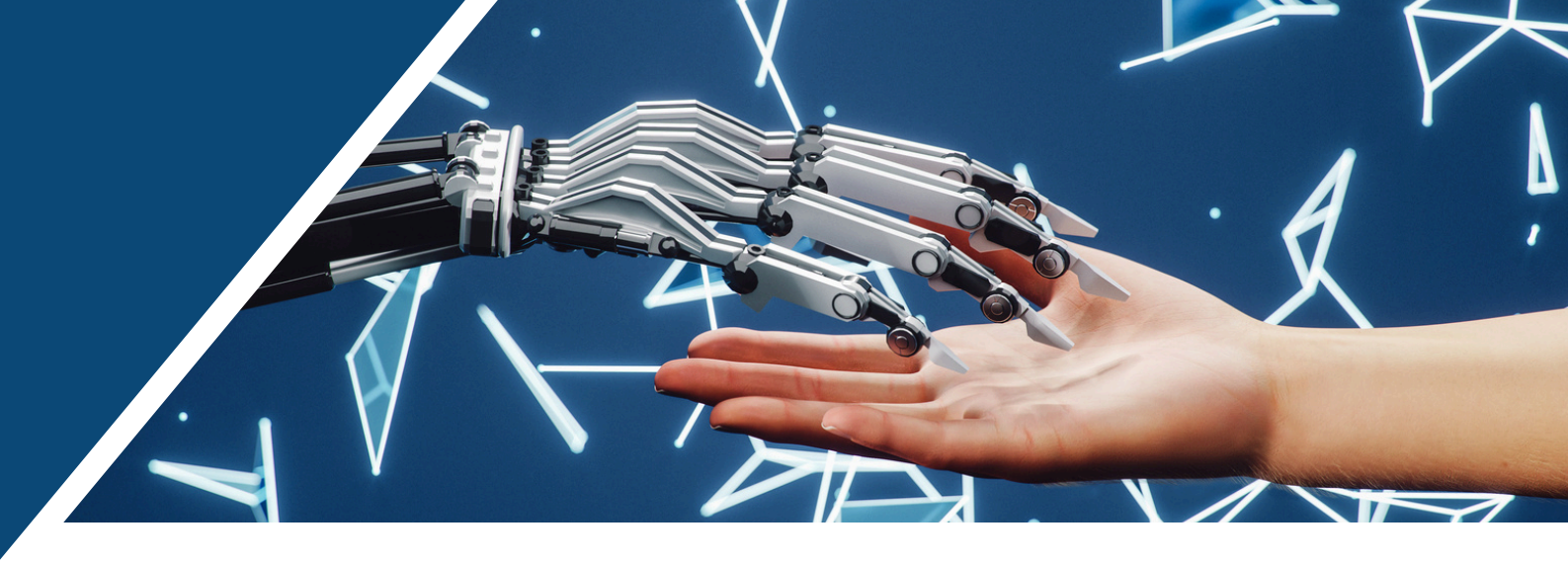
Abstract

Accurate determination of tomato ripeness is essential for their marketability and consumer acceptance. In this study, the use of Convolutional Neural Networks for Object Detection particularly the Faster Region-Based Convolutional Inception v2 Architecture neural networks was explored for the detection and classification of tomato ripeness into three categories: Mature Green Tomato, Breaker Tomato, and Red Tomato. The researchers collected and preprocessed a dataset of tomato images, then the model was trained and evaluated using various detection and classification metrics. It demonstrated an accuracy of 78.57% for Mature Green, 88.37% for Breaker Tomato, and 100.00% for Red Tomato. In summary, the model performs well on test datasets with an accuracy percentage of 89.06%. The outcomes indicate how well the method works for precisely detecting and classifying tomato ripeness, with potential applications in commercial tomato production.

Keywords

Tomato Ripeness, Object Detection, Faster Region-based Convolutional Neural Network, Machine Learning, Image Processing



Depression Detection Using BERT on Social Media Platforms

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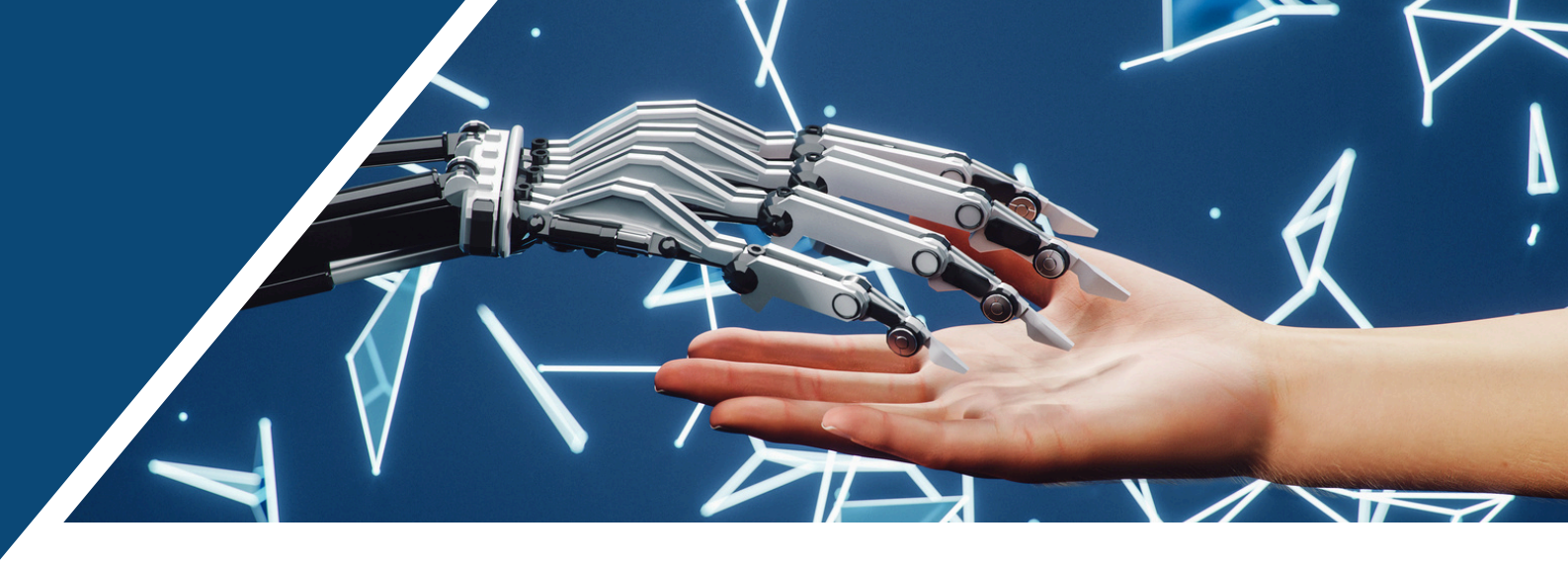
School of Information Technology, Engineering, Mathematics and Physics (STEMP), The University of the South Pacific, Suva, Fiji

Abstract

Depression detection from social media has attracted significant attention for its potential to offer early intervention and support to individuals facing mental health issues. In this study, we present a comprehensive evaluation of deep learning techniques for depression detection, with a specific focus on leveraging BERT, a powerful Natural Language Processing (NLP) Transformer model. Our exploration encompasses tailored preprocessing techniques for social media text, diverse feature extraction methods, and optimized model architectures tailored for depression detection tasks using BERT. Through rigorous experimentation and evaluation, we compare the performance of different BERT-based strategies, considering metrics such as accuracy, efficiency, and scalability. Additionally, we conduct a comparative analysis of labeled and unlabeled data from the same dataset. For labeled data, we employ BERT directly, while for unlabeled data, an autoencoder is utilized following label removal. The findings indicate that BERT outperformed other methods, achieving a high F1-score of 93% on the Reddit dataset. BERT achieved an impressive test accuracy of 91.92%, surpassing the Autoencoder model, which attained 84.84%.

Keywords

Depression Detection, BERT, Social Media, NLP Transformer, Mental Health



DeepExtract: Neural Networks Based Image Keypoints Extraction for Indirect SLAM Algorithms

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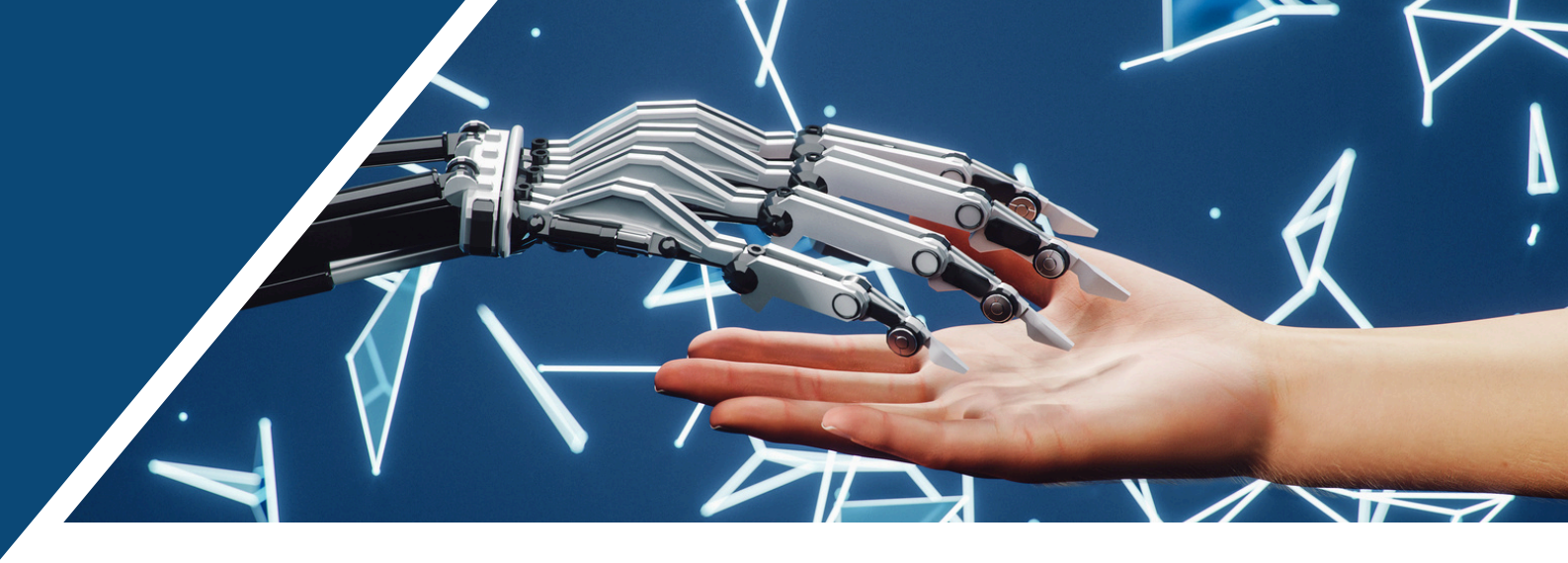
Robotics and Artificial Intelligence, DRDO, Pune, Maharashtra
School of Mechanical Engineering, COEP Technological University, Pune, Maharashtra

Abstract

Indirect SLAM (Simultaneous Localization and Mapping) algorithms primarily rely upon image features to estimate poses and to perform loop closure. Traditional image key point extraction algorithms fail to detect features in the image in some cases due to various reasons like low exposure, lack of contours and hardware constraints. To tackle this issue, we propose a U-Net neural network based image keypoint extraction algorithm that works on low cost camera hardware. We utilize an unconventional approach by applying image segmentation techniques to extract Shi-Tomashi features for training the neural network. It is an attempt to building innovative approaches for Deep learning-based visual odometry problem. The primary focus of this work is to establish a new research direction for deep learning based keypoint extraction tailored for real-time SLAM on low-cost and low-power devices. We aim to lay the foundations for further investigation into segmentation-based key-point modeling and its impact on critical SLAM components like feature tracking, mapping, and loop closure detection.

Keywords

Feature Extraction, Deep Learning, SLAM, Image Segmentation



A Motion Capture Quality Comparison Between Rokoko and Kinect

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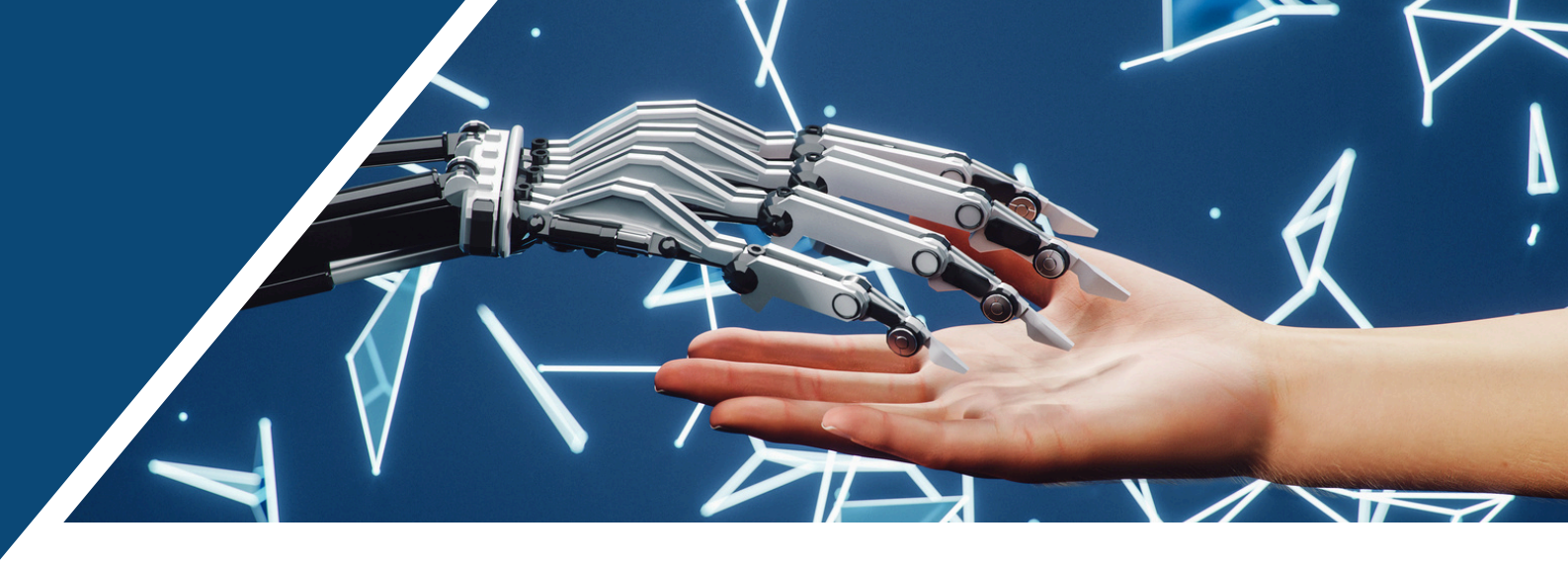
Abstract
In human machine interaction tasks, the quality of motion capture plays a critical role. Rokoko Motion Capture System (Rokoko) is a relatively economic motion capture device and has been utilized in various areas of motion-related research. In this study, we test the representative ability of the products captured by Rokoko and Microsoft Kinect v2 (Kinect). Three non-professional actors wore the Rokoko to do three kinds of activities: walking with normal velocity, jumping with vertical acceleration and rotation, by displaying different body functions. Motion data were recorded using these two devices simultaneously. We compared the pros and cons of the results of the captured motions by these two devices and provide suggestions and precautions using Rokoko Smartsuit Pro for motion capture activities for researchers.

Keywords
Human Machine Interaction, Kinect, Motion Capture, Rokoko



SPECTRUM: A Multi-Component Pipeline for High-Quality Image Synthesis

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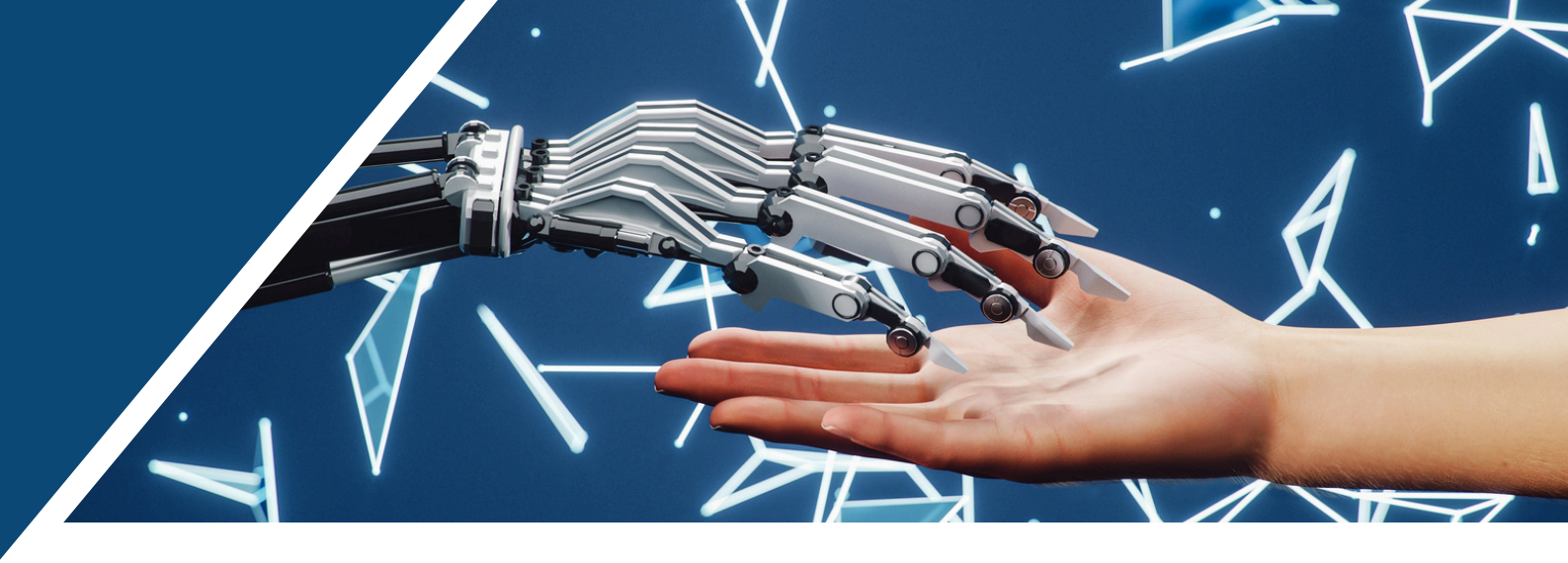
Artificial Intelligence and Machine Learning, Acharya Institute of Technology, Bengaluru, India

Abstract

This research paper introduces a novel pipeline for image generation and enhancement, integrating advanced techniques from stable diffusion and deep neural network (DNN) super-resolution. The pipeline consists of three key components: Stable Diffusion v1.5, Stable Diffusion XL Refiner 1.0, and ESPCN (Enhanced Sub-Pixel Convolutional Network). Stable Diffusion v1.5 serves as the foundation for text-to-image generation, utilizing the innovative approaches of Self Attention Guidance (SAG) and Classifier-Free Guidance (CFG). CFG directs the model's output fidelity towards the provided prompt, ensuring faithful image generation. Meanwhile, SAG leverages internal self-attention maps to iteratively refine image details, resulting in higher-quality outputs. The Stable Diffusion XL Refiner 1.0 component enhances previously generated images, affording control over the influence of prior images on refinement. By adjusting this influence, users can tailor the refinement process to either maintain consistency with the previous image or explore new visual possibilities. ESPCN, a Deep Neural Network Upscaler embedded within OpenCV, completes the pipeline by upscaling the generated image by a factor of two. Its compact design enables real-time operations, making it suitable for various applications. Through comprehensive experimentation and evaluation, this pipeline demonstrates remarkable capabilities in generating highquality images from textual prompts and refining them to achieve desired visual outcomes. The integration of stable diffusion techniques with DNN super-resolution presents a promising avenue for advancing image generation and enhancement methodologies

Keywords

Stable Diffusion, Deep Neural Network (DNN), Text-to-image Generation, Super-resolution, Image Enhancement



Real-Time Recognition of Malagasy Banknotes (Ariary)

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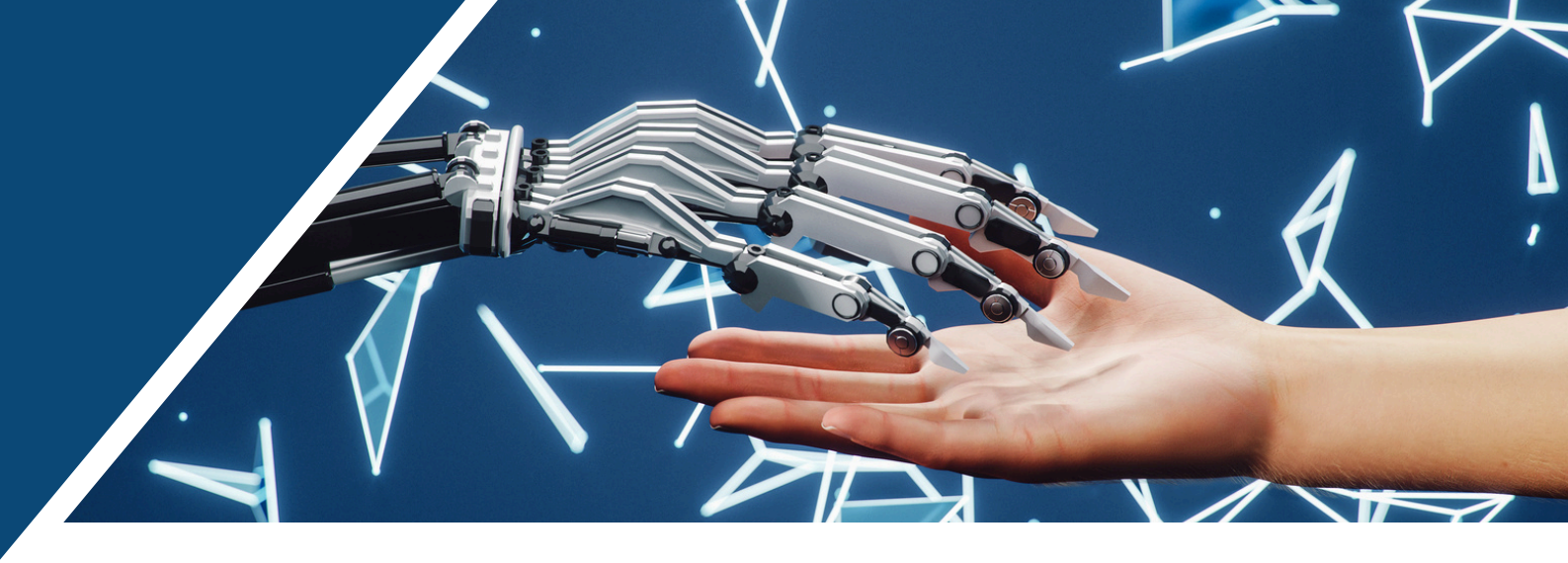
Laboratory of Computer Science and Mathematics Applied to Development (LIMAD), University of Fianarantsoa, Fianarantsoa, Madagascar

Abstract

The research work focuses on real-time recognition of Malagasy banknotes, aiming to introduce a significant innovation that will contribute to the country's development, particularly in the financial and economic sectors, both nationally and internationally. The main objective is to establish an automatic system for recognizing Malagasy banknotes for future use in various devices, such as ATMs (Automated Teller Machines) and mobile devices for visually impaired individuals. The study begins with a thorough analysis of various real-time object recognition models, such as Faster R-CNN (Faster Region-based Convolutional Neural Network), SSD (Single Shot MultiBox Detector), and YOLO (You Only Look Once), which are widely used in the fields of computer vision and deep learning. After evaluation, the choice is made to utilize transfer learning with Yolov8 due to its superior performance and ability to accurately detect objects, including small ones. To enhance the model's performance, adjustments are made to the hyperparameters of the pretrained model, as well as improvements in data preprocessing. This includes adding padding to standardize the image size while preserving their original features, as well as instance normalization to eliminate biases among different classes of banknotes, especially in real- world conditions. The model evaluation is initially conducted on Android mobile phones to simulate practical usage conditions. The results demonstrate that the preprocessing improvements have significantly enhanced the model's ability and stability to instantly identify each denomination of Malagasy banknotes. In conclusion, this research work has led to the development of a real-time Malagasy banknote recognition system based on the Yolov8 model, which instantly identifies each denomination of Malagasy banknotes from the mobile phone camera, providing an effective solution for financial operations in Madagascar while ensuring inclusive access to monetary services for visually impaired individuals. For future steps, extending recognition to other currencies, integrating additional features for visually impaired individuals, counterfeit detection, and integration into various devices using banknotes in daily transactions are envisaged.

Keywords

Real-time Recognition, Malagasy Banknotes, YOLOv8, Transfer Learning, Preprocessing Enhancement



Machine Learning Approach for Early Diagnosis of Alzheimer's Disease Using rs-fMRI and Metaheuristic Optimization with Functional Connectivity Matrices

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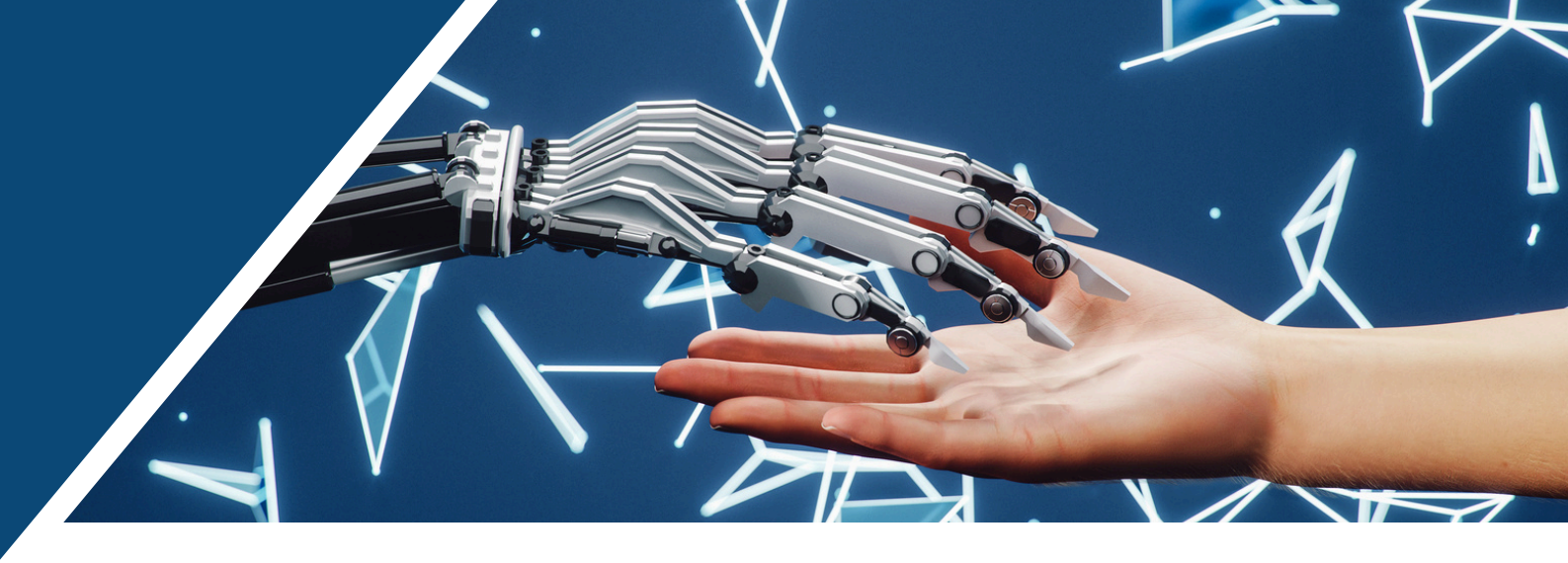
Department of Biomedical Engineering, Zonguldak Bülent Ecevit University, Zonguldak, Turkey

Abstract
Alzheimer's disease is a cognitive disease that occurs with memory loss and usually occurs in older ages. Nowadays, considering that the risk of Alzheimer's increases every year as the life expectancy of the individual increases and has become a global problem, the importance of early detection of Alzheimer's disease is emphasized. This study uses brain connectivity matrices with informative features obtained from resting state functional MRI (rs-fMRI) data as features for early and effective diagnosis of Alzheimer's. Feature selection is performed using SMA and PSO algorithms, both of which create a machine learning model using optimization algorithms for Alzheimer's diagnosis. Among the two different models, the SMA-based model achieved approximately 92% success in diagnosing Alzheimer's disease with an average of 104 features. This revealed that the proposed method has good potential.

Keywords
Alzheimer, rs-fMRI, Connectivity Matrices, Optimization, Machine Learning



Bengali Speech Sentiment Analysis Using Machine Learning Models: A Comparative Study

Mohammad Tanveer Shams, Md. Akib Hasan, Animesh Das Chowdhury, Tabassum Jahan Lamia, Md. Reasad Zaman Chowdhury, Mohammad Marufur Rahman
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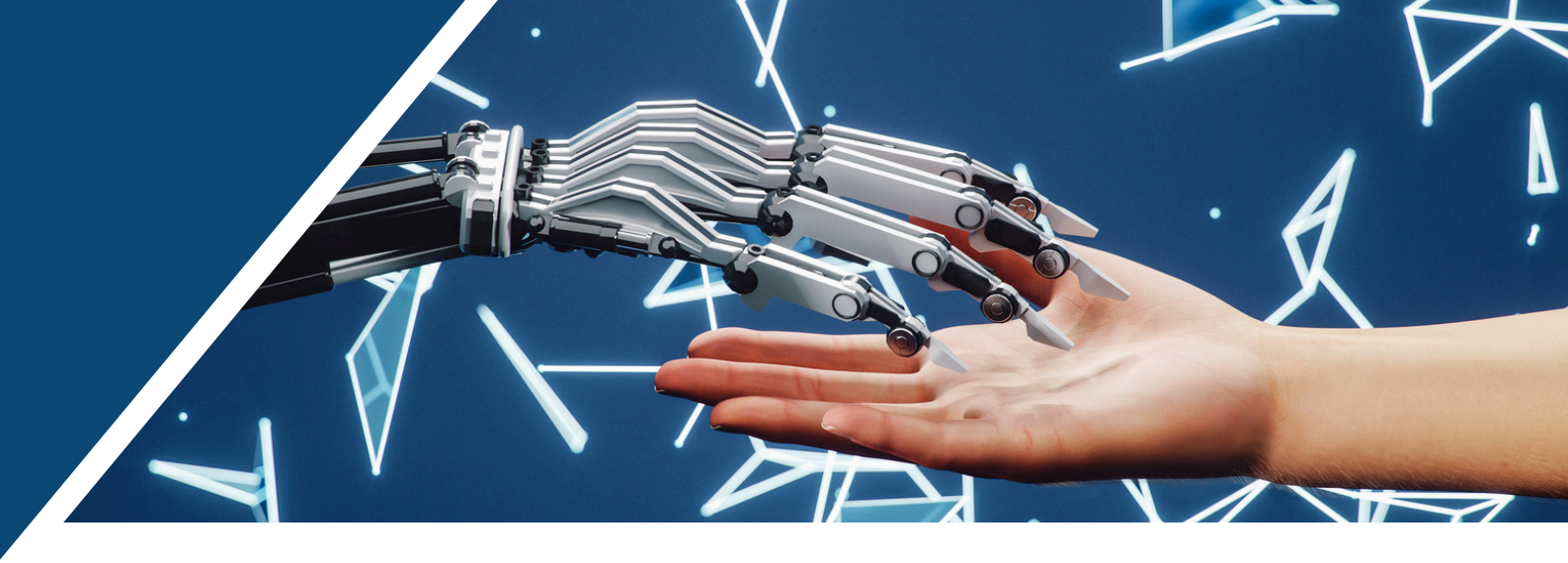
Abstract
Though scholars find speech sentiment analysis based on audio data to be a very intriguing study topic, not enough work has been done for the fifth most spoken language in the world, Bangla. The purpose of this study is to close this research gap. SUBESCO, BanslaSER, and KBES combined dataset were utilized in this study's evaluation of all the models. Evaluations have been done on CNN models, ML models, and sequence models like LSTM and BI-LSTM. Mel-frequency spectrum was exploited by CNN models, while machine learning and sequence models were applied to numerical features. DenseNet201 achieved the finest accuracy of all the models, at 94%. Finally, utilizing both hard and soft voting, all of the models based on numerical features and spectrogram features were ensembled, yielding accuracy rates of 94.99% for numerical features and 95% for spectrogram features.

Keywords
SSA, SUBESCO, BanslaSER, KBES, CNN, ML, Sequence Model, Spectrogram, MFCC, Ensemble



Deep Learning-Based Intelligent X-bar Control Chart for Monitoring Manufacturing Process

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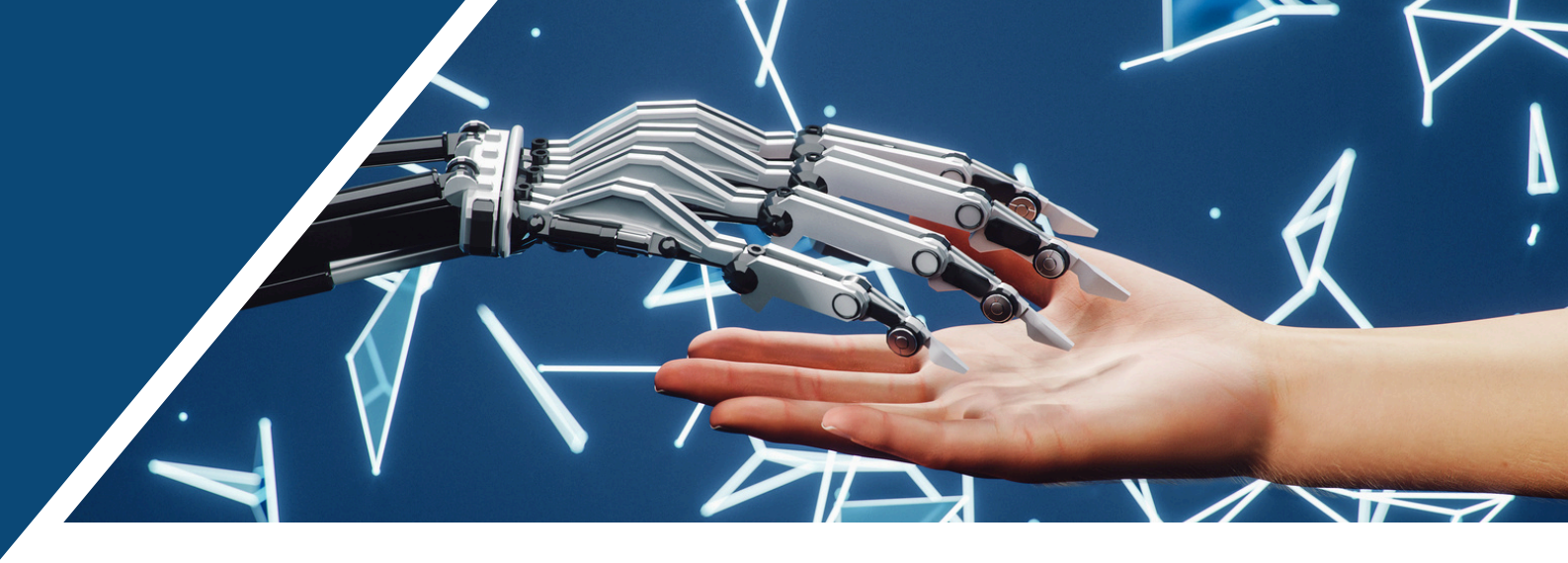
Intelligent Automation and BioMedGenomics Laboratory, Faculty of Sciences and Technique of Tangier, Tangier, Morocco

Abstract

The X-bar control chart is a statistical tool widely employed in manufacturing to detect irregularities in product quality and machine deviation over time. This chart helps ascertain whether a process is statistically under control by establishing upper and lower limits derived from the probability distribution of the quality characteristic. However, traditional control chart methods have limitations, particularly in identifying anomalies beyond predefined patterns. The current study explores the application of deep learning methods to enhance the predictiveness of X-bar control charts. Initially, Long Short-Term Memory (LSTM) and Bidirectional Long Short-Term Memory (Bi-LSTM) models are utilized to forecast X-bar values in statistical process control. Subsequently, a case study is conducted by applying the trained models to the injection molding process, focusing particularly on the Cushion melt parameter, a critical aspect of the injection process. The models are trained and fine-tuned by adjusting various hyperparameters such as optimizer type, number of layers, and number of cell units. The LSTM model achieves an R-squared value of 0.739, Mean Squared Error (MSE) of 0.0043, and Mean Absolute Error (MAE) of 0.0507, while the Bi-LSTM model shows slightly lower performance with an R-squared of 0.702, MSE of 0.048, and MAE of 0.501. These outcomes can be utilized in control charts to predict quality status, thereby enhancing anomaly detection in the injection molding process.

Keywords

X-bar, LSTM, Bi-LSTM, Injection Molding Process



Comparative Study of Region Based Approaches to Road Image Classification of National Highways of Bangladesh Using Deep Learning Models

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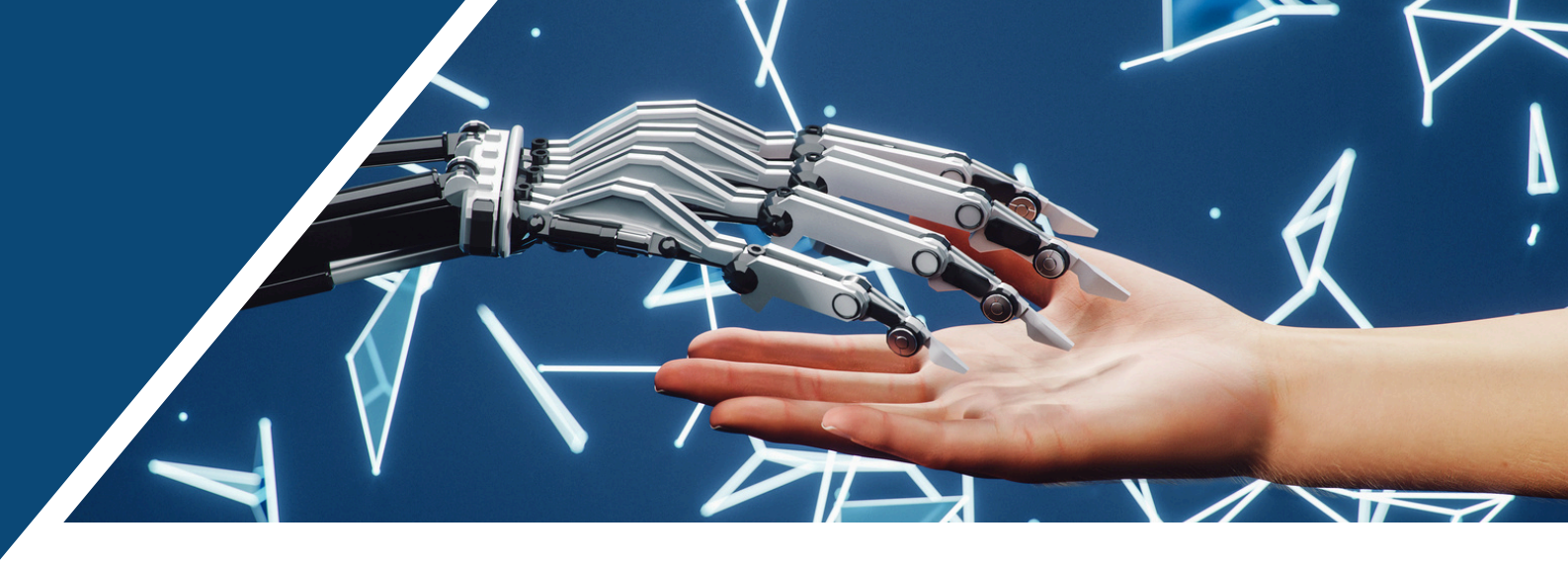
Abstract

A country's infrastructure must have roads, especially in emerging nations like Bangladesh. The research centers on national roads, which play a crucial role in the nation's economic growth by linking important cities, ports, and industrial centers. Although these routes have a strategic purpose, it is clear from the sizeable funding that the Road and Highway Division (RHD) has set aside for preserving their quality. There has been a worrying decline in road conditions, as evidenced by recent statistics, which emphasize the urgent necessity for an efficient road quality evaluation. Through extensive research, we have expanded upon the previous dataset and test set, resulting in a final dataset comprising 49,660 highresolution satellite images of roads, along with a test set of 1,573 images. Recognizing limitations in prior research regarding the absence of region based approaches such as attention mechanisms, we have implemented two different approaches. In the first approach, only the road portion has been extracted from satellite images and then with that dataset, a number of deep learning models have been evaluated. In this approach, RegNet X 32GF has gained the highest accuracy among other CNN models having 69% accuracy. To check if the deep learning model performs better with attention mechanism, we implemented our second approach where ResNet50 has been used as a backbone CNN model with an additional attention branch which processes the Region of interest mask (ROI). Here, as ROI mask, a binary mask of road images where only the road portion is highlighted is passed with original satellite images to see if it performs better than individual CNN models. The result of the second approach shows that it performs better than the first approach with an accuracy of 75% which is 6% higher than the first approach's top-performing CNN model, concluding that the attention mechanism performs better in the case of road quality classification.

Keywords

RQA, Road Image Classification, Deep Learning, Road Extraction, CNN, Attention Mechanism



Vehicle Class Detection and Counting on a Malaysian Road Using YOLOv8 and OpenCV

Mahbub Hassan, Hridoy Deb Mahin, Muzammil Jusoh, Abdullah Al Nafees, Arpita Paul, Md Ashequl Islam
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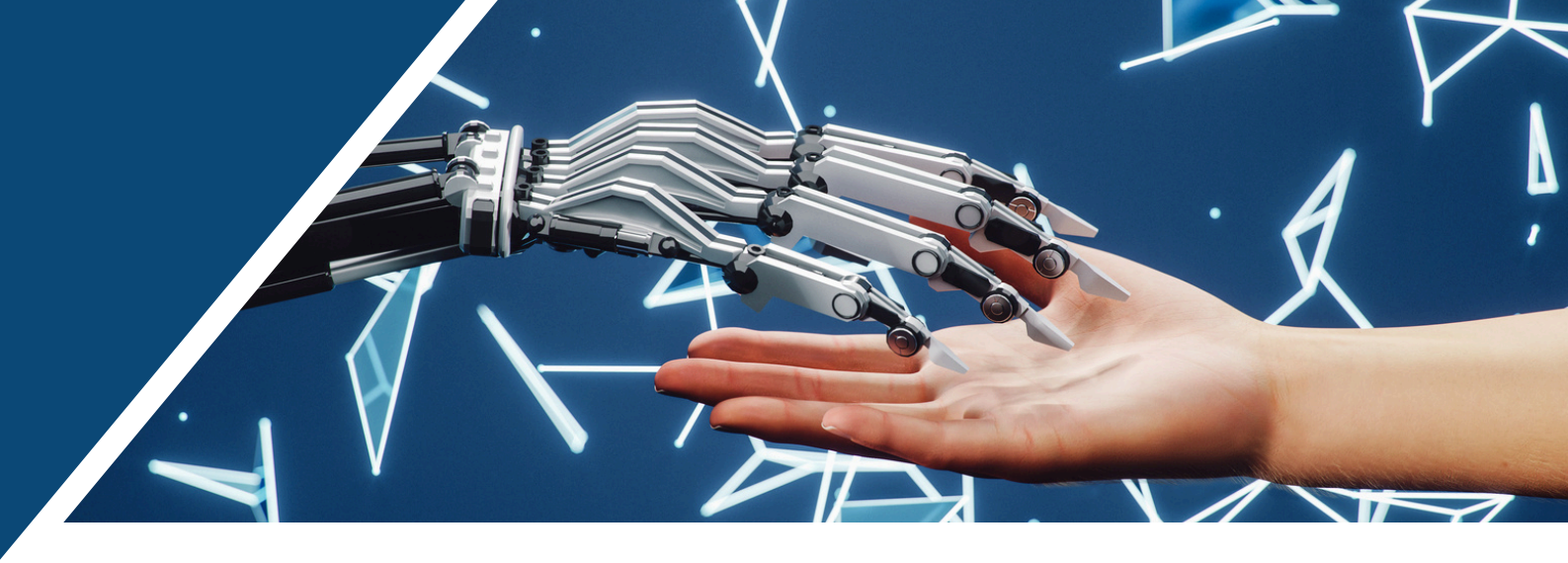
Sylhet Engineering College (SEC), School of Applied Sciences & Technology, Sylhet, Bangladesh

Abstract

Traffic monitoring systems are a crucial aspect of Intelligent Transportation Systems (ITS). This study utilizes a state-of-the-art deep learning algorithm, YOLOv8, with OpenCV, to address the challenges of vehicle counting and classification. The specific research area chosen was a highway in Malaysia, which had not been previously investigated in algorithm-based vehicle detection systems. The implementation of this model on the highway is essential for enhancing road safety and preventing accidents. Our findings reveal that the model achieved a remarkable 96% accuracy in detecting vehicles and 94.08% accuracy in classifying them. As a result, it is recommended to implement this model on the highway to improve traffic management and increase overall safety.

Keywords

YOLOv8, Vehicle detection, ITS, Deep learning, OpenCV



Real-time Production Rescheduling with Machine Breakdown Using Genetic Algorithm-Adaptive Large Neighborhood Search Algorithm

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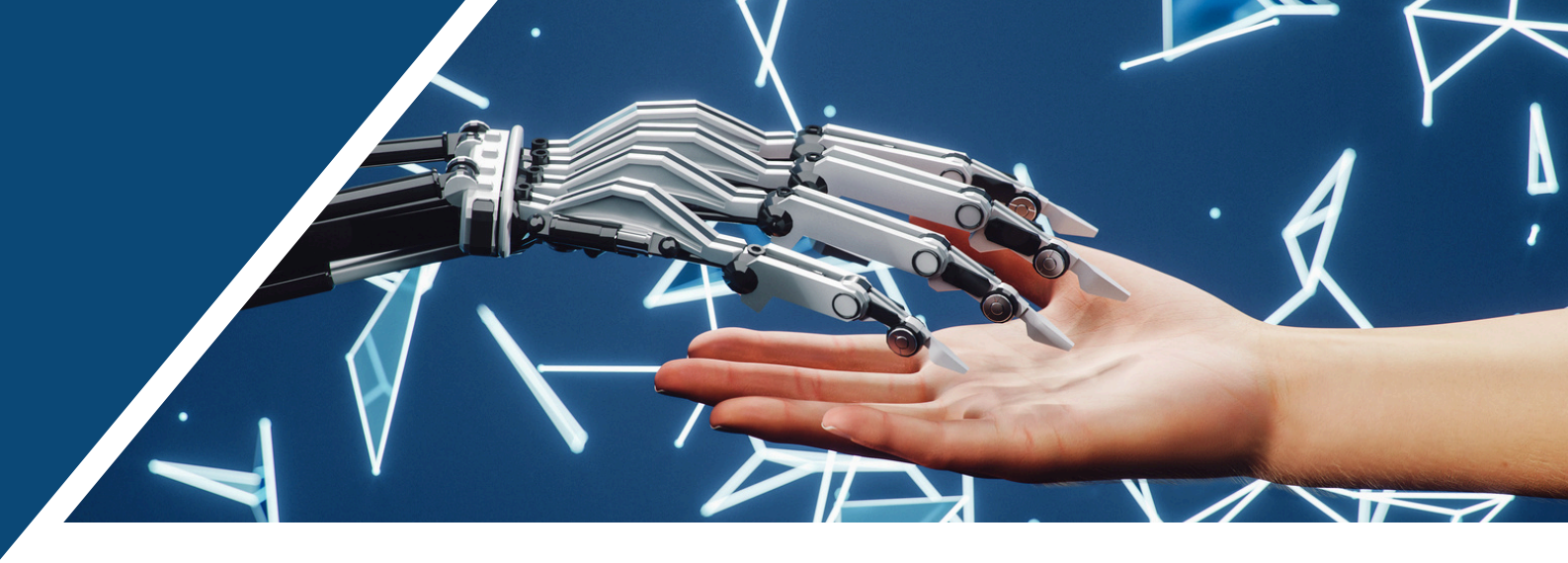
School of Management Technology, Sirindhorn International Institute of Technology, Thammasat University, Pathumthani, Thailand

Abstract

Job shop scheduling is critical to manufacturing optimization, encompassing proactive planning and reactive adjustments to unforeseen disruptions. This paper addresses the complex job shop environment characterized by parallel machines within groups, shared machines across processes, and the occasional dedication of machine groups to specific processes due to extended processing times. We propose a novel real-time rescheduling methodology to enhance production efficiency in this dynamic setting. Our approach integrates a Genetic Algorithm (GA) with Adaptive Large Neighborhood Search (ALNS) to effectively explore a vast solution space. We further introduce batch splitting to increase flexibility and responsiveness to disruptions. Rigorous evaluation of diverse problem instances demonstrates the methodology's ability to minimize tardiness and makespan while maintaining computational efficiency. Significantly, our approach effectively repairs schedules disrupted by machine breakdowns, improving delivery times and reducing production costs.

Keywords

Real-time Rescheduling, Genetic Algorithm, Adaptive Large Neighborhood Search, Job Shop Scheduling



Sign2Text: Deep Learning-based Sign Language Translation System Using Vision Transformers and PHI-1.5B

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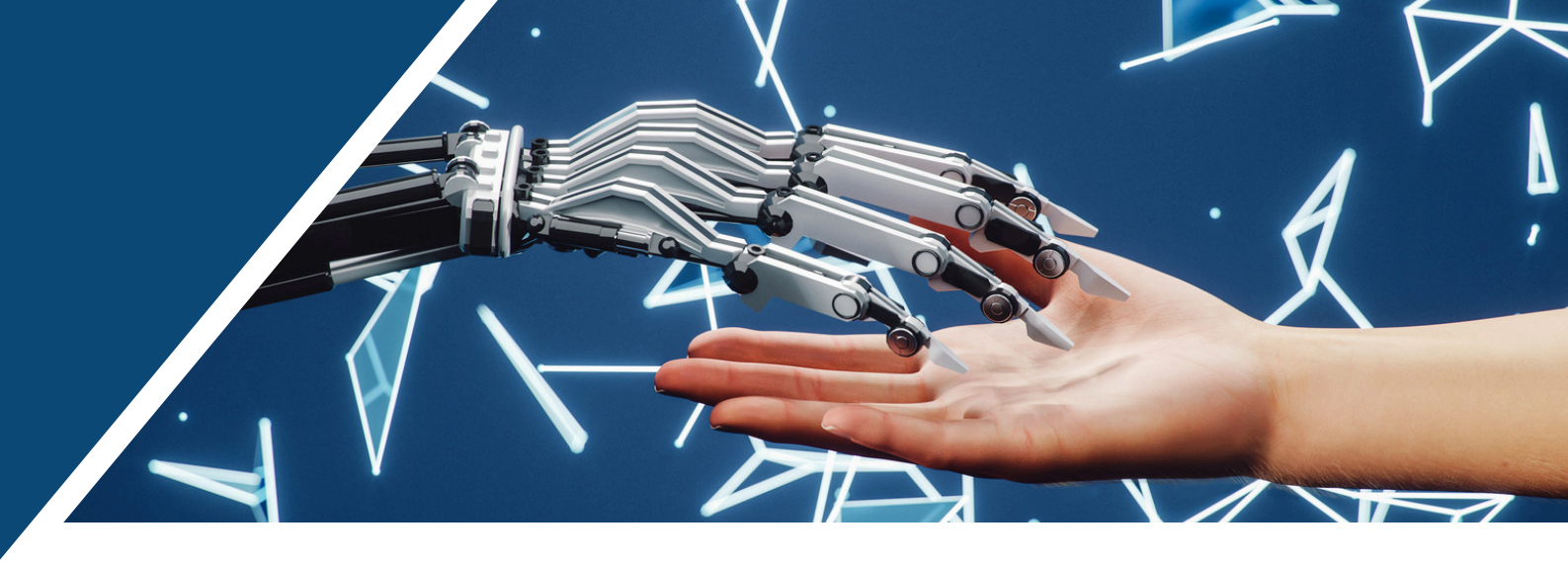
Abstract

Sign language is essential for communication among deaf individuals, yet barriers persist effectively in translating its rich linguistic expressions into textual representations.The dynamic nature of signing poses a significant challenge for existing sign language recognition systems, particularly in intricate and continuous contexts. Moreover, these systems primarily cater to specific sign language dialects, neglecting the diverse linguistic landscape of sign languages globally. This paper proposes an innovative sign language translation system that addresses these challenges by leveraging recent advancements in computer vision and natural language processing. Our approach focuses on Indian Sign Language (ISL), which presents unique challenges due to its utilization of both hands. The system utilizes a Vision Transformer (ViT) trained on a comprehensive video dataset to classify various sign language elements, while integrating a sophisticated language model, PHI-1.5B, to refine translated text for grammatical correctness and structural integrity. By combining ViT and PHI-1.5B, our system aims to achieve robust and contextually relevant translation of ISL gestures into textual representations.

Keywords

Sign Language Translation, Indian Sign Language (ISL), Vision Transformer (ViT), PHI-1.5B, Continuous Sign Language Recognition (CSLR)



Energy-Based Resource Allocation in UAV Assisted Mobile Networks for Public Safety

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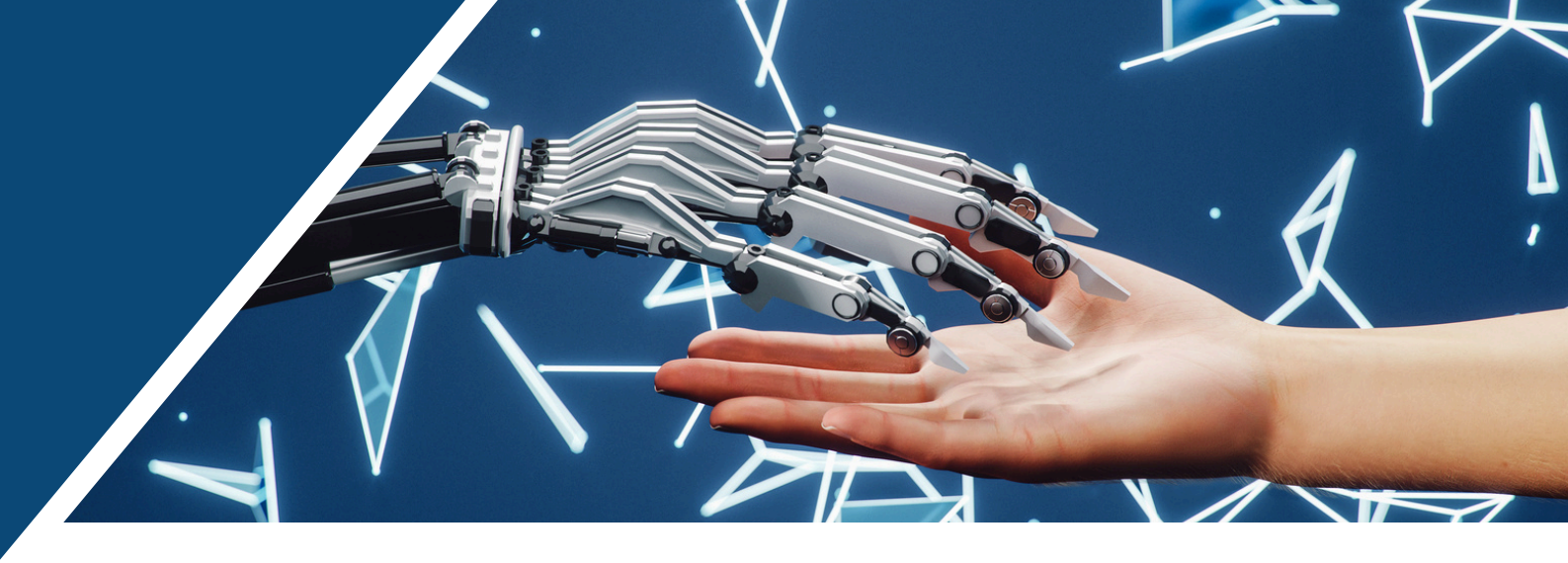
National Telecommunications Regulatory Authority (NTRA), Giza, Egypt
Arab Academy for Science and Technology and Maritime Transport (AASTMT), Cairo, Egypt
Ain Shams University, Cairo, Egypt

Abstract

This paper presents an optimized communication scheduling and prioritization approach for unmanned aerial vehicle (UAV)-assisted disaster networks. The solution leverages a non-preemptive queuing model, unlike the First-Come-First-Served (FCFS) approach, to manage limited resources, such as battery power and bandwidth, based on the energy levels and proximity of available UAVs. The energy-based resource allocation strategy further enhances efficiency by prioritizing ground node (GN) with lower remaining battery levels, maintaining communication links for longer during the disaster response. Additionally, the system employs AI-based algorithms to dynamically select the most suitable master node (MN) from the available MN, further optimizing the communication network. Simulation results demonstrate the effectiveness of the proposed approach in terms of message delivery latency, resource utilization, and overall system performance.

Keywords

Public Safety, UAV, Critical Communication, Command Control Center



Predicting Power Outages in Baghdad City Using Deep Learning Techniques

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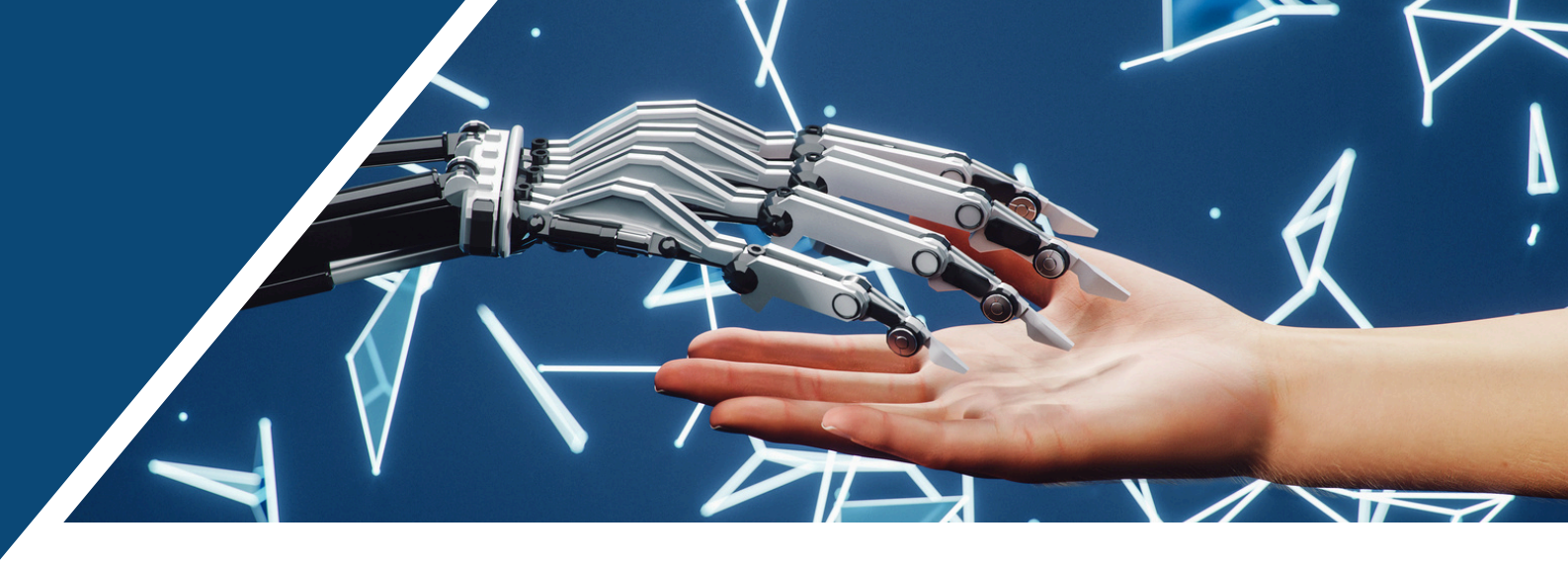
Abstract
Predicting power outages in Iraq is essential in the design and growth of electrical networks and is also necessary to ensure the stability and reliability of electric power and enhance productivity. The purpose of the presented research is to use deep learning techniques to accurately determine electric power outages and develop proactive plans to determine the cost and infrastructure necessary to ensure continued power supply in this country. The research uses deep learning algorithms, like GRU (Gated Recurrent Unit), the RNN (Recurrent Neural Network), and the LSTM (Long Short Term Memory), to predict power outages resulting from increased electrical load measured by electricity distribution companies in Iraq (Baghdad) for both long term and short term. Comparison between the three prediction models showed that RNN is more accurate in predicting electricity outages in Baghdad for the short term with a minimum MSE of 0.0002346 and MAE of 0.003556, while GRU is the best for forecasting power outages for the long term with the lowermost value of MSE of 0.00508 and MAE of 0.04874.

Keywords
Power Outage in Iraq, RNN, LSTM, GRU, Deep Learning, Time Series Prediction



Research Issues and Challenges in the Computational Development of Trustworthy AI

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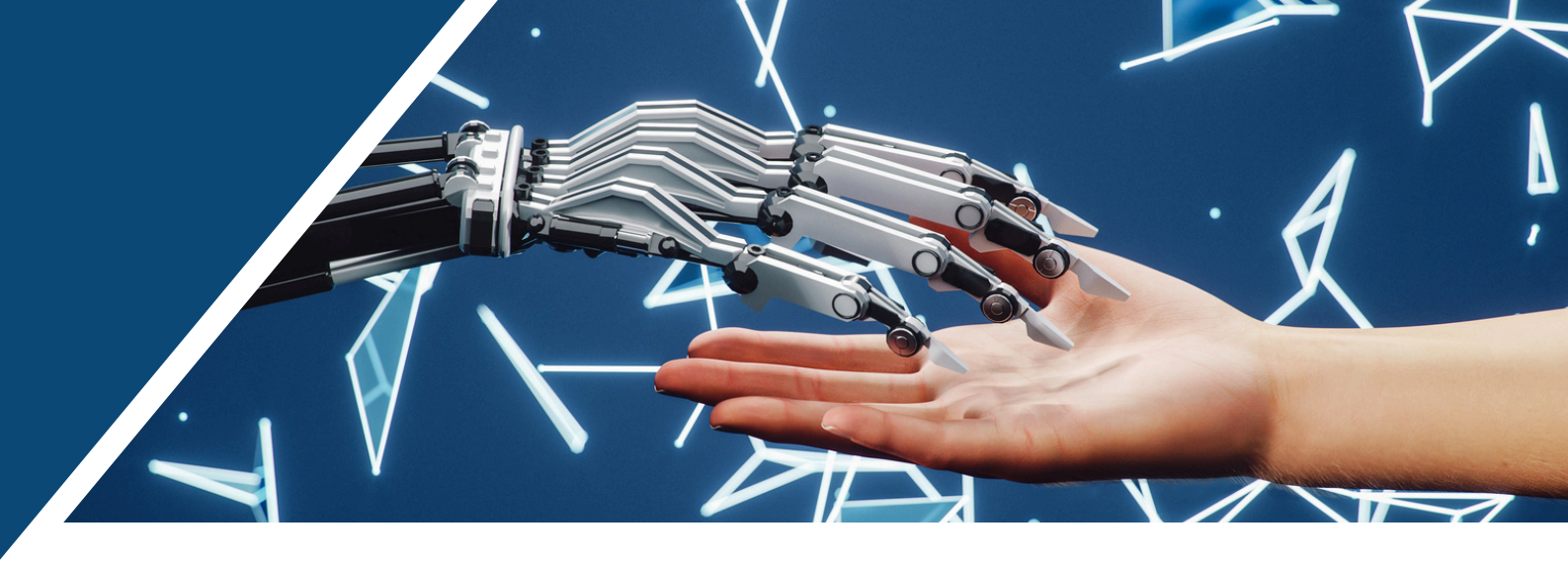
Abstract

The development and deployment of AI systems necessitate a steadfast commitment to reliability, safety, security, ethics, and social responsibility. This paper introduces key research issues and challenges for trustworthy AI based on our experience working on several ongoing research projects at Mälardalen University (MDU), Sweden, which considers practical, real-world scenarios from the mobility, transportation, and healthcare domains. Our observations have highlighted several critical technical components that underpin trustworthy AI. These components include fairness, safety, transparency, explainability, accountability, rigorous testing, verification, and a human-centric approach to AI. Notably, these elements align closely with the current state-ofthe-art practices in the field.

Keywords

Trustworthy AI, Transparency, Explainability, Fairness, Verification



Position-Specific Batting Role Assignment and Player Ranking Using Ensemble Learning

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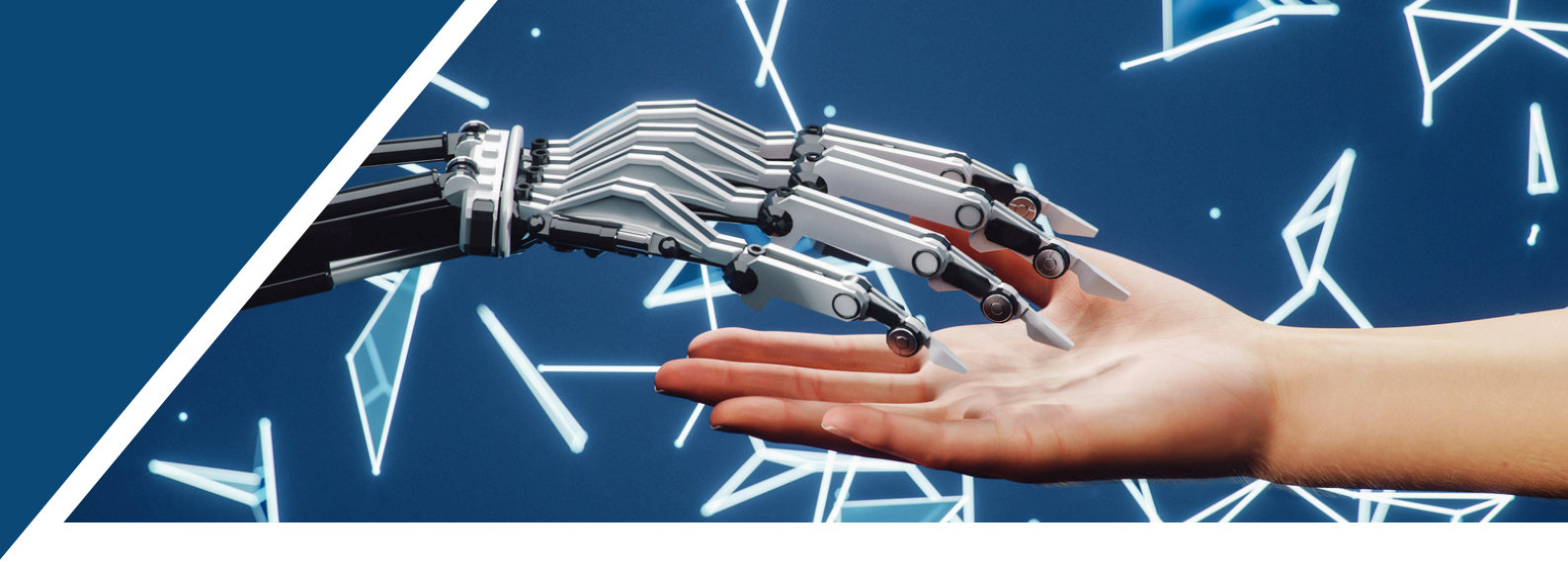
Abstract

Cricket is a popular game around the world that includes three major formats. The T20 format stands out as the fastest format in cricket. A team's batting order significantly affects the outcome of the match. Every player must play his role according to the batting position. Hence assigning roles to batsmen based on their batting positions are crucial. Previous studies were performed on win prediction, team selection, player performance evaluation, and classification of players using machine learning. However, there are no prior studies to classify batsmen according to batting positions and rank players in each category. This study aims to classify players based on their roles in the batting order as top-order, middleorder, lower-order, or tail-ender batsman in T20 format and rank players in each category using classification probabilities. The data for the study was collected from www.crickinfo.com website. For this study, 347 players who belong to a country that has Test membership were used. Initially, Classification was performed using machine learning models such as Naïve Bayes, RF (Random Forest), Decision Tree, SVM (Support Vector Machine), and KNN (K-Nearest Neighbors). Then, ensemble learning was used, and the best performance was observed in the stacking model with seven base models. That model reached a training accuracy of 97.69% and a testing accuracy of 95.40%. Additionally, it achieved a precision of 95.16% and a recall of 95.35%. The findings of this study show that ensemble models can effectively classify batsmen according to the batting positions and ranking players in each category. This classification and ranking are important to selectors, coaches, captains, and team management when making team selections, forming batting lineups, and performing tasks such as player replacement. The future work of this study aims to improve timely predictions using scheduled online training.

Keywords

Ensemble Learning, Machine Learning, Ranking, Batting Positions, Classification, Cricket



An Efficient Intersection Over Union Algorithm with Angle Orientation for an Improved 3D Object Detection

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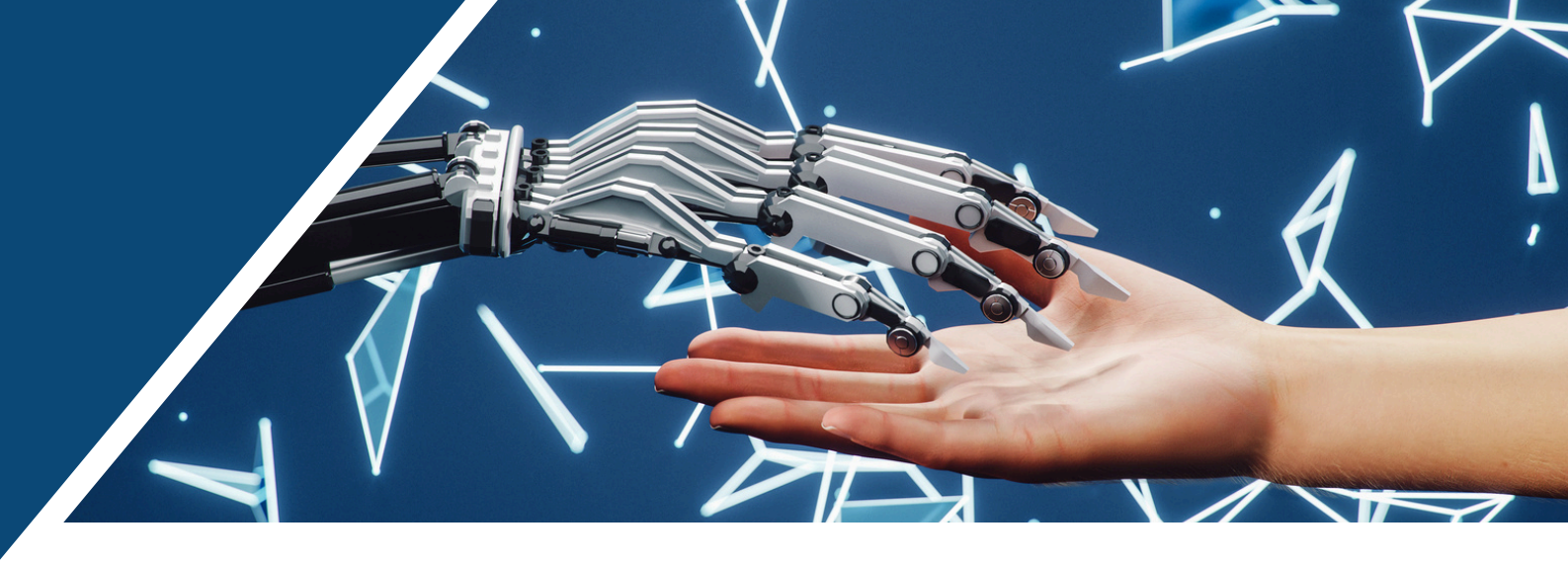
Center for Artificial Intelligence Technology, Universiti Kebangsaan Malaysia, Bangi, Malaysia

Abstract
An essential portion of computer vision research is the detection of objects in three dimensions (3D) that has been used widely in many applications such as autonomous vehicles and augmented reality, visual security surveillance, and many more. The mismatch between the desired ground truth and the predicted bounding boxes is crucial to the process of 3D object detection. This difference is also known as loss function in the field of 3D object detection. Of late, there has been significant work in the loss function algorithms that led to several versions of improvement. However, the influence of angle orientation between the ground-truth bounding box and the predicted box is yet to be addressed. In 3D object detection, the loss function is usually described as an intersection over union (IoU) algorithm. Therefore, in this work, an efficient IoU (EIoU) algorithm with refinement of angle orientation is presented as an improved version of the IoU algorithm. Evaluation outcomes on the KITTI dataset have shown that the projected technique is able to reduce false detection and correct the angle offset significantly as compared to the standard Mixture-Density-based 3D Object Detection (MD3D) method.

Keywords
Loss Function, Intersection Over Union Algorithm, Angle Orientation, 3D Object Detection



ECG Cardiac Abnormality Signal Classification Using HMLP Network

Shazreen Shaharuddin, Nur Izzani Mat Rozi, Maizatullifah Miskan, Fakroul Ridzuan Hashim, Mohd Salman Mohd Sabri, Siti Noormiza Makhtar

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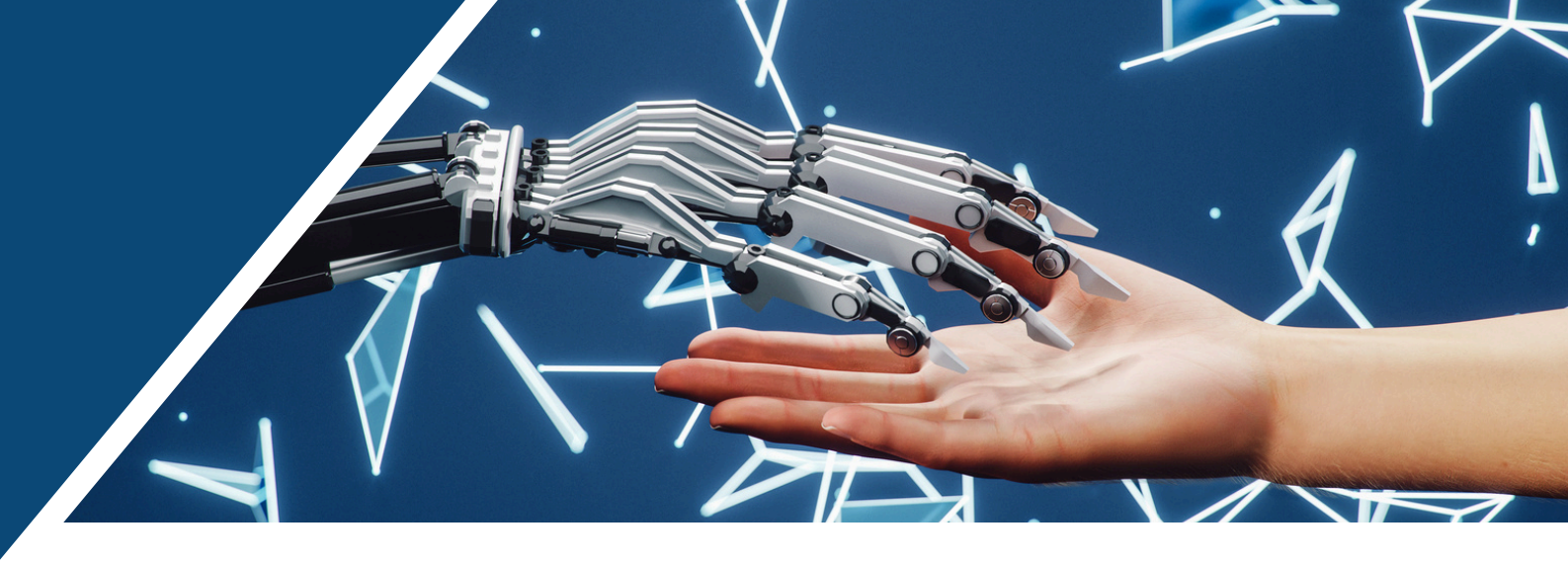
Faculty of Engineering, National Defence University of Malaysia, Sg. Besi Camp, Kuala Lumpur, Malaysia

Abstract

When irregular heartbeat symptoms appear, it is vital to properly diagnose the patient's cardiac condition. The research intends to apply a training algorithm for disease identification. The ECG signal includes data points such as P peak amplitude and duration, QRS wave amplitude and duration, and T peak amplitude and duration. These information points serve as input parameters. To improve the prediction model, the Hybrid Multilayer Perceptron (HMLP) network was used. Bayesian regularisation (BR) is preferred over backpropagation (BP) for more accurately estimating the validity of the ECG signal model. The HMLP with BR model works effectively, with a mean squared error (MSE) of 0.32 and a regression value of 0.96.

Keywords

Cardiac Abnormality, Amplitude, Duration, ECG Signal, Accuracy, MSE



Transformer Health Index Monitoring Using Supervised Prediction Model

Nazrul Fariq Makmor, Afzan Zamzamir, Ja'afar Adnan, Azharuddin Muktharuddin, Fakroul Ridzuan Hashim, Yulni Januar

Faculty of Engineering, National Defence University of Malaysia, Sg. Besi Camp, Kuala Lumpur, Malaysia
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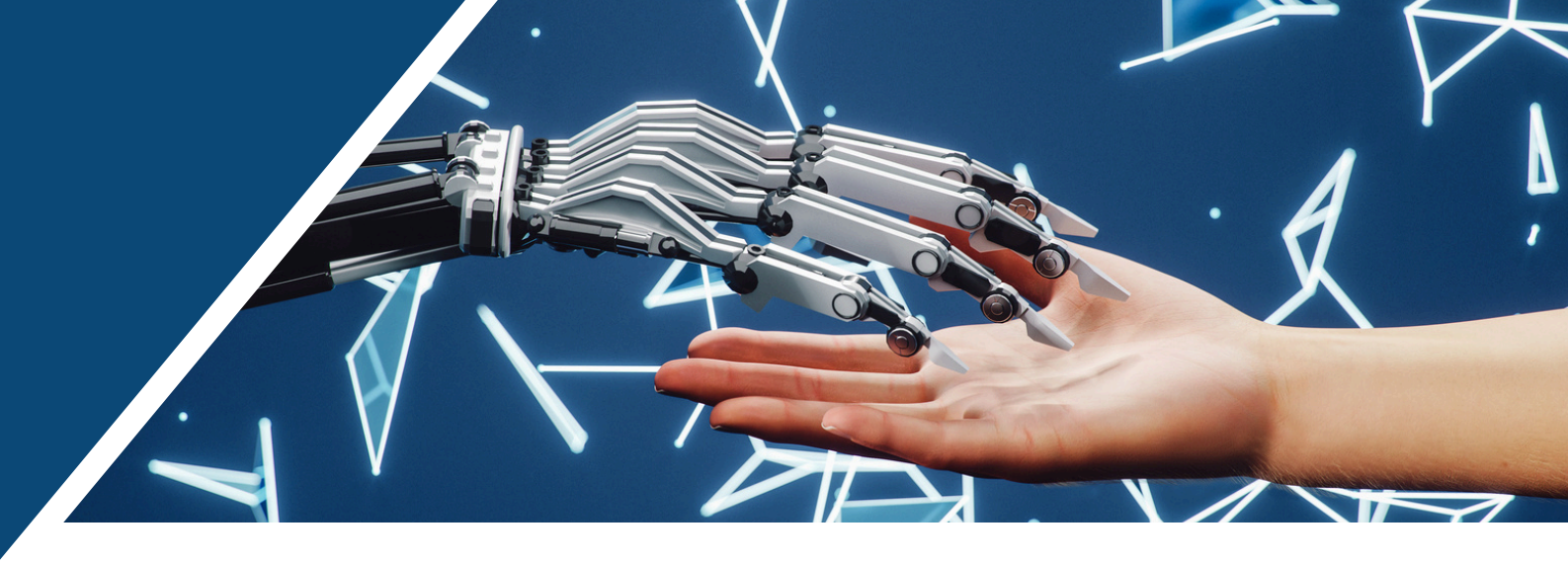
Abstract

Dissolve gas analysis (DGA) is a method used to distinguish between transformers that are in optimal condition and those that require scheduled maintenance. The primary objective of DGA is to accurately identify issues caused by different gas forms in the transformer. The key gas method (KGM) analysis is a frequently employed approach in DGA. KGM is utilised to classify the health index of the transformer based on the development of gases within the transformer. On top of that, the prediction models include K-Nearest Neighbours (KNN), Discriminant Analysis, Principal Component Analysis (PCA), and Decision Tree offered as the decision making of the health index classification. The resulting outcome is subsequently compared to alternative prediction models to determine the ideal performance based on accuracy, precision and recall prediction. The results demonstrate that the KNN prediction model surpasses other models with an accuracy of 94.27%, precision of 94.12% and recall 92.44%.

Keywords

Transformer, Dissolve Gas Analysis, Key Gas Method, MSE.



Web-Based Medical Information System for Stroke Rehabilitation Internet-of-Things (RIOT) Patients: A Prototype

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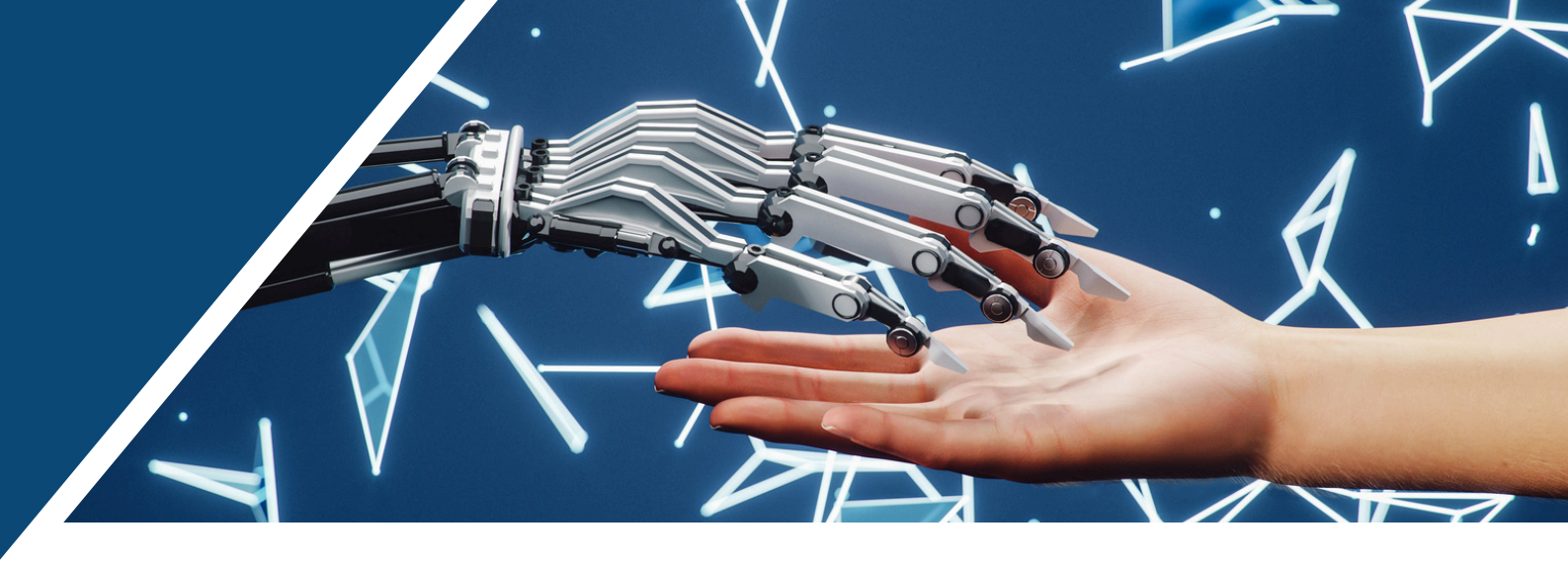
Department of Mechanical Engineering, Mila University, Negeri Sembilan, Malaysia
Department of Information Systems, International Islamic University Malaysia, Kuala Lumpur, Malaysia

Abstract

Traditional stroke rehabilitation methods are known to be limited to their accessibility for patients with mobility issues while lacking real-time feedback whereas a modern way as remote rehabilitation seems to be costly for some patients. The downsides of the previous method will eventually execute an impact to the patients' rehabilitation progress. To overcome the issue, as a starting point of this research, the proposed solution is a web-based medical information system that incorporates hand gesture recognition using MediaPipe and RIOT framework. Rehabilitation Internet-of-Things (RIOT) is an IoT system created to aid in remote rehabilitation, specifically targeting stroke survivors in remote areas and healthcare providers specialising in physiotherapy. This system offers a platform for stroke patients to perform rehabilitation exercises with real-time feedback. Additionally, in the making of a proper medical information system using web development technologies, the integration of MediaPipe and RIOT platform development using JavaScript or Python web integration. Moreover, surveys and usability testing were conducted to evaluate its effectiveness. Therefore, an innovative and costeffective approach was developed to provide stroke rehabilitation by combining real-time feedback, and usercentred design, improving accessibility and effectiveness of stroke rehabilitation.

Keywords

Website Technologies, UI/UX Design, RIOT, Usability Testing Survey, Stroke Rehabilitation



Pollen Prediction Using ANN and DNN

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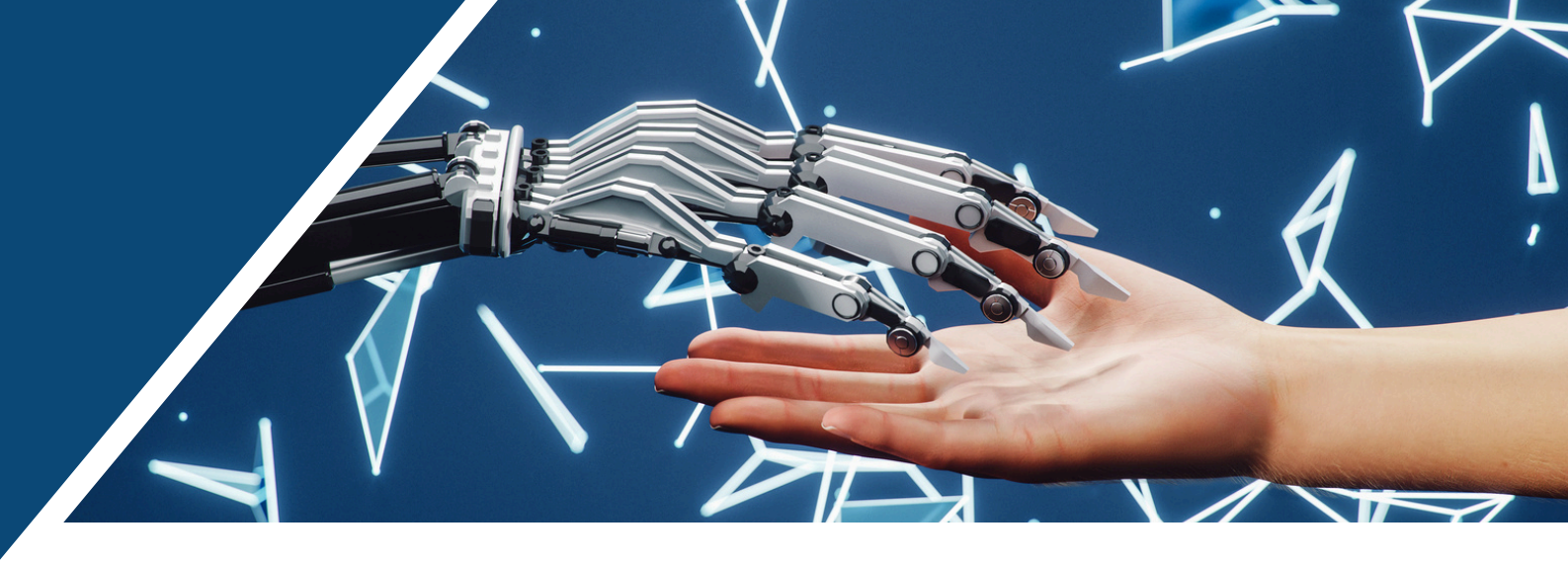
Abstract

Pollen levels significantly impact individuals with allergies, making accurate forecasting crucial for public health and well-being. This study explores the use of Artificial Neural Networks (ANN) and Deep Neural Networks (DNN) for forecasting pollen concentrations. The primary objective is to evaluate the effectiveness of these technologies in forecasting pollen concentrations, offering valuable insights for those susceptible to allergies. Through a comparative analysis of ANN and DNN models, this study highlights their predictive capabilities and implications for pollen forecasting applications. The advanced version of ANN implemented in this study, utilizing the NADAM optimizer, demonstrated promising results with an impressive R^2 value of 0.9987 across more than 60 pollen samples, indicating high accuracy and reliability. The model was trained on historical data from 2013 to the present, facilitating its performance. Comparisons with existing models show the superiority of the proposed ANN model in terms of predictive capability, adaptability to changing conditions, and ability to capture complex patterns in pollen data. Future studies should aim to enhance the clarity and understanding of ANN and DNN models and exploring ensemble techniques and hybrid models to further enhance the accuracy and robustness of pollen predictions.

Keywords

Artificial Neural Network, Deep Neural Network, Pollen Allergy, Regression



Stacked Bi-LSTM for Advanced Toxicity Detection in Comment Classification

Naveen Kumar, Prabhakaran Abraham, Syed Ibrahim Kaliba, Diniesh V C, Maruthamuthu R, Balamurugan Murugan, Seshu Kumar P, Naveen Vekkudu
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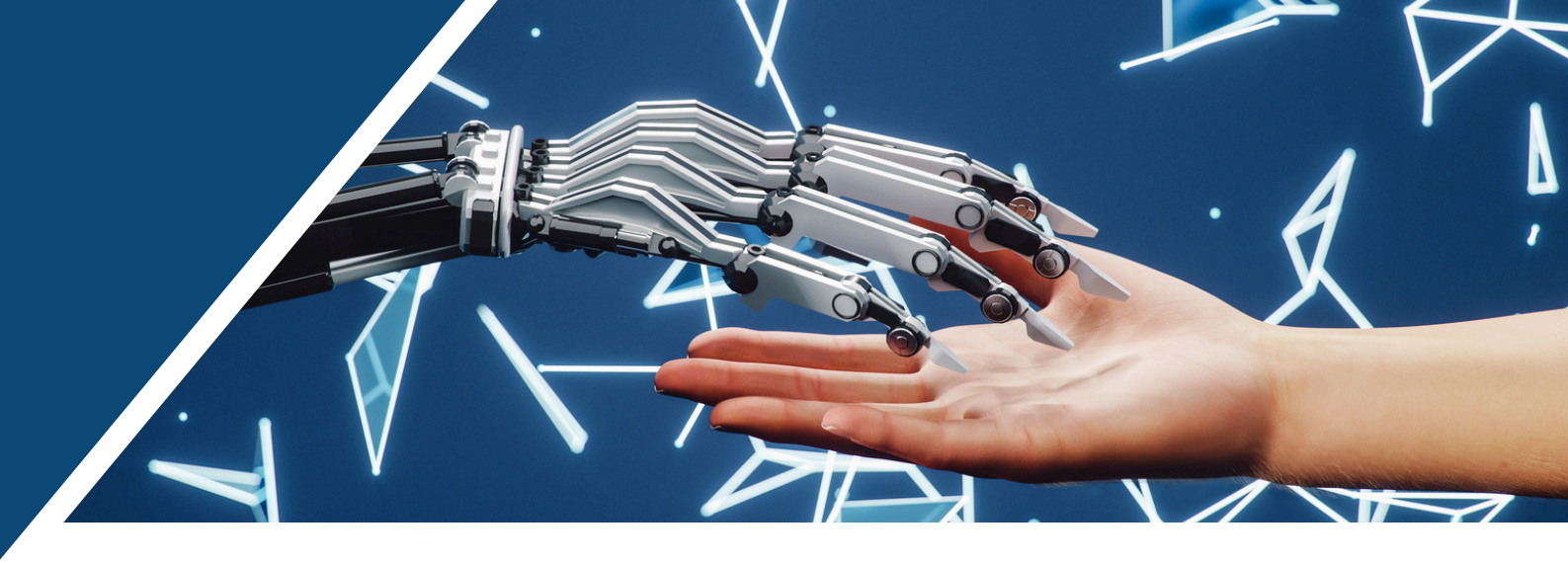
Mai-nefhi College of Engineering and Technology, May-Nefhi, Eritrea
Kongu Engineering College, Tamil Nadu, India

Abstract

The surge in Internet usage has revolutionized online forums, providing dynamic forums for active participation and meaningful debates. However, this has also exposed users to the risk of harassment. Efforts to address toxic comments in online forums have faced challenges, with current solutions unveiling unreliability. Advances in hardware, cloud computing, and natural language processing (NLP) enable the development of more robust approaches, predominantly NLPbased deep learning models. Pre-trained transformer models are gradually utilized for accurate toxic comment classification, bigger traditional methods. Stacked LSTM models, emphasizing hierarchical feature learning and improved contextual understanding, outperform single-layer counterparts, offering a effective solution for online content moderation and sentiment analysis. This research indicates a significant stride towards more dependable and sophisticated toxic comment detection, addressing the challenges of social media effectively.

Keywords

Toxicity Detection, Natural Language Processing, Ensemble Learning, Text Preprocessing, Tokenization



Generating and Integrating Diffusion Model-Based Panoramic Views for Virtual Interview Platform

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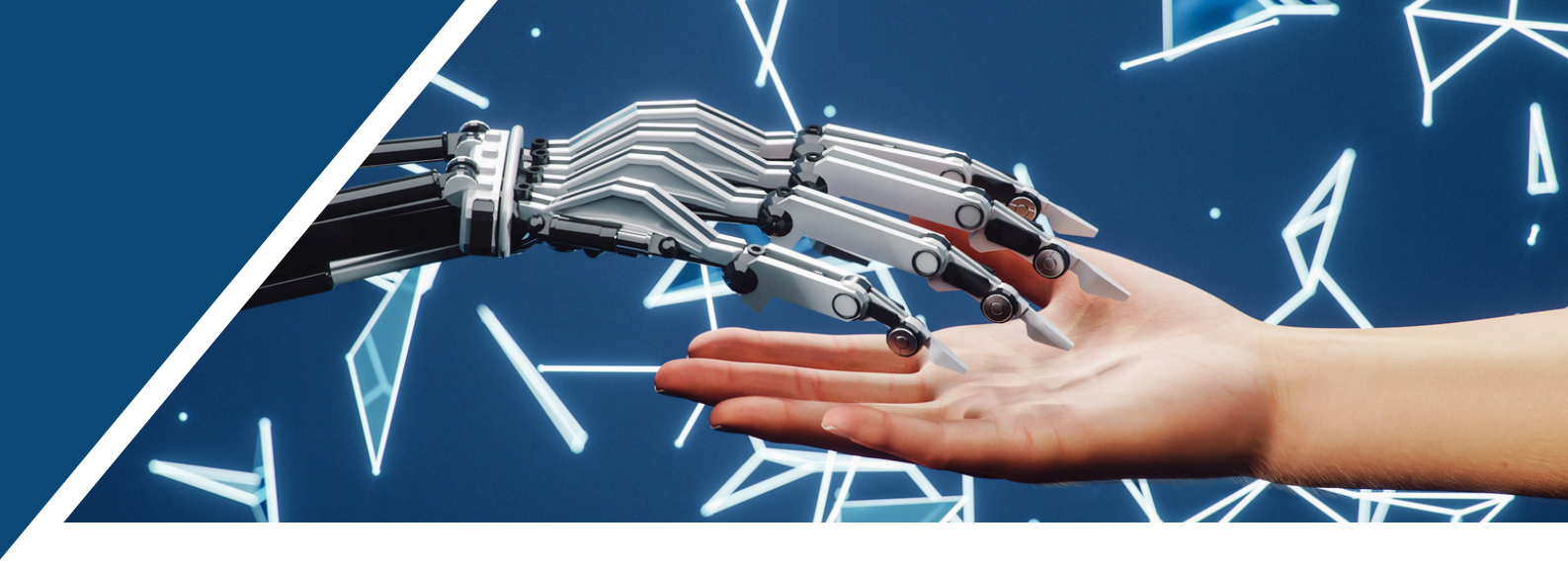
Department of Computer AI Convergence Engineering, Kumoh National Institute of Technology, Gumi, Gyeongsangbuk-do, Korea 2
Department of Computer Engineering, Kumoh National Institute of Technology, Gumi, Gyeongsangbuk-do, Korea

Abstract
This paper presents a new approach to improve virtual interview platforms in education, which are gaining significant attention. This study aims to simplify the complex manual process of equipment setup to enhance the realism and reliability of virtual interviews. To this end, this study proposes a method for automatically constructing 3D virtual interview environments using diffusion technology in generative AI. In this research, we exploit a diffusion model capable of generating high-quality panoramic images. We generate images of interview rooms capable of delivering immersive interview experiences via refined text prompts. The resulting imagery is then reconstituted 3D VR content utilizing the Unity engine, facilitating enhanced interaction and engagement within virtual environments. This research compares and analyzes various methods presented in related research and proposes a new process for efficiently constructing 360-degree virtual environments. When wearing Oculus Quest 2 and experiencing the virtual environment created using the proposed method, a high sense of immersion was experienced, similar to the actual interview environment.

Keywords
Virtual Interview, Diffusion, AI, Panorama, Deep Learning



Copy-Move Forgery Detection Optimization using Harmony Search with Clonal Selection Algorithm

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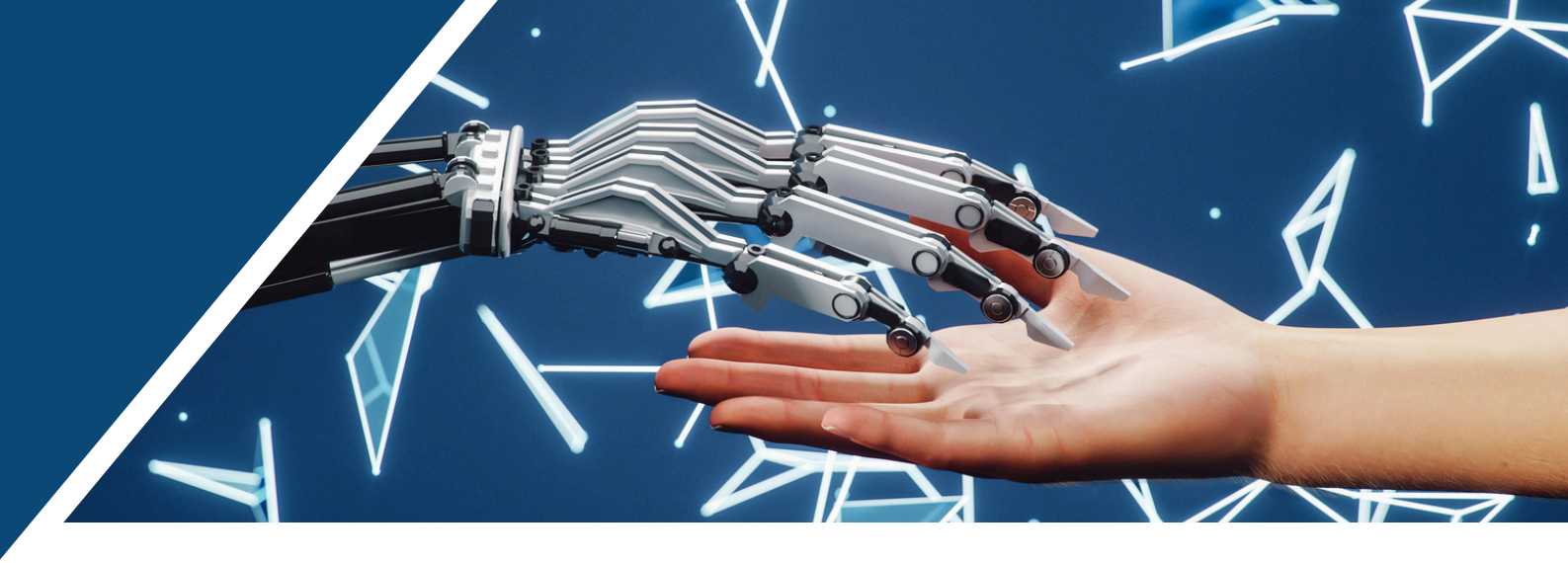
Faculty of Computing and Informatics, Universiti Malaysia Sabah, Sabah, Malaysia

Abstract

In today's world, where technology is advancing rapidly, the extensive use of digital images on social media brings up concerns about their authenticity. One common form of deception is image forgery, especially copy-move forgery, where parts of an image are duplicated and inserted elsewhere within the same image. Traditional detection methods, like randomized search algorithms, often struggle with adaptability. This study presents a new approach that uses the Harmony Search with Clonal Selection Algorithm (HSCSA) to improve the detection of copy-move forgeries by fine -tuning the hyperparameters of Convolutional Neural Network (CNN) models. O ur method involves preprocessing the CoMoFoD dataset, optimizing essential hyperparameters using HSCSA, and comparing the performance of the optimized model with standard CNN models. The results showed a notable improvement, with accuracy rising from 67.72% to 78.20%.

Keywords

Copy-move Forgery, Optimization, Convolutional Neural Network, Harmony Search, Clonal Selection Algorithm



Plant Leaf Diseases Classification Using SVMs, XGBoost, and CNNs Based Texture Features

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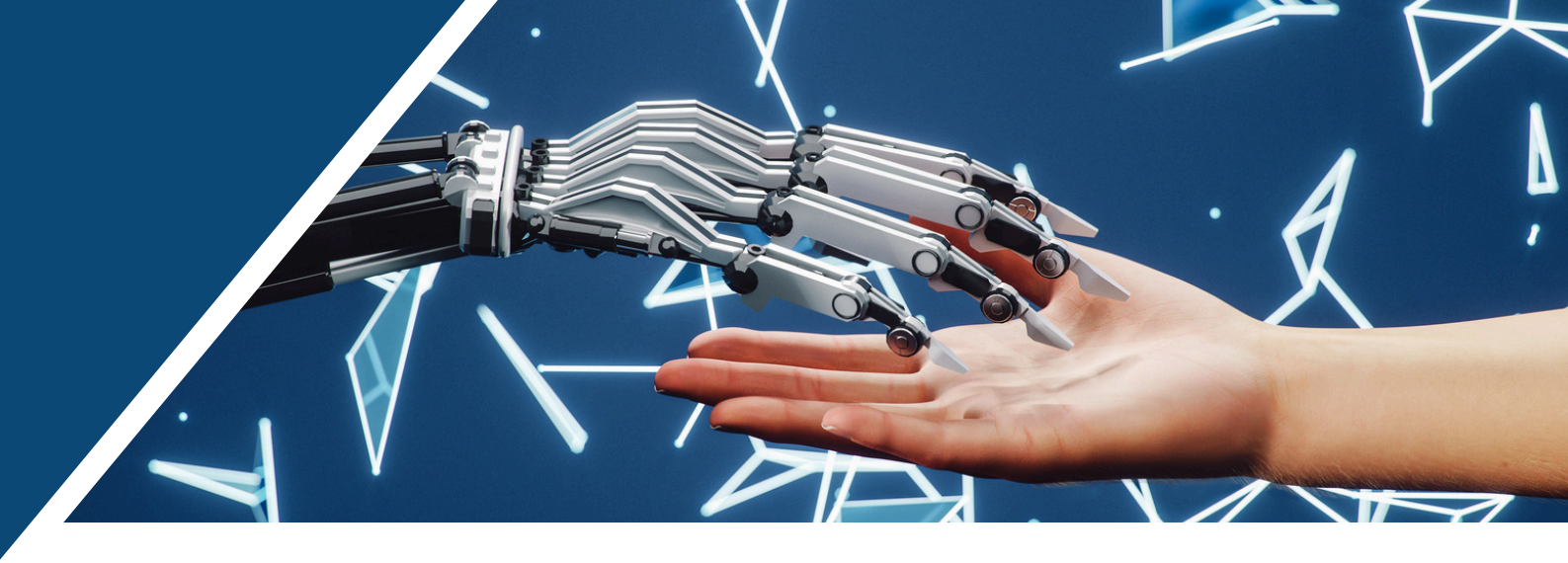
School of Electrical Engineering and Robotics, Queensland University of Technology, Brisbane, Australia

Abstract

Plant diseases identification is frequently used by physical examination or laboratory investigation which creates delays that, by the time identification is finished, results in yield loss. Diseases may affect different parts of plant, specifically the leaf. Different Research have made significant contributions to this sector and used computer vision technologies and machine learning effectively. Consequently, having a thorough understanding of the most recent advancements in machine learning technology and its applications for the identification of leaf diseases. In this paper, a technique is proposed by employing texture features with SVM, XGBoost and CNN to identify leaf disease of five types of plants: Alstonia, Gauva, Jamun, Lemon, and Mango. . We have used Local Binary Pattern to extract texture features from leaf because the diseases can affect the texture of plant, such as hairs, ridges, and waxy coatings. We have used challenging dataset which taken under different conditions, such as humidity, light, nutrition, water, and temperature which affect the texture, shape, colour and size of leaves. The findings show that the CNN based LBP achieved high accuracy in comparing with others models.

Keywords

Plant Leaf Disease, Classification, SVMs, XGboost, CNNs, Texture Features



LLM based Enhanced Form Checker for Weight Training Exercises

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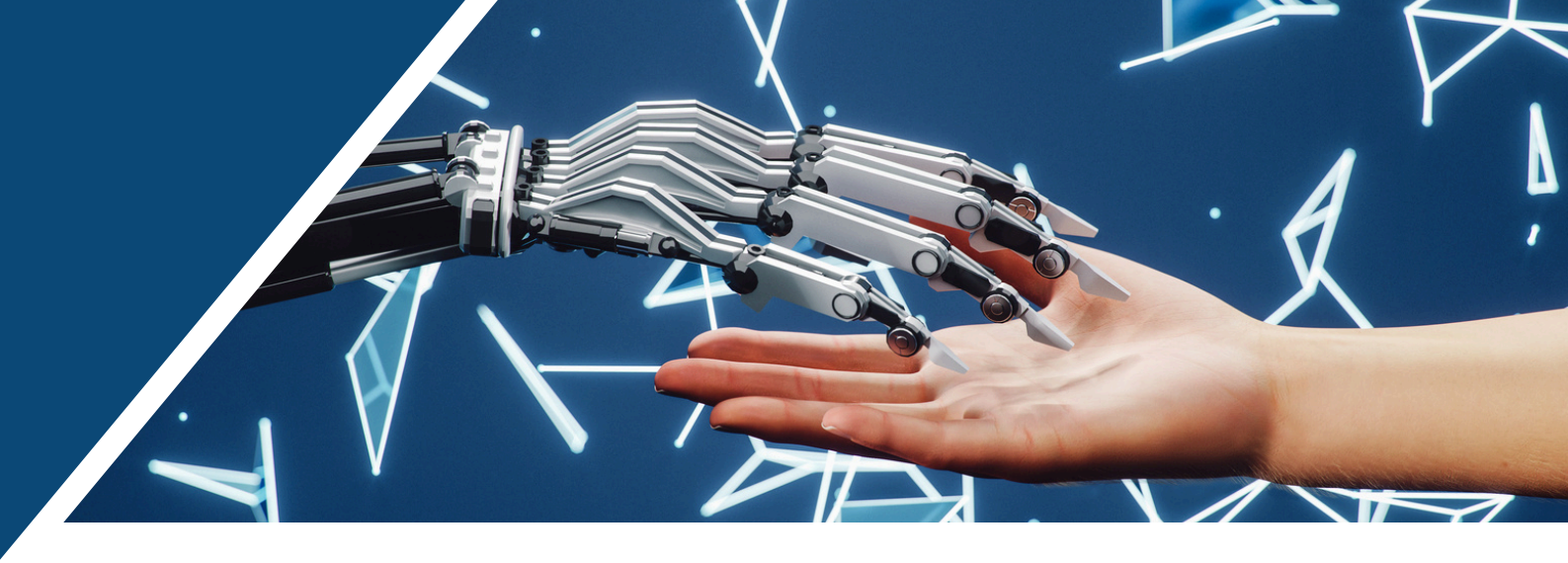
Abstract

Weight training as a fitness regimen has been trending among people across all age groups and genders. It is an effective way to improve physical well-being. Despite the various health benefits associated with weight training, improper execution can lead to ineffective results or injuries in the worstcase scenario. The paper introduces an application called ”Enhanced Form Checker”, which uses a model comprising four Long-Short Term Memory models, collectively referred to as ”Quadra-LSTM”, in conjunction with a Large Language Model. The Enhanced Form Checker utilizes video footage captured by a closedcircuit television camera to offer real-time feedback to users. Through the Quadra-LSTM, the correctness of the exercise form is evaluated, while the Large Language Model provides users with detailed feedback for any detected mistakes during the exercise. The proposed Enhanced Form Checker achieved an accuracy of 95.5%. The paper also provides a comparison between the Enhanced Form Checker and a model proposed in a previous study

Keywords

Weight Training Exercises, Enhanced Form Checker, Quadra-LSTM, LLM, CCTV, LSTM



EfficientNet-Lite 4-Based Classification System for Grading Philippine Strawberries

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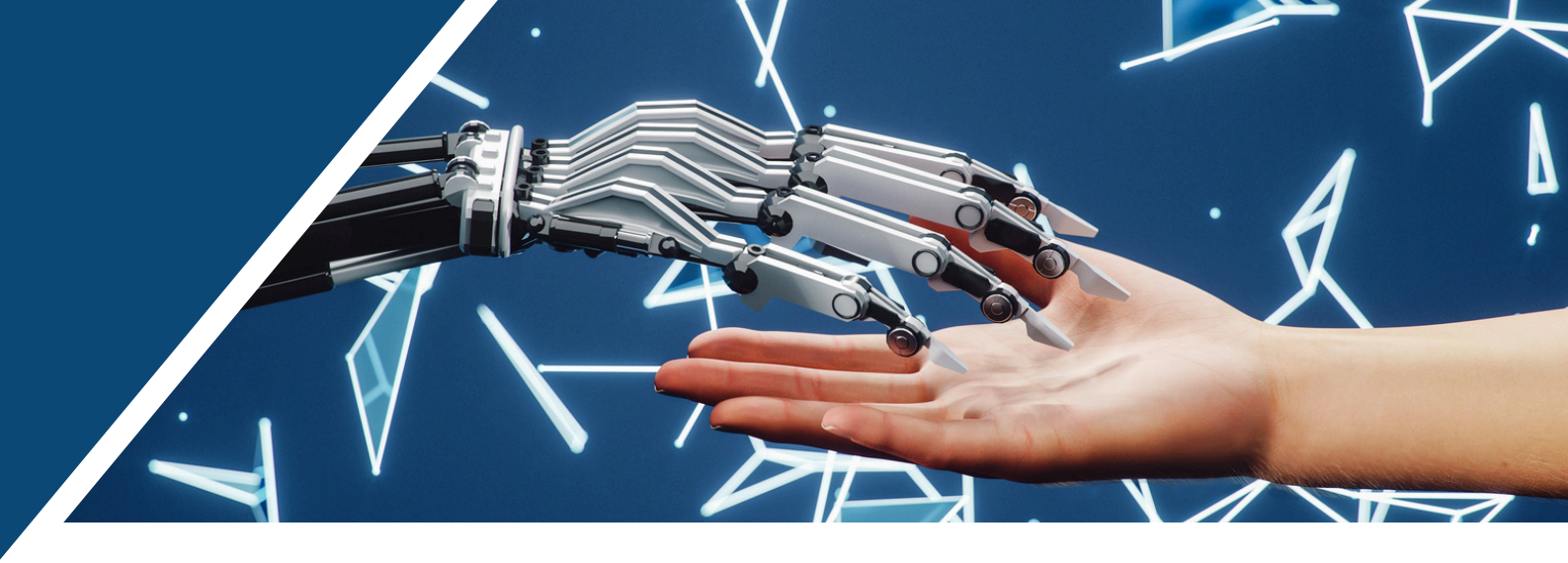
Abstract

This study focuses on developing an automated grading system for Philippine strawberries using the EfficientNet-Lite 4 model and Raspberry Pi 4 hardware. The primary goal is to classify strawberries into predefined categories - Class I, Class II, and Extra Class - according to the Philippine National Standard (PNS). The study employed a dataset of 1836 images across the three classes to train and validate the machine learning model. Results demonstrate high accuracy rates in strawberry classification, with 100% accuracy for the Extra Class, 84% for Class I, and approximately 81.82% for Class II, leading to an overall accuracy of about 88.89%. This indicates the model's strong potential in automating the grading process and improving quality assessment in agricultural produce

Keywords

Strawberry Classification, Machine Learning, Sobel Algorithm, EfficientNet-Lite 4, Raspberry Pi 4



Recycle Waste Detection and Classification Model Using YOLO-V8 for Real-time Waste Management

Mohamad Azfar Bin Mohamad Rastari, Rosniza Roslan, Raseeda Hamzah, Noor Hasimah Ibrahim Teo, Fadilah Ezlina Shahbudin, Khyrina Airin Fariza Abu Samah
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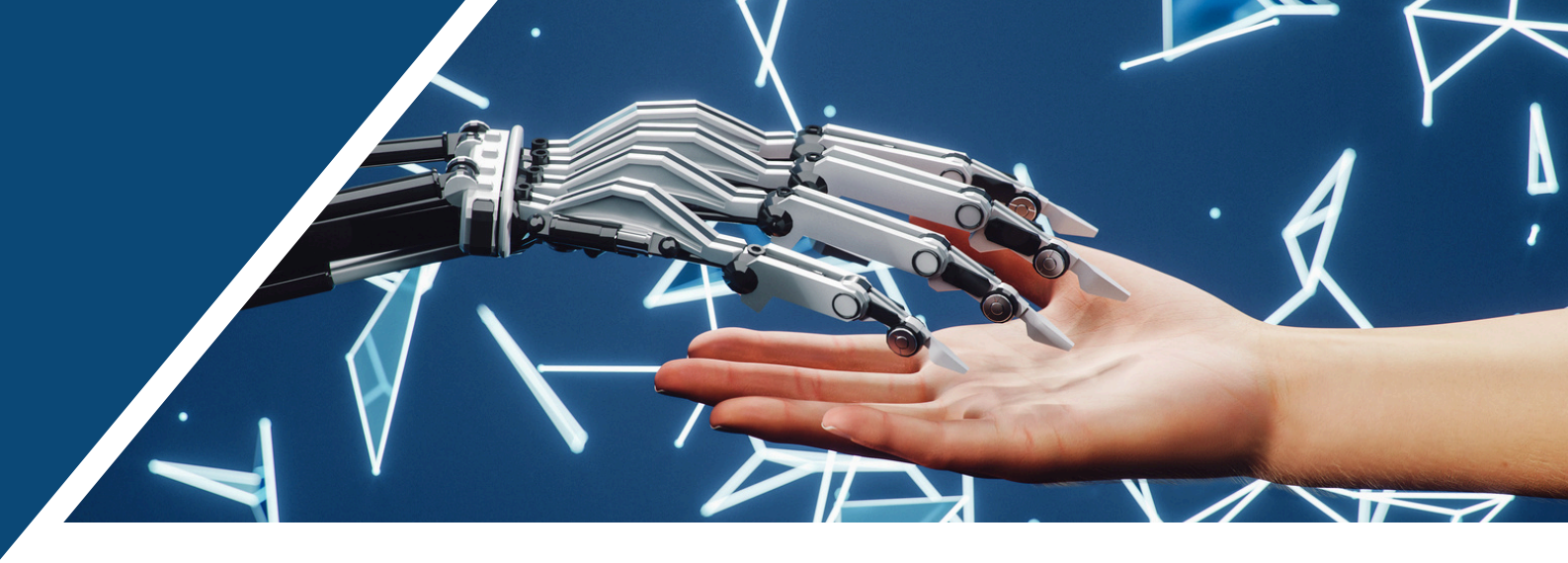
Abstract
The waste management organisations face significant challenges in effectively identifying and classifying waste materials. As of 2023, the world generates approximately 2.1 billion tonnes of municipal solid waste annually, with projections estimating this will increase to 3.8 billion tonnes by 2050. However, traditional manual methods for waste segregation are time-consuming, labour-intensive, and prone to errors. Numerous artificial intelligence applications in waste management can greatly benefit from the use of technology to streamline and improve the waste detection and classification process. Therefore, this paper presents and studies the recycle waste management model that utilizes the You Only Look Once Version 8 (YOLO-v8) object detection model for real-time waste identification and classification. All the image datasets have been collected and captured in the Malacca and Selangor areas. Additional dataset acquired from the Garbage Classification Dataset. To evaluate the quantitative predictive performance of the proposed model, model summary, confusion matrix, accuracy, precision, recall, and F1-score are computed with random-splitting and manual-splitting of train-test image dataset with the ratio of 70: 30, 80: 20, and 90: 10. The model tested on 4039 images with four types of recycled waste that are paper, glass, metal, and plastic images. Then, pre-processing with data augmentation to evaluate as experimented with 10057 images. The experimental results showed the ratio of train-test for accuracy of 97.63%, precision of 95.3%, recall of 93.03%, and F1-score of 97.63%. This model showed that the predictive model trained and tested on real-time data from laboratory findings can be used to predict four types of recycled waste, and can be extended to other types of waste and applications in other domains. This proposed model has great significance for prediction study for recycling waste detection and classification. This model demonstrated its potential for future use in a wide range of other classification prediction applications.

Keywords
Recycle Waste, Detection, Classification, YOLO-v8, Waste Management



Shrimp Freshness Quality Assessment Using YOLOv5

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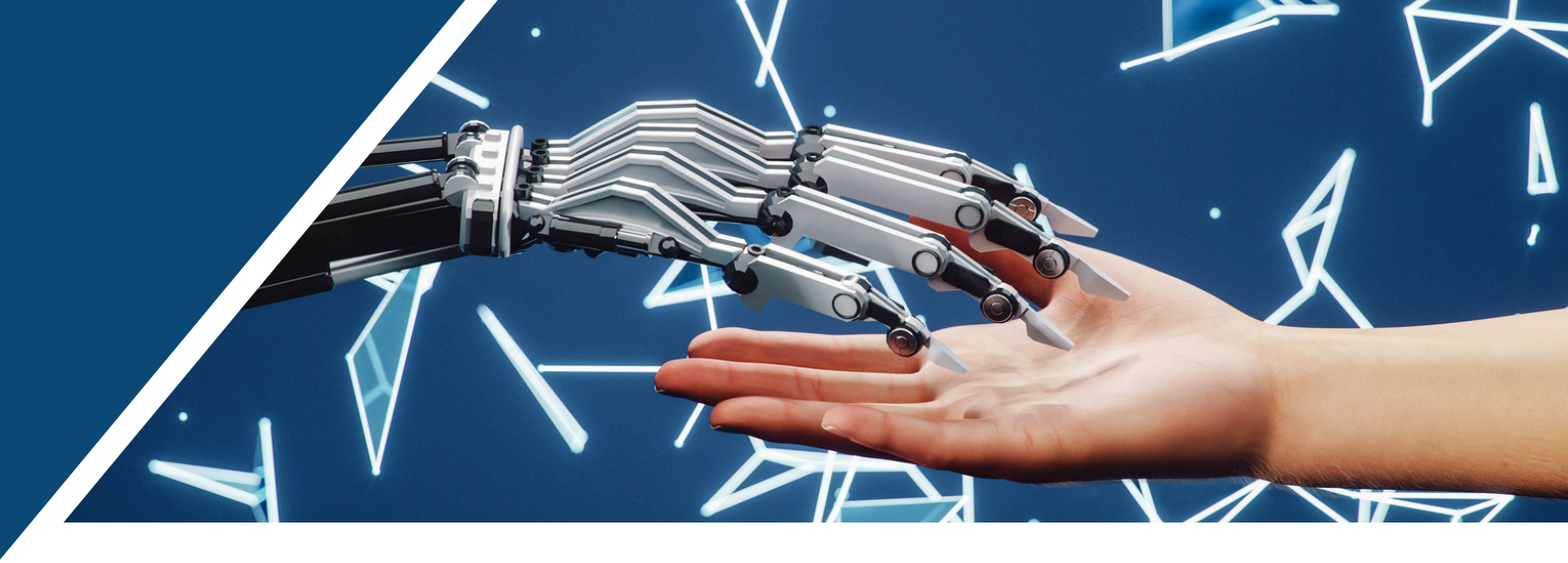
Abstract

Shrimps are known for their benefits in the Philippine aquaculture, health, and food economy. Determining a shrimp's freshness and Quality before consumption is imperative, as it has a sensitive shelf life that can cause serious consumer concerns. We came up with a portable device that captures and determines the type of Shrimp: Penaeus merguiensis (White Shrimp), P. semisulcatus (Tiger shrimp), and Metapenaeus ensis (greasy-back Shrimp) and if the Shrimp is fresh or not based on its color with the utilization of YOLOv5 algorithm. The model is trained and tested using custom datasets processed through a computer. To create the device, Raspberry Pi 4B and a 720P Camera attached to the back of the device is utilized to capture the Shrimp easily. The model's performance is measured and evaluated with a confusion matrix, which produced an accuracy of 89.473% in detecting the Quality of Shrimp and 88.321% accuracy when detecting the types of Shrimp. Results reveal a successfully developed portable device that detects the Quality of Shrimp, classifies the Shrimp, and delivers results in real-time with considerable accuracy

Keywords

YOLOv5 Model, Object Detection, Confusion Matrix, Quality Assessment, Raspberry Pi



Correlation Study of Ripe and Rotten Citrus Fruits Using Neuro-Fuzzy Algorithm

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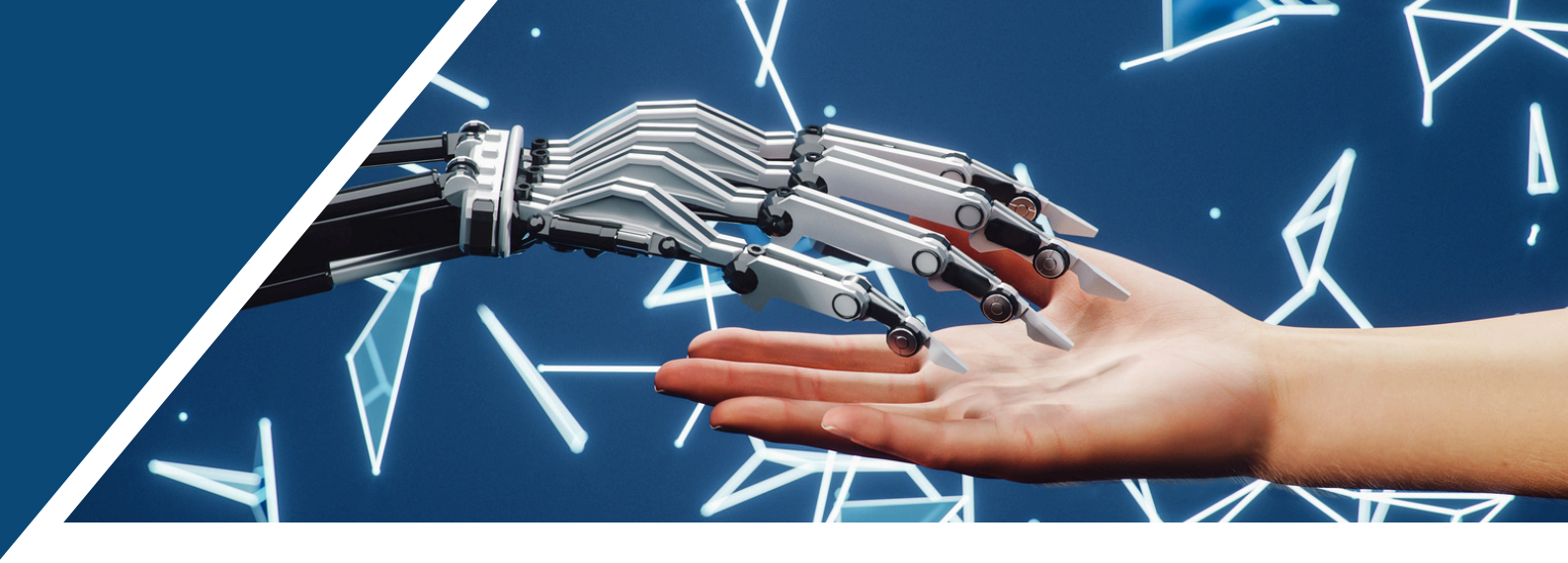
School of Graduate Studies, Mapua University, Manila, Philippines

Abstract

Citrus fruits are known to be easily spoilt because of several factors. People are unable to view a fruit's internal characteristics by nature. Identifying ripe from rotten fruits is a manual process that often involves making assumptions based on physical characteristics such as size, texture, and appearance. The study aims to identify if knowing the pH values of the sap can identify if the fruit is rotten or ripe. Correlation is implemented to see if there the relationship between days and acidity. The method implemented in the study is using neurofuzzy algorithm which read the fine light between ranges of pH levels and status of fruit being ripe or rotten. The dataset of the study was done by the researcher invasively. The saps of each ripe and rotten samples are fed by the researcher using neurofuzzy algorithm which gives a probability result if the fruit is ripe or rotten. Pearson's correlation method is the statistical treatment to see extremes of correlation each fruit has. The result of the study shows an accuracy of 97.15% in dataset training. The results of lemon and satsuma gave a positive moderate correlation while the Meyer lemon show more potential of positive correlation compared to other fruits. Lima orange somehow gave a negative correlation compared to other stated fruits.

Keywords

Acidity, Neuro-Fuzzy Algorithm, Citrus Fruits, Ripe, Rotten



Augmented Deep Learning for Enhanced Early Brain Tumor Detection

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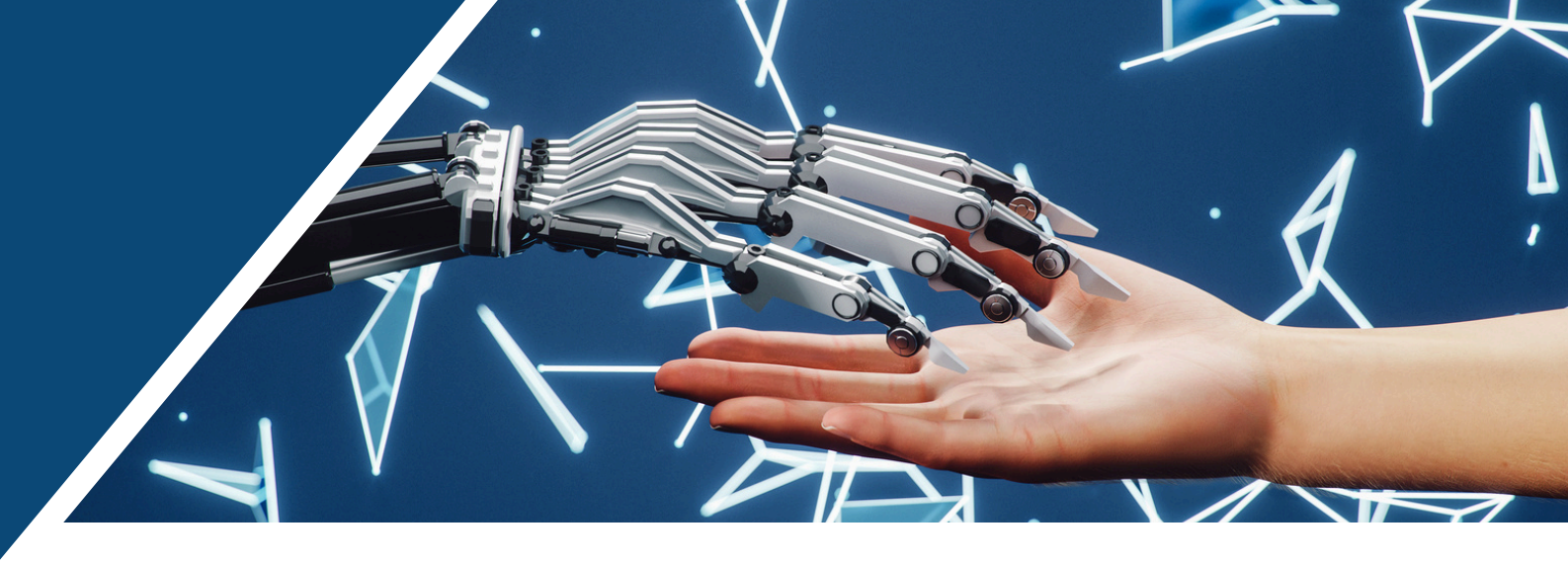
Abstract
Early detection of brain tumor with high accuracy remains challenging in the medical field. Early diagnosis of brain tumor makes patients' survival chances higher. Deep learning with pretrained networks has been widely used to improve the accuracy of detection. The aim of this study is to use transfer learning to detect brain tumor from Magnetic Resonance Imaging (MRI) images. Image augmentation is implemented before the training of the deep learning network as a pre-processing step. The images were augmented using random X-Axis reflection, random translations and random scaling. This data preparation resulted in high quality dataset that improved the accuracy of the classification process. The model was trained using three different neural networks; ResNet-50, VGG-19, and DenseNet-201. The achieved accuracy was 99.3%, 99.7%, and 99.83%, respectively, which outperformed current brain tumor detection classifiers. This research methodology paves the way for future work aimed at classifying other tumor types with a similar achieved high accuracy.

Keywords
Brain Tumor, Deep Learning, Image Augmentation, VGG-19, ResNet -50, DenseNet-201



Electricity Load Forecasting using Attention-based Hybrid Deep Learning Model

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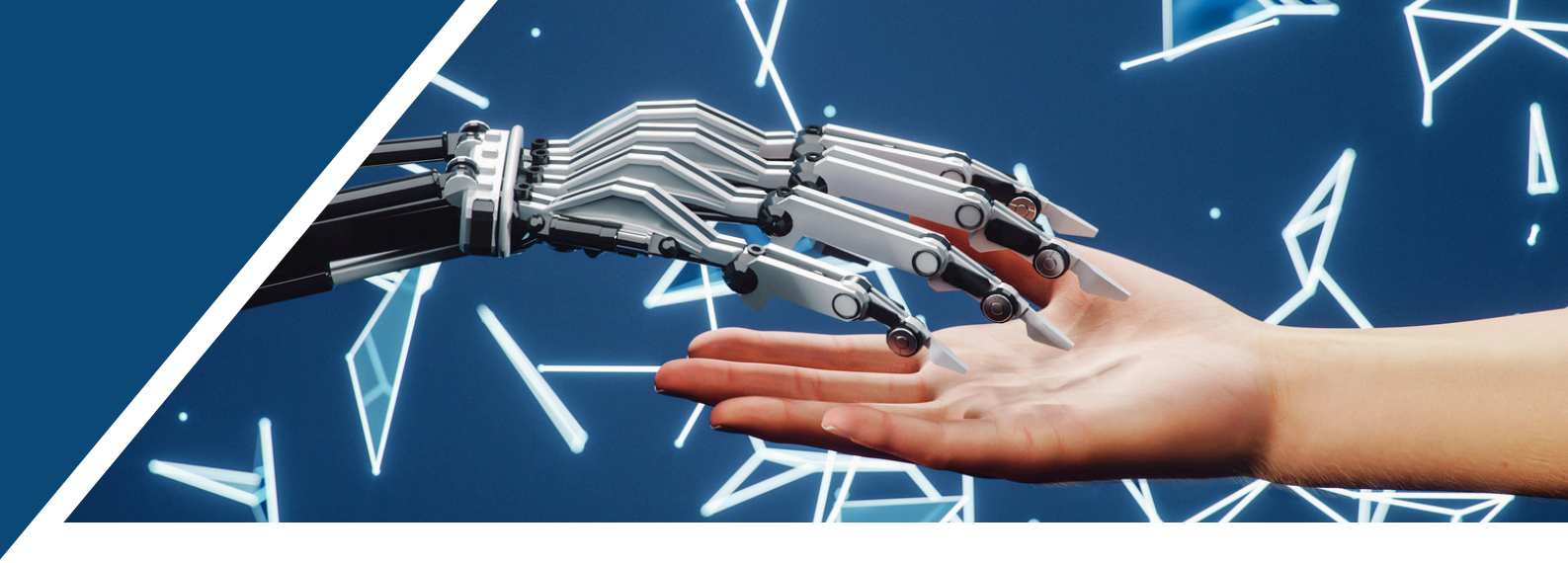
Meta Platforms Inc., Menlo Park, California, United States
School of Information Engineering, Chang'an University, Xi'An, China

Abstract

With the increasing demand for clean energy, there is a growing requirement for accurate load forecasting due to increased electricity usage. This research implements the attention-based mechanism using a convolutional neural network (CNN) based on a bidirectional LSTM model (CNN-BiLSTM) for short-term electrical load prediction. The main objective is to improve forecasting accuracy by incorporating attention processes into the CNN-BiLSTM architecture. The models are trained and tested using historical electricity data. The Attention-based CNN-BiLSTM model is compared with the BiLSTM and CNN-BiLSTM models. The results indicate that the Attention-based CNN-BiLSTM model is better than others, showing higher accuracy, lower root mean square error, and stronger correlation coefficients. The results indicate that incorporating CNN layers and attention processes into the BiLSTM model greatly improves load prediction accuracy, especially for 3-day and 7-day electricity forecasts.

Keywords

Load Forecasting, Electricity Load, Attention Model, Hybrid Attention Model, CNN-BiLSTM



Trajectory Planning of Stratosphere Airship in Wind-Cloud Environment Based on Soft Actor-Critic

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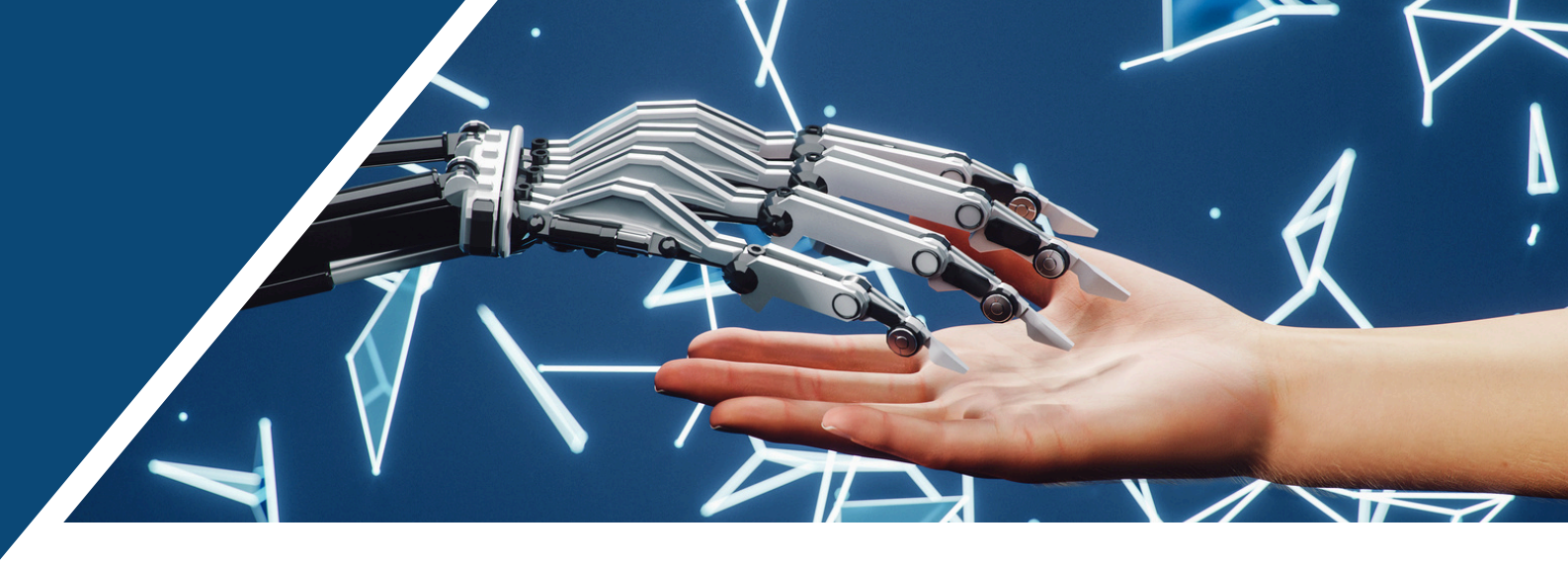
Institute of Unmanned System, Beihang University, Beijing, China

Abstract
The trajectory planning for stratospheric airships needs to consider the following issues: the motion characteristics of airships make the airship susceptibility to wind field disturbances; High-altitude cold clouds can change the thermodynamic equilibrium of lifting gases by altering the thermal radiation received by the airship; The wind field and cloud distribution are random and have relatively high spatiotemporal complexity. This paper proposes a trajectory planning algorithm for stratospheric airships based on Soft Actor-Critic (SAC) algorithm, a policy-based reinforcement learning algorithm. The results prove the capability of this algorithm to plan the trajectory to an arbitrary region while avoiding cold clouds and optimizing energy consumption in the time-variant wind field-cloud environment. Moreover, comparative experiments are conducted with the DQN-based algorithm, demonstrating the advantages of this algorithm in trajectory planning tasks.

Keywords
Stratosphere Airship, Reinforcement Learning, SAC, Trajectory Planning



A Comprehensive Survey on Federated Learning and Its Applications in Health Care

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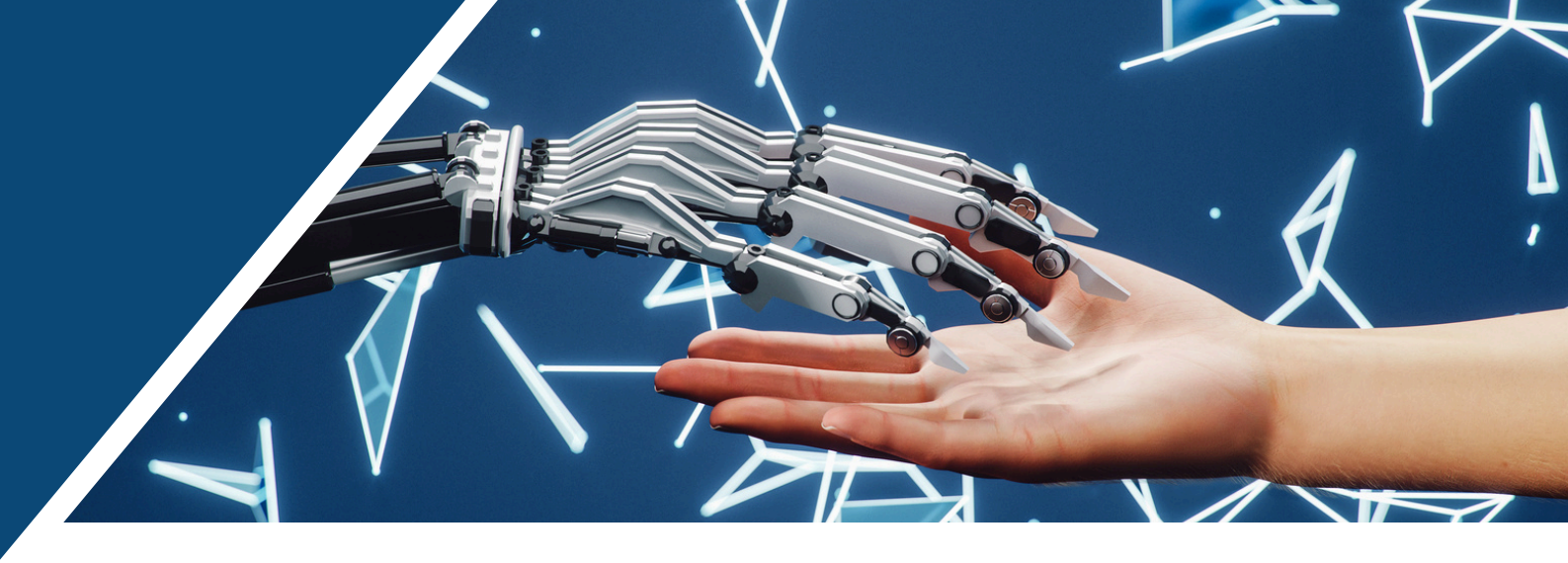
Abstract

With the advancements in the Internet of Things (IoT), data collection has become easier and quicker than ever. Data collected from various devices and organizations leads to the requirement of a special kind of processing. Traditional Artificial Intelligence (AI) and Machine Learning (ML) algorithms might not be suitable to process these big data. Apart from computational and storage concerns, preserving personal data privacy is another crucial aspect. Federated Learning (FL) is the decentralized approach that trains the models locally on the device. Only updated parameters are communicated with the global server. This will not only get the benefit of computing power of participating edge devices but also provide inherent data privacy. This paper provides a survey on state-of-the-art work done on various types of cancers, COVID-19, and medical imaging in recent times. The studies have shown improvements in prediction accuracy with a federated model trained on multiple institute data over the traditional model trained on single institute data. The article also highlights the open research issues and the recent developments in the field.

Keywords

Big Data, Machine Learning, Federate Learning, Cancer Prediction, Global Model



Pants Style Classification Using YOLOv8: An Approach for Enhanced Detection of Pants

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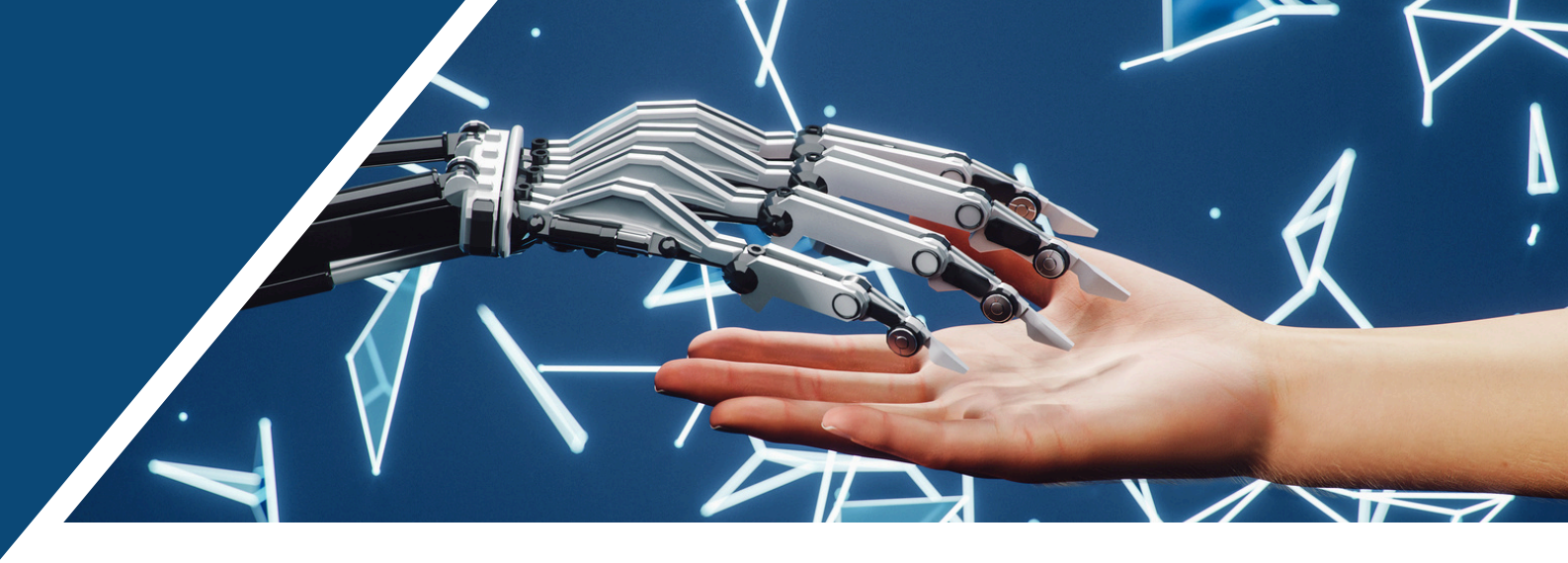
Abstract

In recent years, the fashion industry has witnessed a significant shift towards automation and digitization, particularly in garment classification and detection. This study aims to implement YOLOv8 to detect six types of pants styles: straight jeans, skinny jeans, slacks, jogger pants, cargo pants, and overalls. A portable device was created using the Raspberry Pi Camera Module 3 to capture live feeds and the Raspberry Pi 4 to classify pants styles. Datasets sourced from online repositories were employed and trained using the Python programming language with the TensorFlow library. A comprehensive testing phase, comprising three hundred samples with fifty samples per classification, was conducted. Evaluation using a confusion matrix showed the system achieved an accuracy rate of 88%. These findings highlight the potential of YOLOv8-based pants style classification in various applications, including automated inventory management, personalized shopping experiences, and fashion trend analysis.

Keywords

YOLOv8, CNN, Image Classification, Pants Style Classification, Computer Vision



Development of a Database for the Classification of the Severity of Algal Bloom with the Implementation of Support Vector Machine

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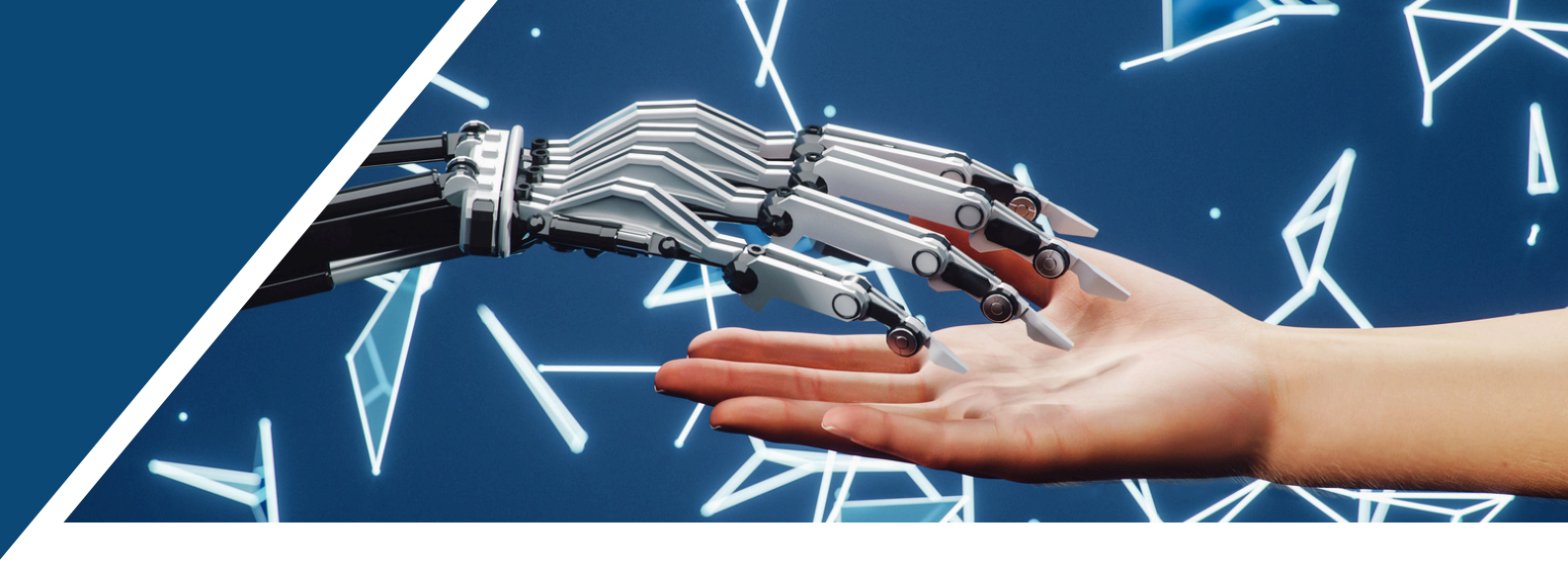
School of Electrical, Electronics and Computer Engineering, Mapúa University, Manila, Philippines

Abstract

This research focuses on the creation of a database for classifying the severity of algal blooms in water samples from Laguna Lake. The major goal was to create a system with a database that stores and classifies the severity of algal blooms based on a variety of water quality factors. Using the K-means algorithm, researchers successfully classified water quality and corresponding algal count data into three severity categories: low, moderate, and high. A prototype system using a Raspberry Pi 3 and affordable sensors was created to measure pH level, water temperature, turbidity, and total dissolved solids, and take algal count input. These measurements helped populate a database that utilizes a Support Vector Machine model to classify the severity of water samples automatically. A survey was conducted. Experts from Maynilad Water Services Inc. assessed the system's performance, confirming the correctness of the SVM predictions with a 90 percent agreement rate across 30 test samples. The generated database and classification system are expected to considerably improve predictive capacities and management techniques for dealing with algal blooms, providing an essential environmental monitoring and research tool.

Keywords

Algae Bloom, Database, K-Means Algorithm, Laguna Lake, Support Vector Machine



Facial Recognition with Deblurring Component (RL Deconvolution) Utilizing MATLAB and OpenCV for Household Surveillance

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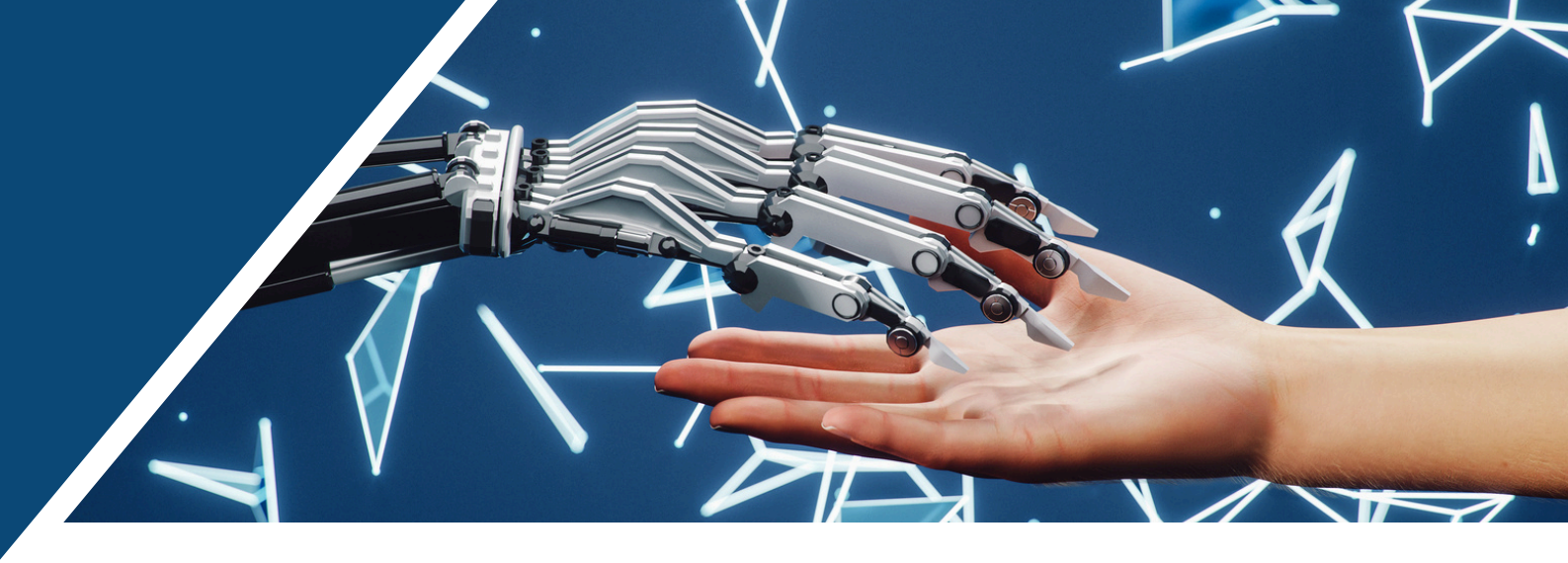
Abstract

The study tackles the challenge of developing a facial recognition in household surveillance systems through the integration of image deblurring techniques. Particularly, it examines the use of Richardson-Lucy (RL) deconvolution, coupled with Speeded-Up Robust Features (SURF) for feature matching, to enhance the clarity of images blurred by motion. The research was conducted using a system developed in MATLAB GUI with OpenCV, focusing on the dual objectives of improving facial recognition accuracy and image quality under motion blur conditions. Various testing was conducted to measure the system's performance, demonstrating that RL deconvolution significantly enhances both the image clarity and the effectiveness of facial recognition, with marked improvements in detection accuracy and Peak Signal-to-Noise Ratios (PSNR) in which it achieved an average value of 29.43dB. Uncontrolled deblurring tests using real-life blurred images demonstrated average success, reflecting the inherent challenges of deblurring images with complex and unpredictable blur patterns. The facial recognition system achieved an accuracy of 96.7% in optimal feature matching threshold which is set at 30. However, performance declined with increased facial occlusion and varying angles, emphasizing the need for further refinement. Lowering the thresholds generally resulted in higher sensitivity, capturing more true positives but at the cost of increasing false positives. While increasing the thresholds enhanced precision by effectively reducing false positives but also increased the risk of false negatives, missing some true matches.

Keywords

Image Deblurring, Image Processing, Deconvolution, Feature Matching, Facial Recognition



Speech Emotion Recognition in Filipino Spoken Language Using Deep Learning

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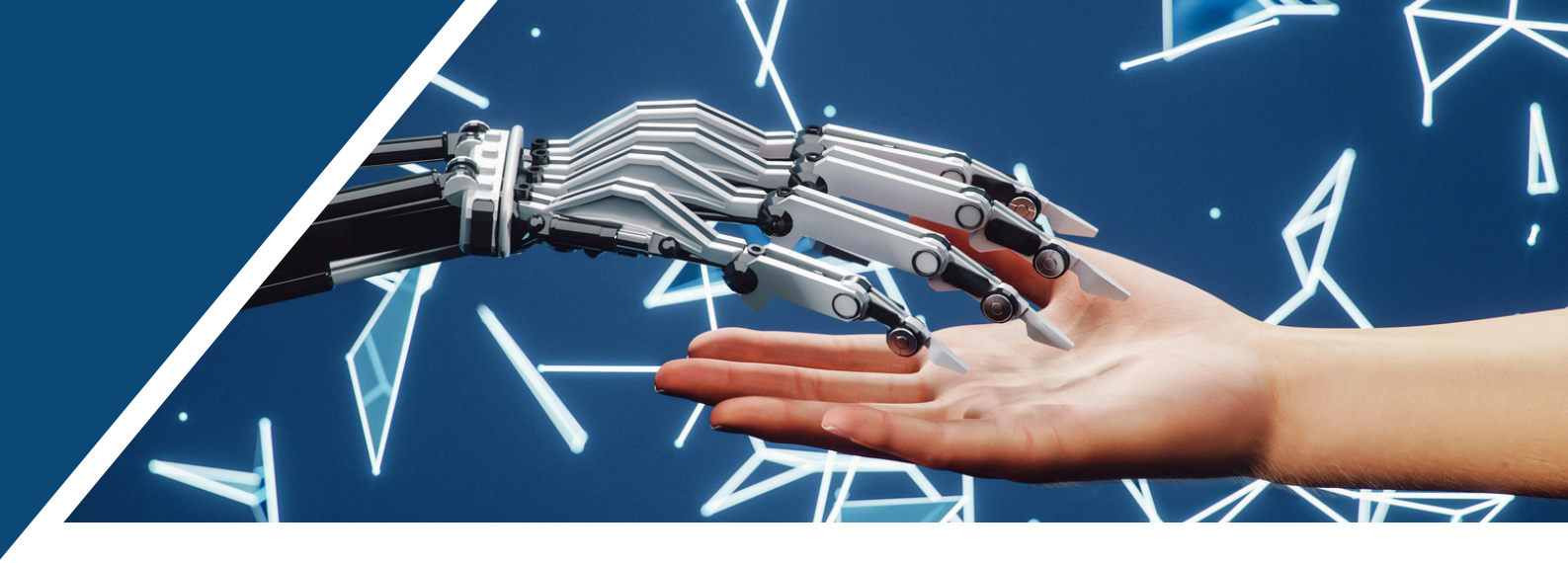
Abstract

SER, or Speech Emotion Recognition, is an essential research area with implications in numerous sectors. However, implementing SER for languages with limited resources presents substantial obstacles, primarily due to data scarcity, which often results in overfitting. Overfitting is a phenomenon where a model excessively learns from training data, which subsequently hampers its effectiveness on new data. To mitigate these issues, several strategies have been suggested by researchers, including transfer learning method, synthetic data generation using GAN or generative adversarial network and hyperparameter tuning. These methods aim to augment the efficiency of SER systems in low-resource languages. The study focuses on speech emotion recognition in the Filipino language. Audio data are extracted from YouTube, which comprises Filipino movies, TV series, interviews, and other content available. The Deep Convolutional Generative Adversarial Network, often abbreviated as DCGAN, is a mechanism employed for the creation of artificial or 'synthetic' data. The five (5) classes of emotions include Sadness, Anger, Fear, Sarcasm, and Neutral. Transfer learning with hyper tuning of parameters of VGG19 architecture was used to build the SER classification model. The training accuracy is 97%, and 95% for testing accuracy. The study concludes that the model enhances the baseline accuracy for the Filipino SER.

Keywords

VGG19, DCGAN, Transfer Learning, Synthetic Data, Filipino Language, SER, Low Resource Language, Hyperparameter Tuning, Overfitting



A Deep Learning Based Ensemble Approach for Gastrointestinal Disease Detection with XAI

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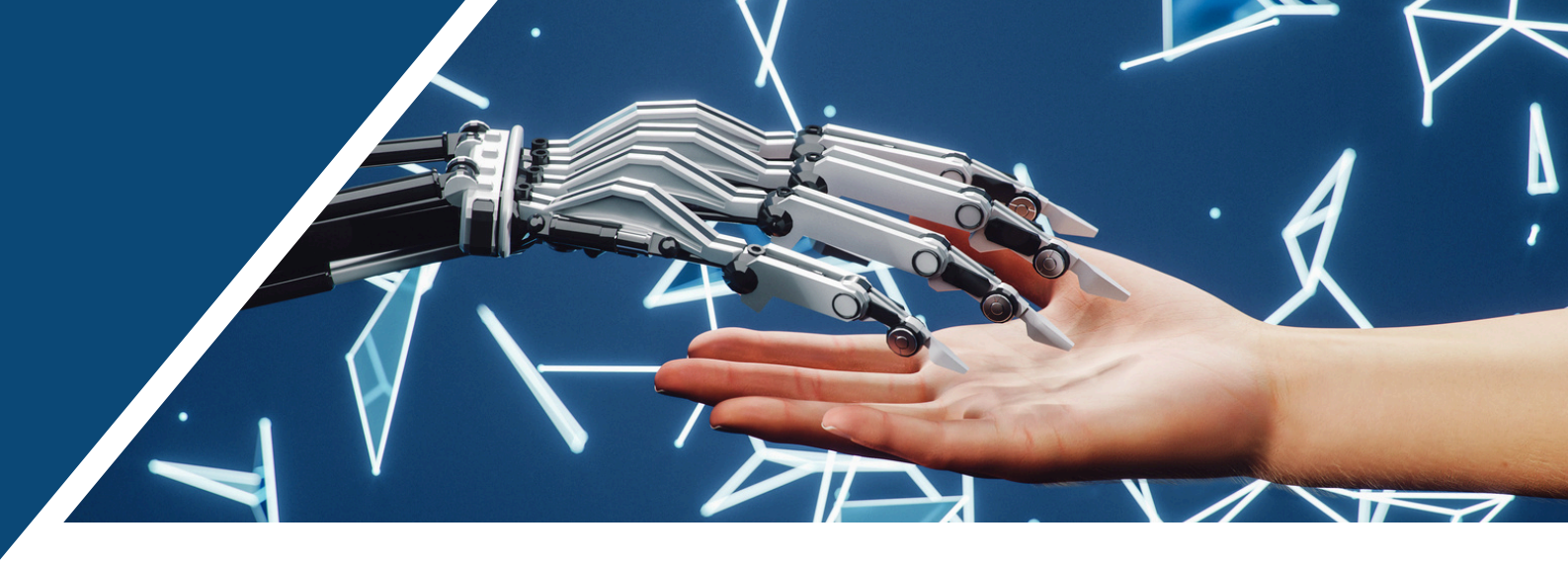
Department of CSE, Daffodil International University, Dhaka, Bangladesh

Abstract

Gastrointestinal (GI) diseases are one of the most prevalent health issues in many parts of the world. It contributes to a number of other severe illnesses, such as esophagitis, ulcers, polyps, diarrhea, abdominal pain, abdominal swelling, gastrointestinal hemorrhage, intestinal blockage, malabsorption, or malnutrition. The early diagnosis and treatment of individuals with GI diseases are extremely important for their recovery due to these reasons. Gastroenterologists often use endoscopic images to detect GI abnormalities and because of the growing amount of patients and data, it is getting harder and harder. A deep learning-based approach can be a viable solution in this regard. In order to identify three various types of GI disorders, this study aims to offer an ensemble technique based on a unique Convolutional Neural Network architecture and other pretrained models. The ensemble model exhibits training and validation accuracy on Kvasir, a multi-class image dataset for computer assisted gastrointestinal illness identification, of 98.95% and 98.00%, respectively. Moreover, the results have been visualized using Explainable AI (XAI) technique called Local Interpretable Model-agnostic Explanations (LIME).

Keywords

Convolution Neural Network, Deep Learning, Pretrained Models, Gastrointestinal Diseases, Classification



Development of a Computer Vision Application for Copra Meat Cooking Detection and Classification using YOLOv8 Architecture

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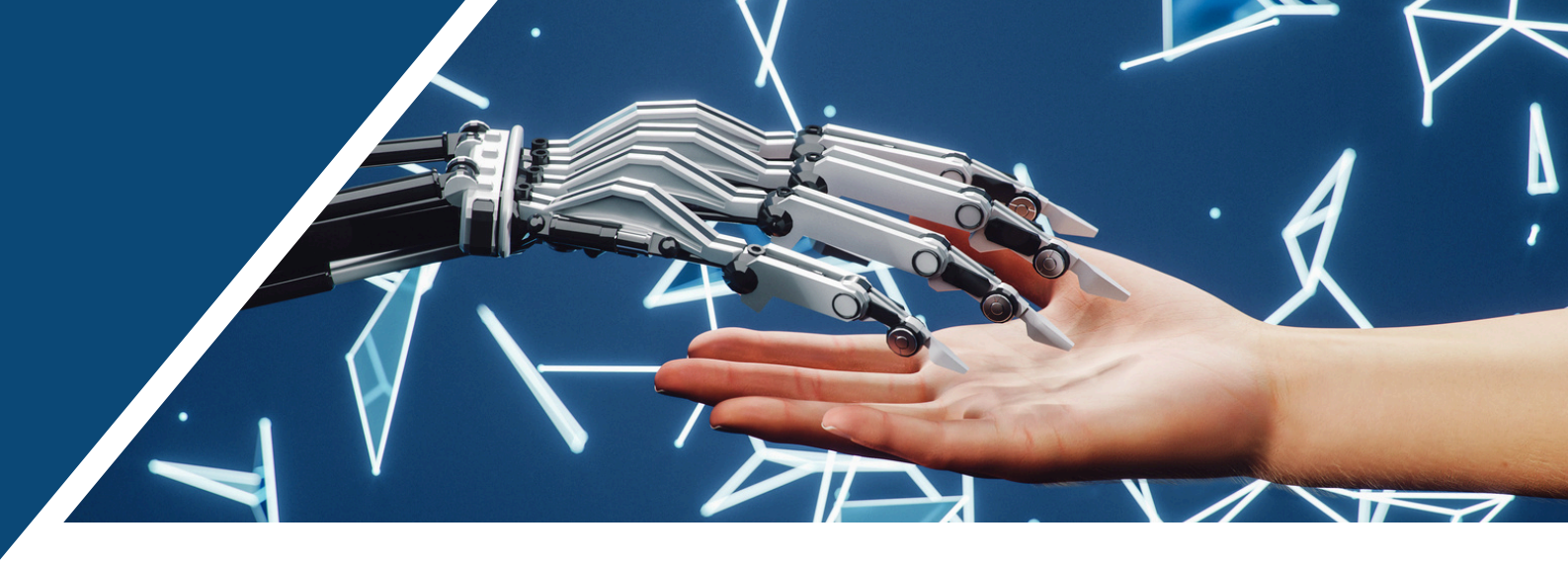
Abstract

Traditional quality assessment methods of copra cooking are labor-intensive and subjective, underscoring the need for automated solutions. This study introduces a copra meat detection and classification application using the YOLOv8 architecture. The hardware setup comprises a custom-built box equipped with a high-definition camera. The software employs YOLOv8 integrated into a Tkinter-based application for real-time image processing. The model achieved an accuracy of 84.40% in live testing, as evaluated using a confusion matrix, indicating robust performance despite slightly lower accuracy in detecting over-cooked copra. Accuracy rates for each class were also determined: under-cooked copra achieved 90%, perfectly-cooked copra reached 86.67%, and over-cooked copra achieved 76.67%.

Keywords

Copra Meat Detection, Computer Vision, YOLOv8, Real-time Detection, Machine Learning, Application, Object Detection



SCAAV: Sensored Cane as an Alternative Aid for Visionless

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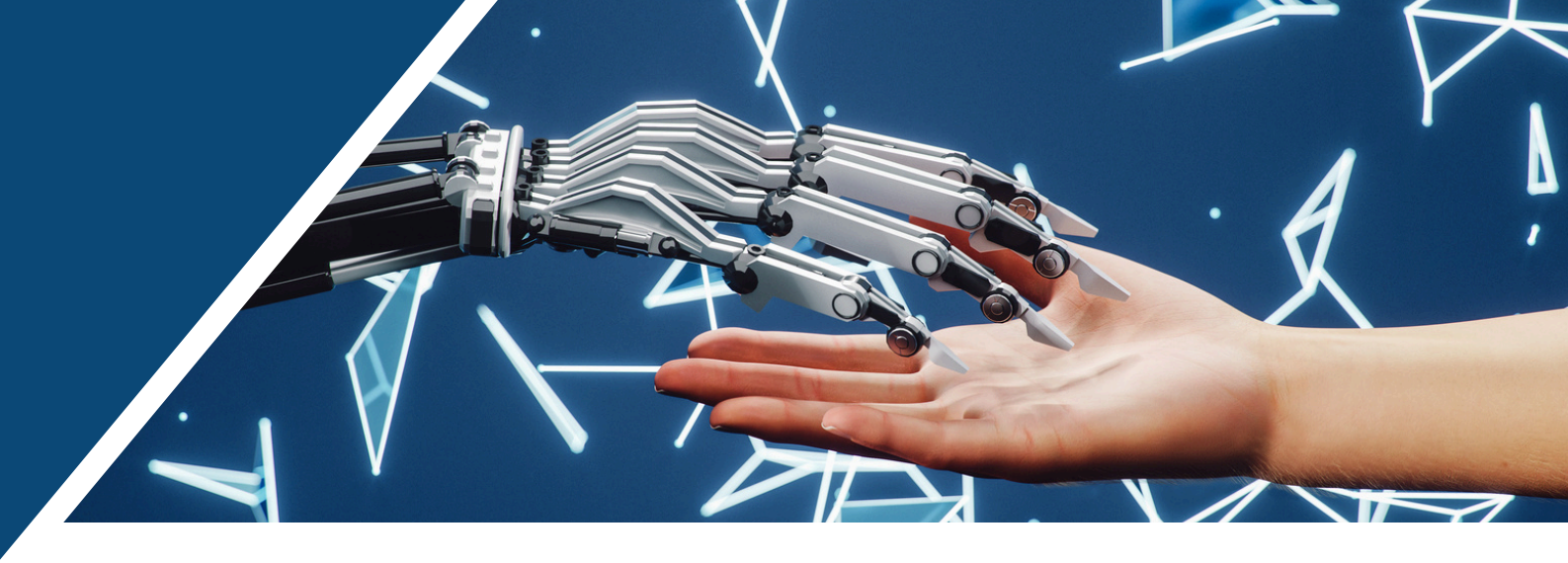
Abstract
Blindness results from various conditions causing vision loss, impacting mobility. To address this, a specialized assistive technology using Raspberry Pi 4 Model B, camera, sensor, and speaker is designed. It assists people with varying degrees of vision impairment, from total blindness to normal vision. Training includes data from six object recognition studies/products. Testing covers obstacle detection, object recognition, guidance, and audio feedback compared to other cane devices. The prototype achieved 80% accuracy in object detection, 65.32% in object recognition, and 71.43% in audio feedback.

Keywords
Blindness, Vision Loss, Mobility Impairment, Assistive Technology, Raspberry Pi 4 Model B, Camera, Sensor, Speaker, Vision Impairment, Object Recognition, Obstacle Detection, Guidance, Audio Feedback, Prototype, Smart Cane



Enhancing Exercise Efficacy: A Predictive EMG Analysis for Dumbbell Press Workouts

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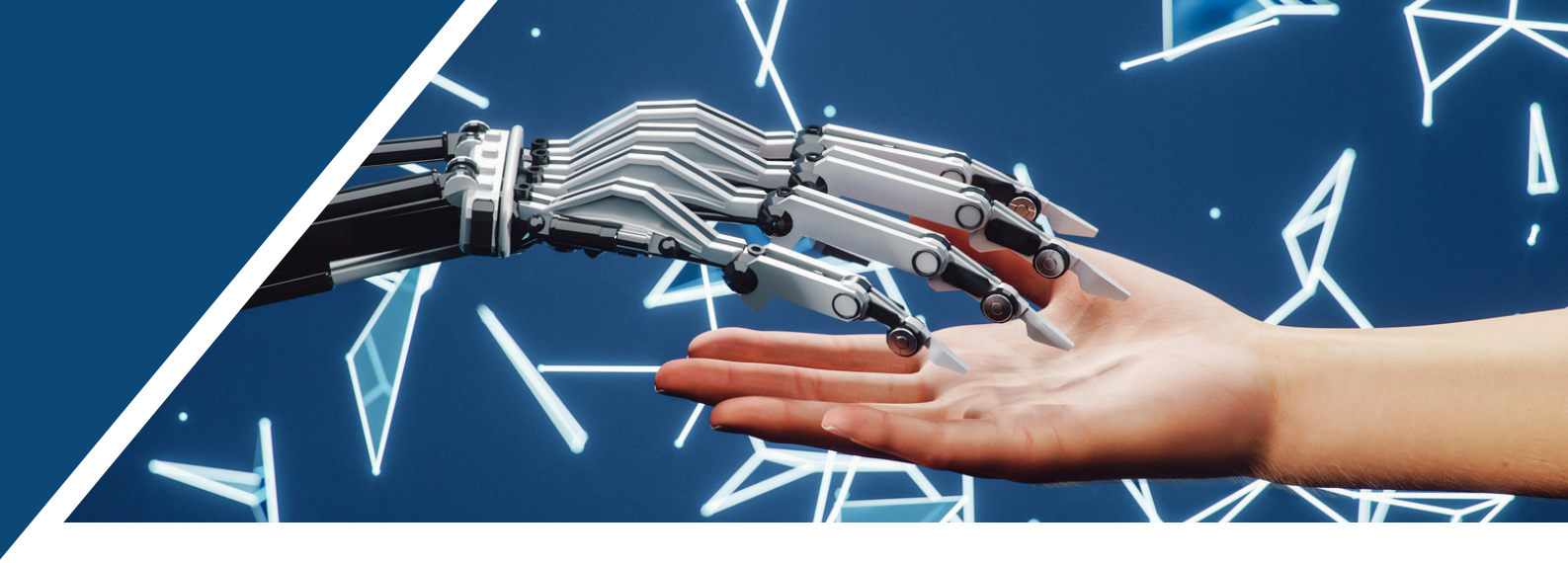
Dept. of Computer Science and Engineering, PES University, Bengaluru, India
Dept. of Physiotherapy, Ramaiah Memorial Hospital, Bengaluru, India

Abstract

The current paper describes a preliminary model that would help improve the dumbbell press exercise through the use of electromyography (EMG). The model recognizes the optimal and marginal repetitions in sets based on the analysis of the EMG data from the pectoral and deltoid muscles. The model provides features like load, rest, and technique hints for set modifications that will improve set quality and minimize nonoptimal repetitions in order to provide safer and more efficient training. The findings of this study can be used to give customized training advice by presenting immediate feedback according to individual EMG patterns. The data used in this study is self-reported and obtained from two participants who have previous experience exercising, so they are aware of the movements done. Additionally, a positive feedback system was established, a formula for dynamic adjustment of the exercise plan, taking into account the fitness and experience of the participants was introduced, which improved the effectiveness of the exercises. The proposed paradigm helps to optimize training outcomes in strength and conditioning programs regarding the maximization of exercise performance and the minimization of the injury risk. The study entails three series of exercise tasks at varying angles with participants completing multiple sets of exercises and EMG data collected. A three-layers Artificial Neural Network, Random Forest Classifier, Logistic Regression and Long Short-Term Memory (LSTM) models were used, and it was observed that the models were highly accurate in the classification of exercise quality and the feedback generated could help in improving performance

Keywords

Sport Performance Testing and Optimization, Electromyography (EMG), Signal Classification, Machine Learning



Classification of Pathogenic Molds on Peanuts Using Image Processing and CNN

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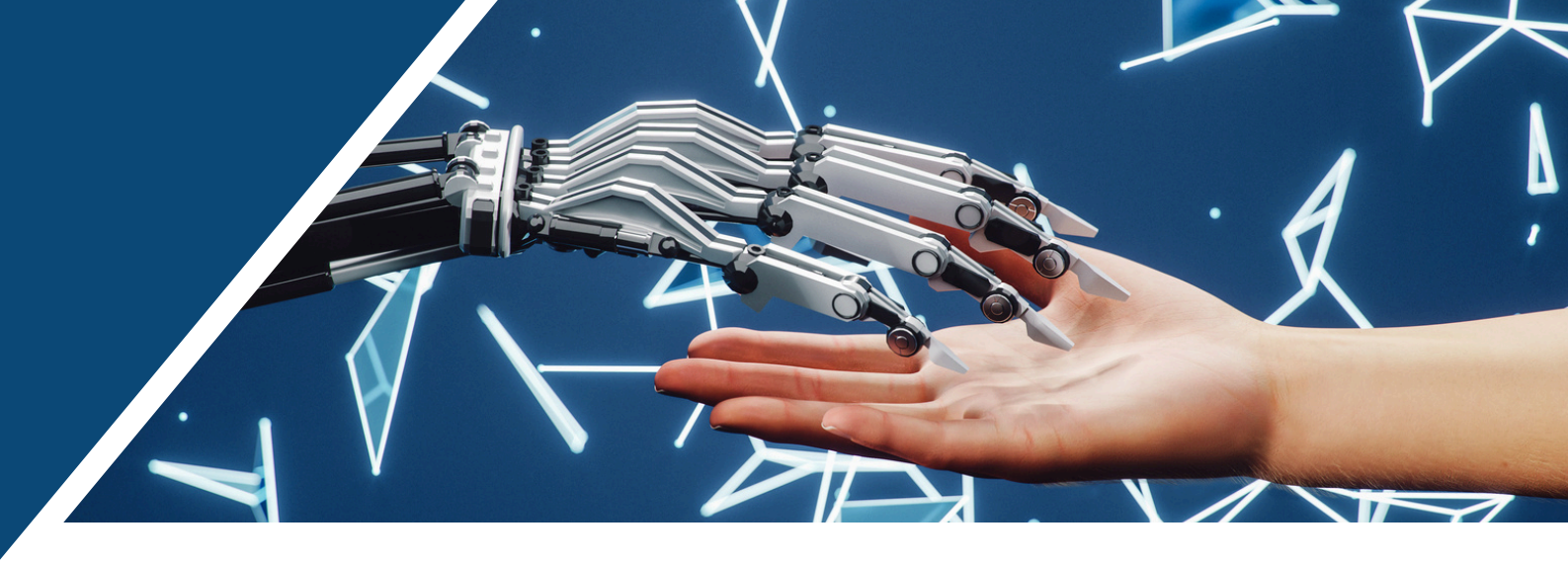
School of Electrical, Electronics, and Computer Engineering, Mapúa University, Manila, Philippines

Abstract

Contemporary research has manifested the advantages of applying computer vision and deep learning in various fields, such as agriculture and biology. This study combines image processing and Convolutional Neural Network (CNN) to identify and classify two kinds of pathogenic molds on peanuts (Arachis hypogaea) through their macroscopic and microscopic views. The researchers successfully developed a prototype that classifies Rhizopus sp. and Penicillium sp. on peanuts using the YOLOv8 algorithm on the Raspberry Pi 4. The image dataset was collected by constituting two separate mold cultures and by deliberate contamination of peanuts inside the laboratory. Key features such as structure, shape, and colour were extracted from peanut and mold images. The overall system accuracy reached 94.44%. The macroscopic segment reached a mean average precision (mAP) of 99.5%, while the microscopic segment reached 86.9% mAP. The current model may be optimised further in future studies through the expansion of datasets, experimentation with alternative image processing techniques, and utilisation of more advanced hardware.

Keywords

CNN, Raspberry Pi, YOLOv8, Microscopic View, Pathogenic Molds



A Hybrid Model for Deciphering Doctors Handwriting Notes Recognition

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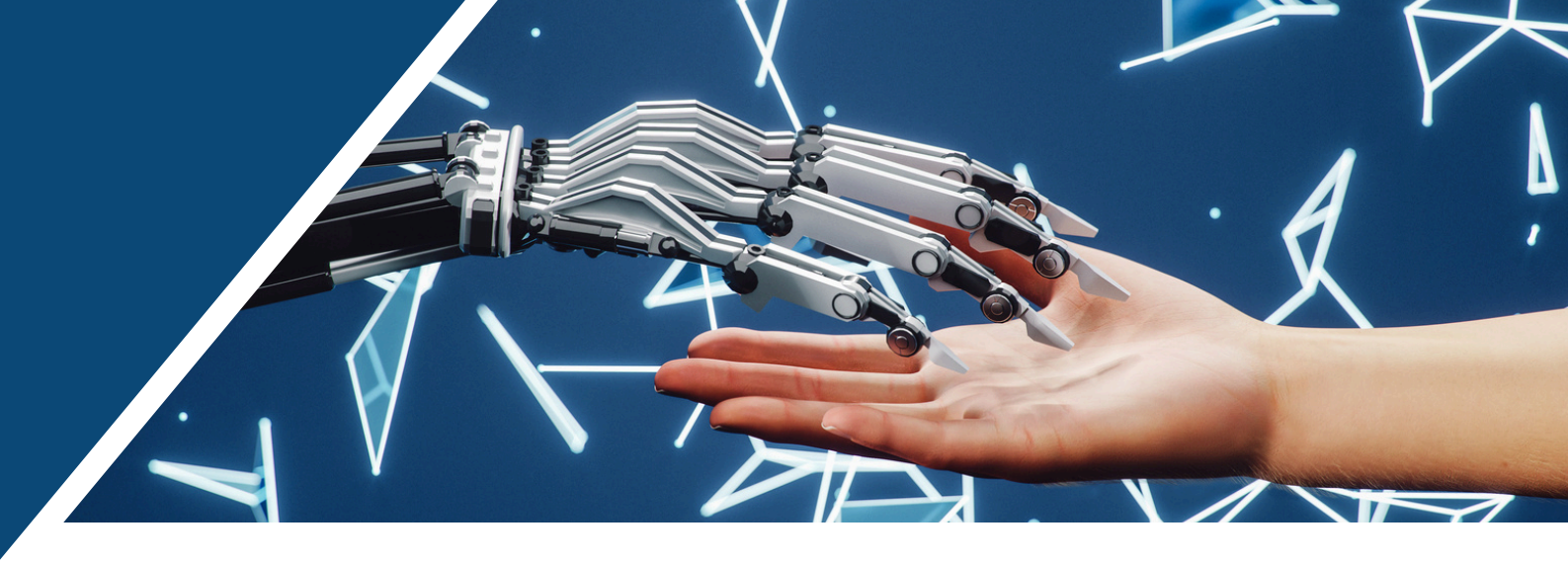
Abstract

Handwritten Text image Recognition (HTR) in medical profession has become the major challenge due to the complexity of doctors' handwriting styles and the critical need for precise and efficient text recognition. This study proposes an innovative approach that combines the power of Bidirectional Long Short-Term Memory networks (BLSTM) and Convolutional Neural Networks (CNN) to address these challenges effectively. The proposed model harnesses the bidirectional capabilities of BLSTMs to capture contextual dependencies within doctors' handwritten notes, enabling it to understand and interpret handwriting more accurately. Additionally, CNNs are employed for feature extraction, enabling the model to recognize salient patterns and representations within handwritten text images. This paper presents comprehensive experiments conducted on a diverse dataset of doctors' handwritten notes, demonstrating the model's superior performance compared to conventional approaches and outperform the existing work in terms of accuracy. Two different crucial metric word error rate and character error rate are accessed through the combination of BLSTM and CNN that yields state-of-the-art accuracy, robustness to variations in handwriting styles, and remarkable adaptability across various medical document in context of Nepal.

Keywords

Handwritten Text Image, Bidirectional Long Short-term Memory Network, Convolution Neural Network, Word Error Rate, Character Error Rate, Accuracy



Smart Industrial Machine Management and Control System Based on IoT

Pritom Sadhu, Arajit Saha, Md. Abdul Muttalib Moon, Md. Asaduzzaman Fahim, Sumayea Alam Sara, Sazib Hosen, Salman-EAdmia, Munmun Akond, Kh. Asekur Rahman, D.M. Idid Ibne Asad Enan

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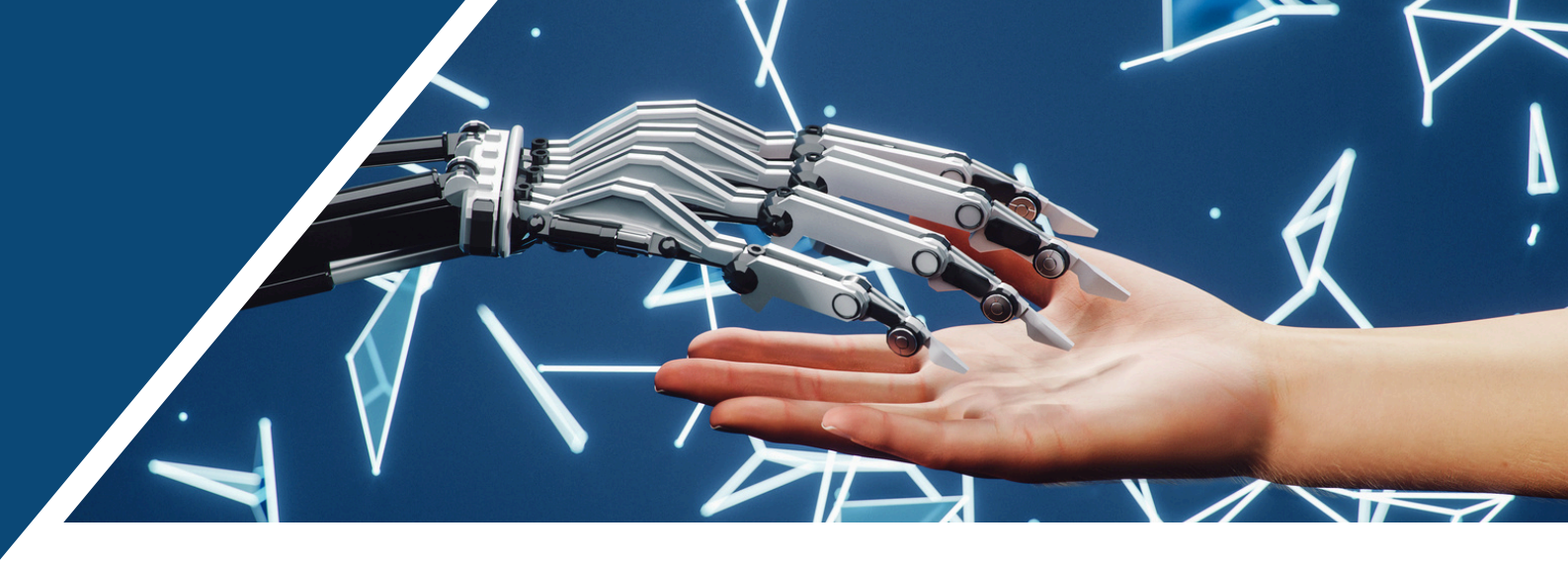
Abstract

Nowadays, several unexpected accidents have occurred in industrial companies, resulting in significant destruction, property damage and, most importantly, loss of worker life. At this point, worker's security and safety have become a significant concern everywhere. On the contrary, technological advancements take precautionary measures to a whole new level in today's world. Aside from this, there is significant demand for industrial sensor monitoring to ensure workers' safety. So, utilizing the Internet of Things (IoT) technology to manage industrial machinery and improve safety in the workplace, which is also known as IIoT. In addition, "Industrial Internet of Things (IIoT)" refers to a system of interconnected devices used in industrial applications essential to monitoring and managing machines and crucial elements of an industry. Therefore, an IoT-based system has been proposed to monitor and control machines. This study provides a cost-effective and reliable system consisting of a microcontroller, various sensors, and software that can precisely monitor and control industrial machines and collect and store real-time data. Furthermore, the entire system is controlled by a Wi-Fi module microcontroller, which notifies the user in times of any hazardous situation with suggestions of possible solutions. The suggested system effectively monitors and controls the functionality of machines and improves workplace safety.

Keywords

Industrial Internet of Things (IIoT), Internet of Things (IoT), Industrial Machine Management, Industrial Machine Control, Remote Monitoring, ESP-32 Micro-controller



Unmanned Aerial Vehicle-enabled Deep-Learning Based Detection and Segmentation

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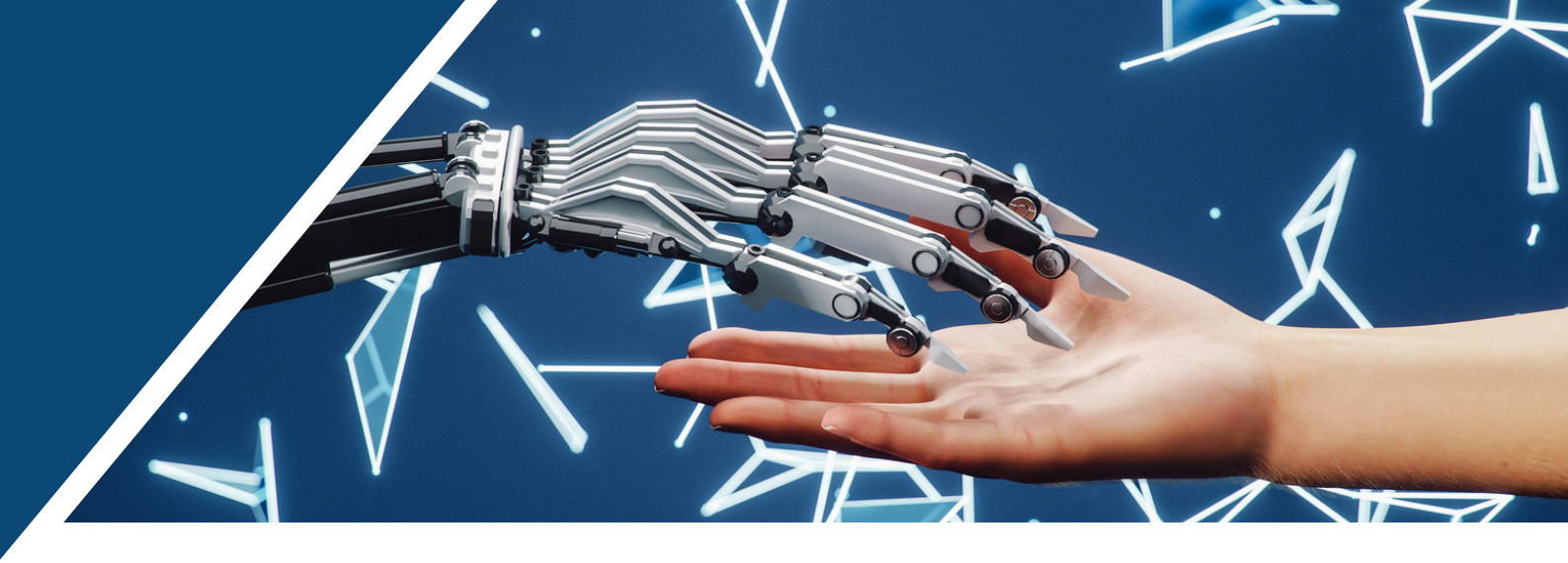
Abstract

Pine wilt disease (PWD) must be precisely located and detected early in order to be managed and prevented from spreading. A deep-learning framework for segmenting and identifying PWD in pine trees is presented in this paper using a UAV. The researcher method uses unmanned aerial vehicle (UAV) imagery to accurately identify infected trees. The researcher method uses unmanned aerial vehicle (UAV) imagery to accurately identify infected trees. In order to do this, the researcher used YOLOv9 for PWD identification, ResNet18 with DenseNet121 for PWD and nonPWD category categorization, and TransUNet for segmenting probable PWD regions. Data augmentation was used to prevent overfitting and improved the accuracy of the model. Subsequently, a deep learning model is trained to precisely segment areas affected by disease. The proposed YOLOv9 model for Pine Wilt Disease (PWD) detection achieved an accuracy of 80%. The proposed ResNet18 with the DenseNet121 model achieved an overall accuracy of 95.21% in classifying PWD and nonPWD instances. The proposed model in the segmentation of PWD was the TransUNet which achieved an accuracy of 92.39%. The results of the study demonstrate the improvement of performance in detecting pine wilt disease, which can be used for effective monitoring of pine trees.

Keywords

Pine Wilt Disease, Forest Health Monitoring, UAV Imagery, Deep Learning



Development of a Computer Vision Application for Mango (Mangifera indica L.) Fruit Defect Detection Using YOLOv8 Architecture

Kaycee Kaye Villanueva, Juvy Amor M. Galindo, Apple Joy R. Tamayo, Jamie Eduardo C. Rosal, Daryl Ivan E. Hisola
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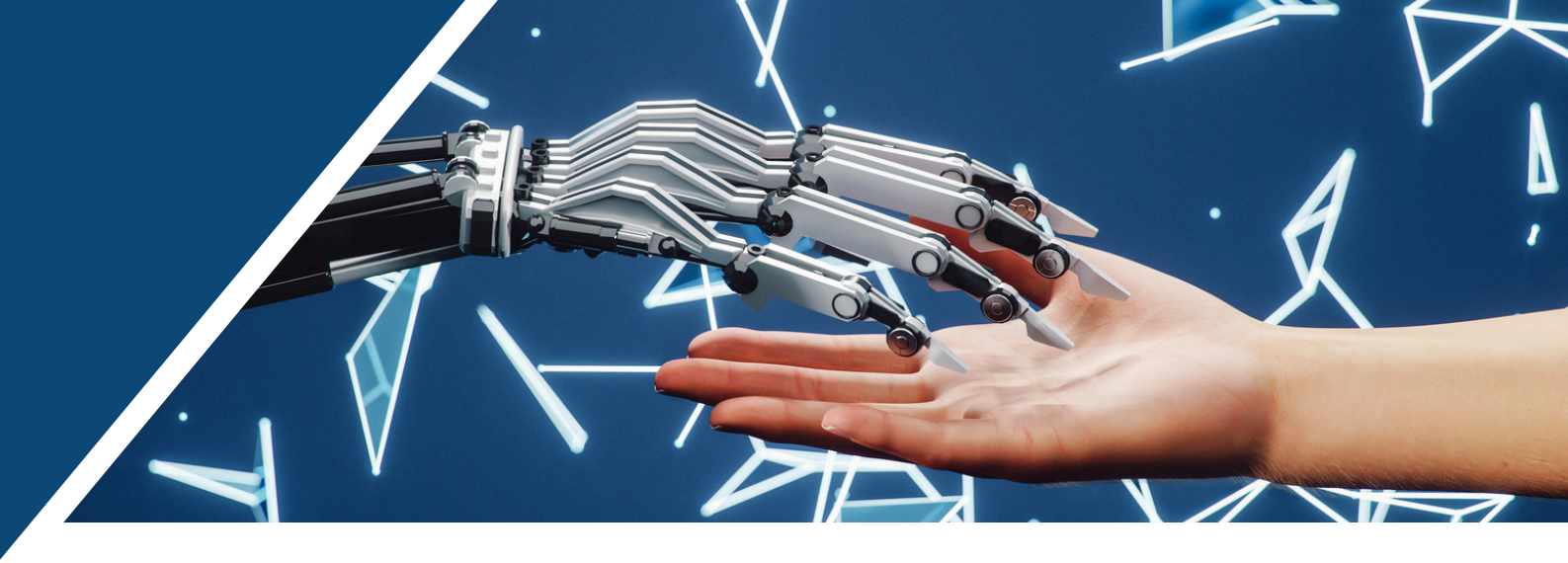
Abstract

This study investigates the utilization of YOLOv8 architecture to detect and categorize defects in 'Carabao' mangoes, using machine learning and object detection methods, the model was trained on a dataset comprising 2,160 annotated images, augmented to enhance performance. Results demonstrated high accuracy rates: 100% for black spot, 80% for brown spot, and 83.33% for mango scab in real time application. The model exhibited a mean Average Precision (mAP) of approximately 95% across IoU thresholds ranging from 0.50 to 0.95, with 70% at an IoU threshold of 0.50, highlighting its precision in object detection. Additionally, the average recall rate was an impressive 93%. A custom-built controlled environment ensured consistent and detailed imaging, while software implementation integrated the YOLOv8 model into a Tkinter-based application for real-time image processing and defect classification. This study underscores the effectiveness of the YOLOv8 architecture in mango defect detection, particularly for appearance-based defect classification.

Keywords

Mango Defects, YOLOv8 Architecture, Object Detection, Computer Vision, Machine Learning



Adaptive Traffic Signal Control using Genetic Algorithm for a 2×2 Traffic Network

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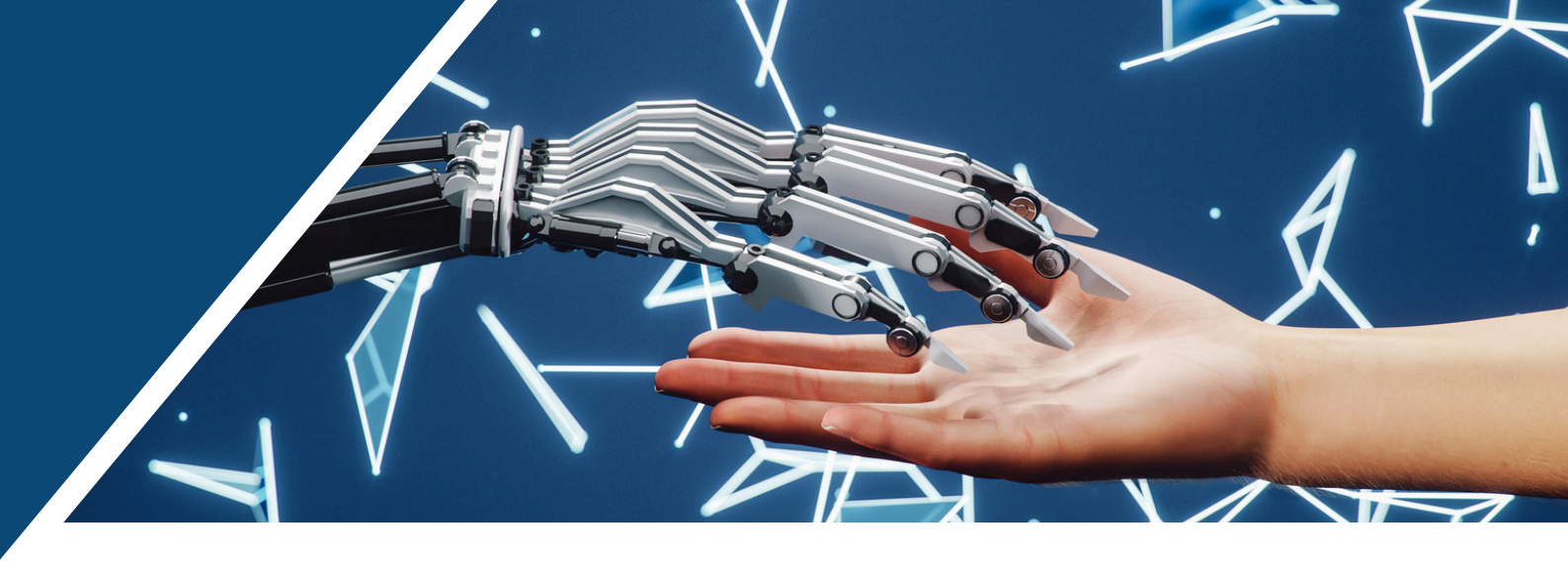
Abstract

This paper proposes an adaptive traffic signal control (ATSC) system optimized using genetic algorithm (GA) to reduce travel delays at multiple intersections. The growing urban population has caused significant traffic congestion, leading to wasted time, higher costs, and fuel waste. The main aim is to enhance traffic optimization performance by improving ATSC signal timings at multiple intersections, optimized using GA. A 2×2 grid traffic network is developed to represent the multi-agent network, and the GA-based traffic optimizer is formulated to optimize traffic signals based on the traffic inflow rate. The performance of the GA-based signal optimizer is evaluated and compared with pretimed traffic control based on the average delay and queue length of vehicles passing through the intersections in undersaturated and saturated traffic. The simulations results show a decrease of 4.7 % (1.7 s) in delay and 6.8 % (0.6 pcu) in queue length for GA-based traffic control during undersaturated traffic scenarios, and a decrease of 18.7 % (8.4 s) in delay and 14.1 % (1.8 pcu) in queue length during saturated traffic scenarios. These results highlight the effectiveness of the GA-based signal optimizer in managing traffic flow in a multi-agent-based signalized traffic network. This paper provided a valuable contribution to the field of traffic signal optimization, particularly in urban settings where congestion is a significant issue.

Keywords

Genetic Algorithm, Adaptive Traffic Signal Control, Multi-agent System.



Optimizing Temporal Segmentation of Multi-Modal Non-EEG Signals for Human Stress Analysis

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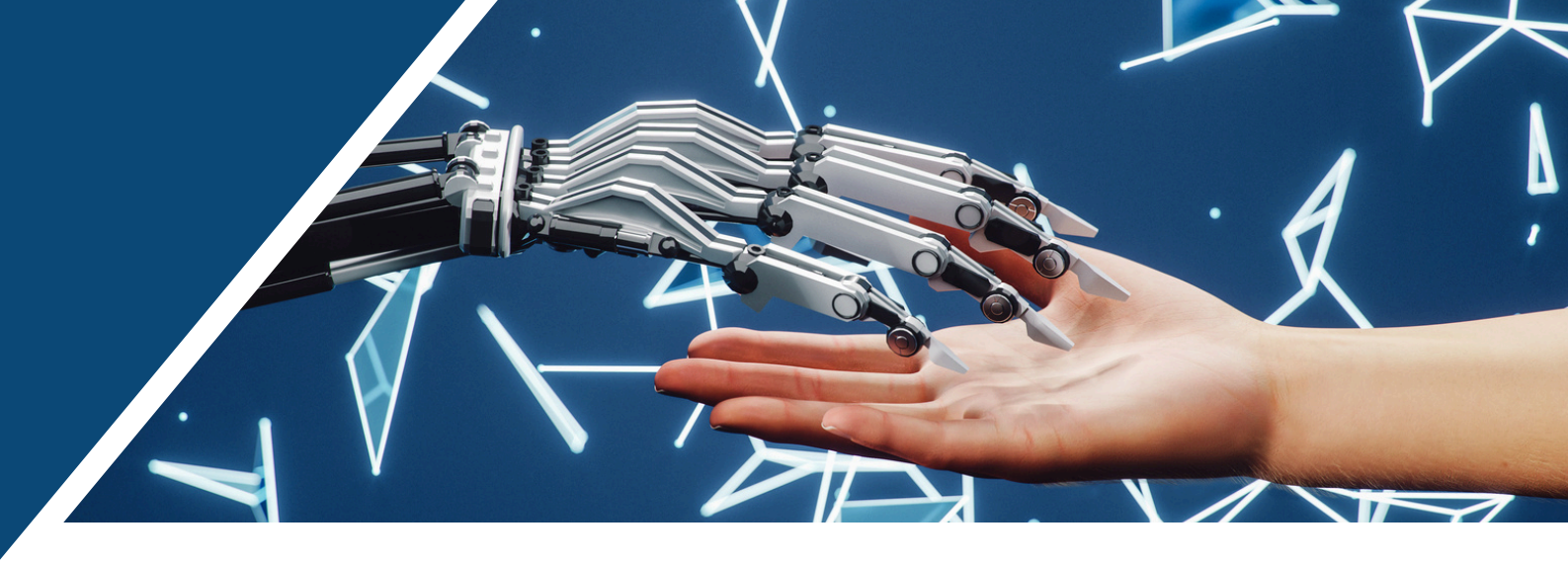
School for Sustainable Futures, Amrita Vishwa Vidyapeetham, Amritapuri, India
School of Information Technology, Deakin University, Burwood, Australia

Abstract

Prolonged or severe exposure to stress is the underlying etiology of several diseases. Stress is a defensive mechanism that follows multiple stages of physiological responses, culminating in adaptation or coping of the body. However, frequent occurrence of stress can lead to fatal mental and physical consequences. Hence incessant stress monitoring in subjects, even during routine tasks, is vital. More critical is the identification of stress during its early onset, when the physiological response is at its peak. Quantifying stress using EEG based technology has been prevalent for the past several decades. But due to its lack of portability and the comparatively early stages of single channel acquisition devices, use of EEG based devices for continuous remote stress monitoring is quite impractical. The most suitable alternative is human stress analysis through non- EEG physiological signals acquired using wearable devices like smart watches and electronic finger rings. This paper investigates continuous stress monitoring using features from non-EEG signals such as acceleration (movement, gravity, noise), temperature, electrodermal activity, arterial oxygen level, and heart rate. Data from 20 healthy subjects was collected during Relaxation, Physical stress, Cognitive stress, and Emotional stress states. Sample epochs were temporally segmented into windows representing the onset, sustenance, and offset of stress. Eighty-one linear and non-linear measures were extracted from each windowed epoch. Stress state identification was performed using Logistic Regression and Random Forest models, with performance evaluated via stratified 5-fold cross- validation. Findings indicate stress impacts are greatest at onset, with 1-minute and 2-minute windows yielding higher classification accuracies than 5-minute windows. Optimizing temporal segmentation can reduce stress identification time by 60%.

Keywords

Stress Monitoring, Multi-modal, Windowed Epochs, Feature Extraction, Linear Classification, Non-linear Classification, Non-EEG Data, Wearable Devices



Utilisation of the Dijkstra Algorithm to Determine the Shortest Path on Universiti Malaysia Sabah's Main Campus in Kota Kinabalu

Masitha Raziah Binti Henri, Shaliza Hayati A. Wahab, Salmah Fattah, Nordin Saad, Nur Athirah Maisarah Binti Tambrin, Nur Farah Izzati Binti Jamaluddin, Sherlyn Ong Shu Shien, Zarra Soffea binti Ghazalie
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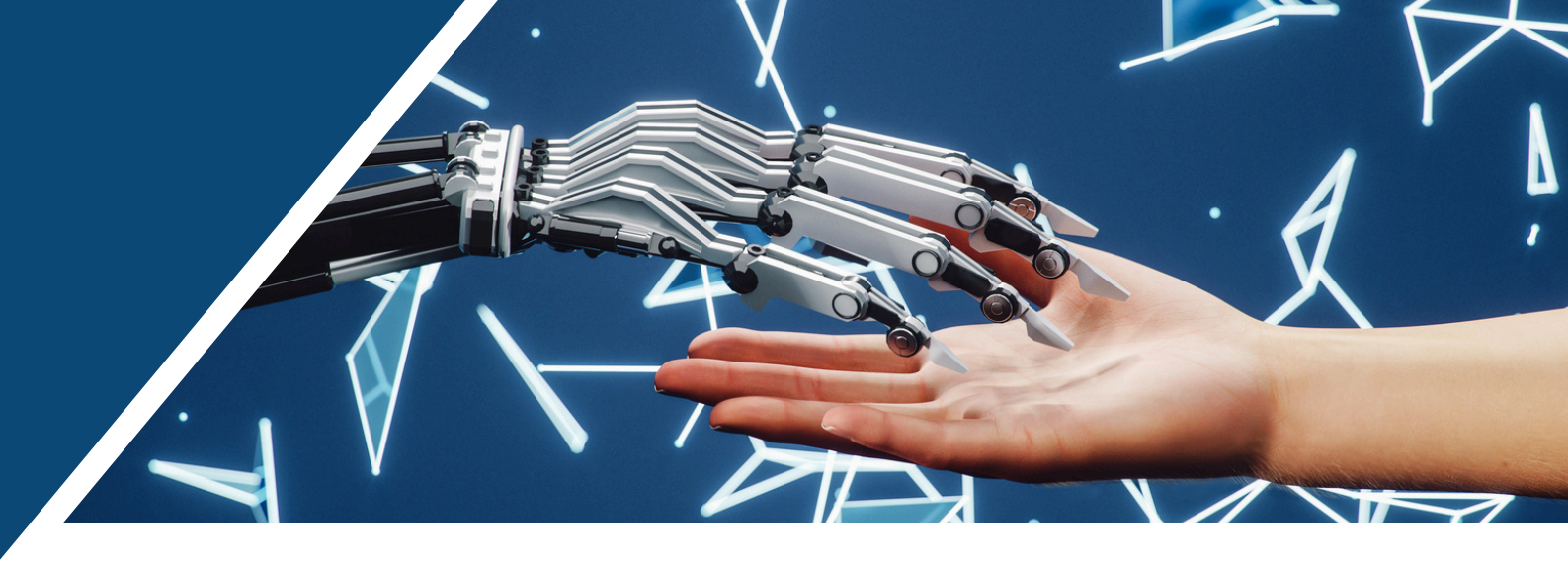
Abstract
The purpose of this research is to determine the shortest path in the Universiti Malaysia Sabah main campus using the Dijkstra algorithm. It is to determine the paths from selected locations to different locations. The buildings in the institution were illustrated in the form of a graph, where the nodes are selected locations or faculties, while the edges are the paths, and their cost indicates the length. Besides, in this research, Matlab software is used to resolve the routes. The purpose of this software is to create a graph and discover the locations of the routes. Designing maps from optimal routes and the proposed routes is a complicated problem that can be solved by putting in the Dijkstra algorithm. The implementation of the Dijkstra algorithm in searching for the optimal-shortest paths of selected routes is a great choice to solve the problem and enables the validity of the results.

Keywords
Dijkstra Algorithm, Shortest Path, Matlab, Routes Maps, UMS



Enhancing Face Detection Accuracy with VGG-16 Neural Network and Data Augmentation

Min Keng Tan, Jun Shen Chin, Renee Ka Yin Chin, Lorita Angeline, Chung Fan Liau, Kenneth Tze Kin Teo
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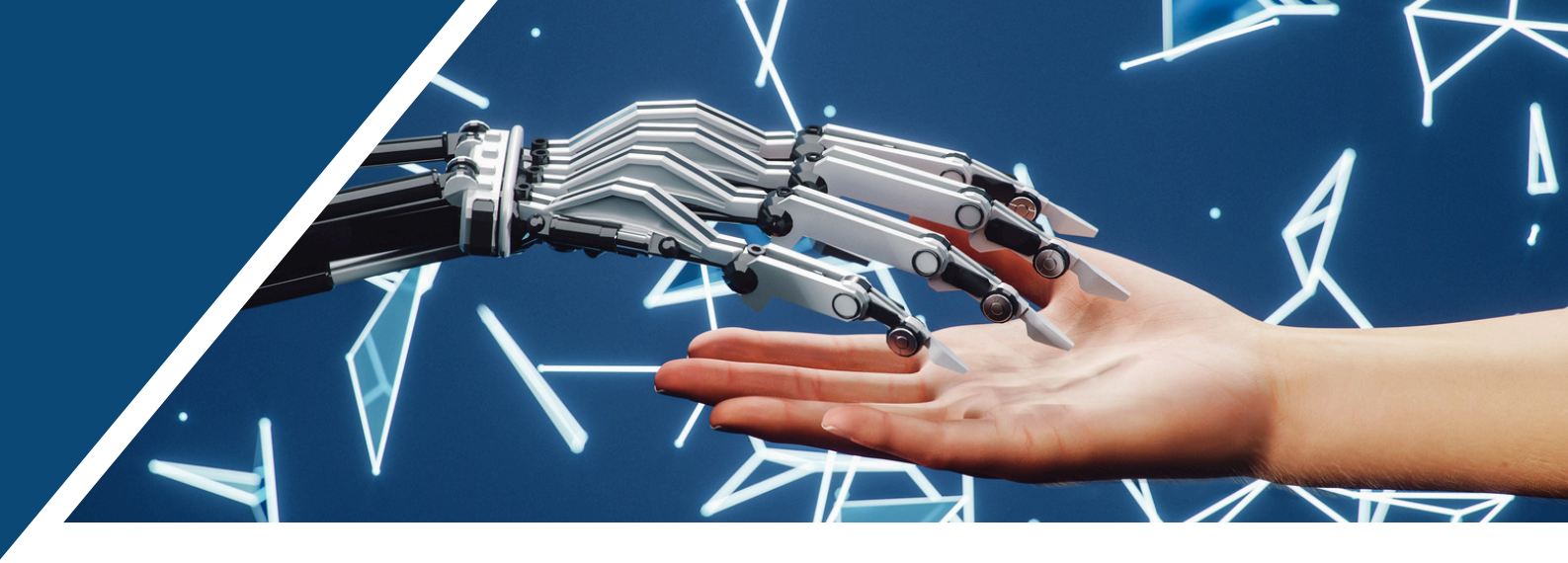
Abstract

A face detection model can be used to detect the presence of a face in real time detection with great accuracy. However, the face detection model can only perform well under a very optimum condition and situation which makes it unreliable and unrealistic as it should be able to perform detection under normal conditions. Geometric transformation, color transformation and even kernel filters will affect the face detection model and will cause the detection model to not function and cause misclassification. A convolutional neural network (CNN) of Visual Geometry Group 16 (VGG-16) will be utilized to train the dataset and optimize the face detection model. The objective of this work is to mitigate the high loss and misclassification by performing image augmentations towards the data and analyze which augmentations parameters are ideal for the face detection model. The mixed augmentation selection method was proposed to solve the problem of not being able to detect face under different conditions. The result of different parameters and augmentations selections have been analyzed and compared and upon fine-tuning of parameters, the accuracy can be increase to 96.4% from the initial 74.4%.

Keywords

Face Detection, VGG-16 Convolutional Network, Deep Learning, Data Augmentation



A Cancellable Semi-Supervised Gait Recognition in 5G: The Future of Biometric

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School of Computer Science and Information Systems, North-West University Northwest, South Africa
Department of Knowledge and Information Management, University of Johannesburg, Johannesburg, South Africa
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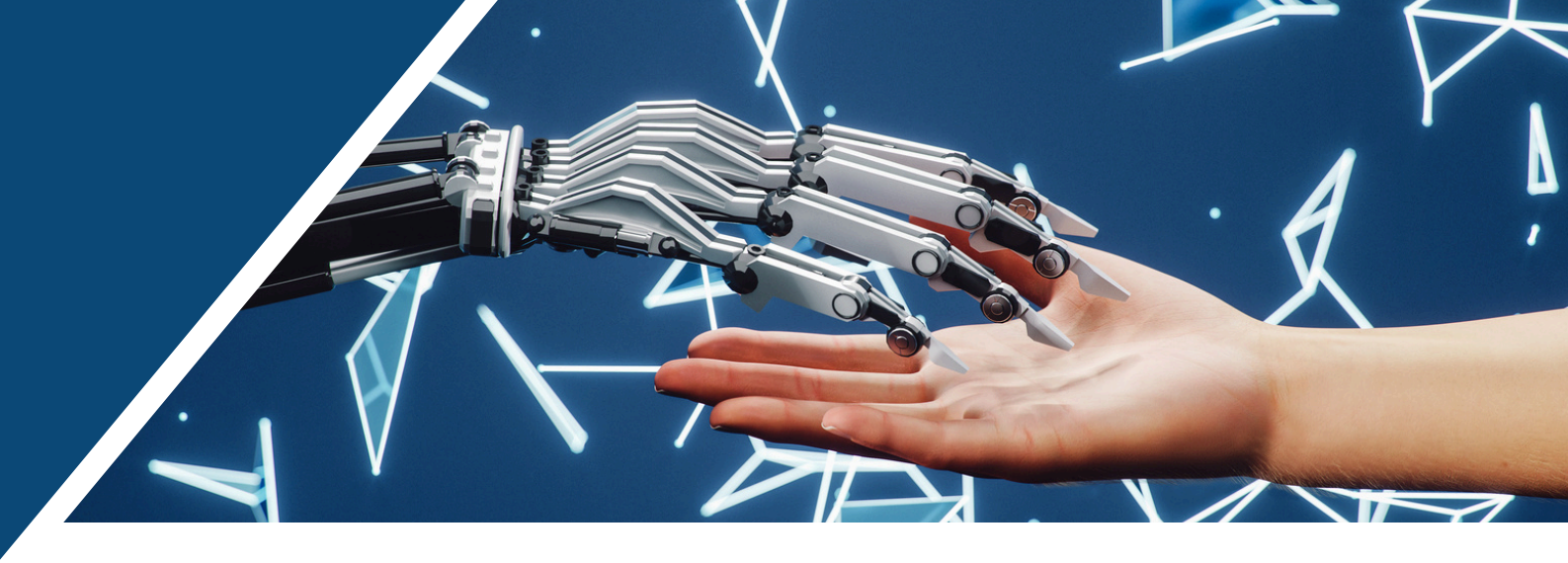
Department of Computer Science, Botswana Accountancy College, Gaborone, Botswana

Abstract

— The rapid advancement of 5G technology needs a wide range of infrastructure solutions to handle various scenarios. 5G technology has increased the number of vulnerable endpoints that connect to a network, presenting hackers with more opportunities to exploit. Also, in addition to extremely high capacity and rigorous latency requirements, the security provisioning is getting difficult in 5G networks. Therefore, a strong authentication and authorization system is required to provide to service security for smooth interaction between various users and access to network services. The biggest concern with 5G is to secure biometric templates. With 5G, hackers will have greater bandwidth and faster speeds to perform more assaults than ever before. Cancelable semisupervised gait recognition in 5G refers to a method of recognizing and identifying individuals based on their walking patterns (gait) using a combination of supervised and unsupervised learning techniques, while maintaining the ability to revoke and update the recognition model in a 5G network environment. Traditional gait recognition approaches primarily focus on supervised learning methods that use a limited number of labelled sequences to train. In this paper, we propose to develop a cancellable semi supervised gait recognition scheme using feature adaptive random projection technique. The study indicates improved privacy and security of biometric templates. Our semi supervised model returned a 96% classification rate which is a better performance compared to the supervised and unsupervised algorithms

Keywords

5G technology, Biometrics, Semi-supervised Gait, Cancellable Biometrics



Leveraging OBD II Time Series Data for Driver Drowsiness Detection: A Recurrent Neural Networks Approach

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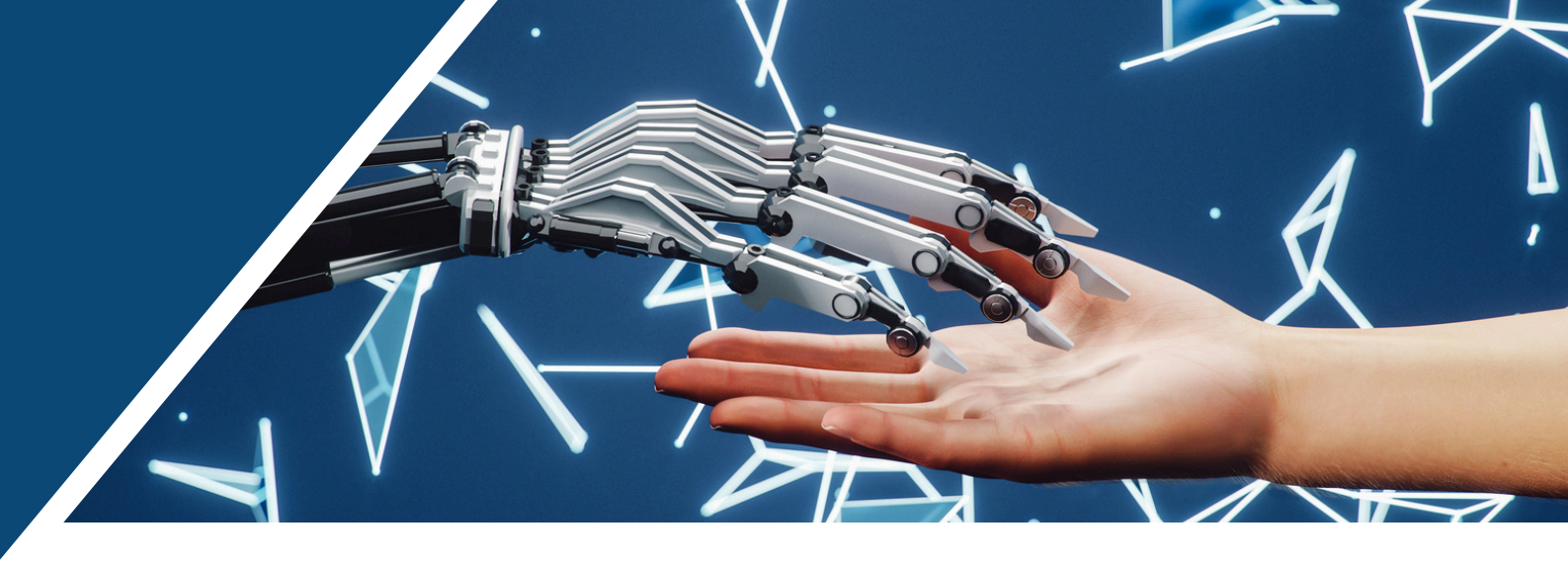
Abstract

Driver drowsiness is a major concern in the field of road safety, contributing significantly to road accidents and injuries. To address this issue many studies, focus on the development of a driver drowsiness detection system, existing detection system often rely on driver behaviours, physiological signals, and vehicle behaviours but each approach has limitations in terms of accuracy and real-time applicability. This study utilizes OBD-II (On-Board Diagnostic II) sensors' data, including parameters such as speed, RPM, throttle position, and steering torque, in conjunction with a camera equipped with a pretrained model for effective data labelling. The methodology employed through the conversion of time series data windows. This approach facilitates the utilization of a recurrent neural network (RNN) for classification, leveraging the model's ability to analyse sequential data patterns. Through rigorous training and testing, the integrated model achieves an impressive accuracy of 81.95% in identifying drowsy and normal driving patterns. The obtained results underscore the effectiveness of the integrated model in discerning subtle variations in driving behaviour, demonstrating its potential as a reliable tool for realtime drowsiness detection. The system's impact lies in its ability to save lives and prevent injuries by providing timely warnings or interventions to drowsy drivers, contributing to safer road environments and the overall reduction of drowsiness-related accidents.

Keywords

Deep Learning, Driver Drowsiness, OBD-II Data, Recurrent Neural Network



Transformer Tracking Using Spatiotemporal Features

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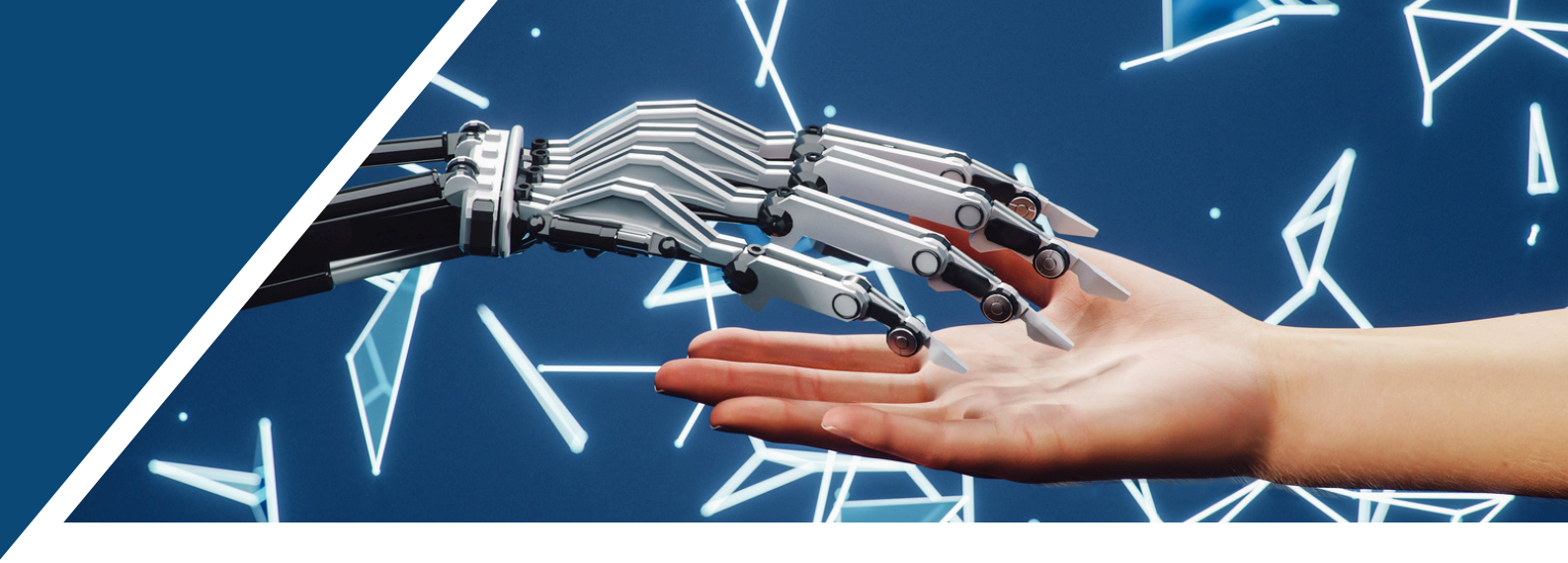
Department of Interdisciplinary Studies, University of Jaffna, Jaffna, Sri Lanka
Department of Computer Science, University of Jaffna, Jaffna, Sri Lanka

Abstract

Recent approaches in single-object tracking leverage Transformer-based architectures to achieve state-ofthe-art performance by utilizing the attention mechanism between target templates and search region patches. However, most existing trackers fail to capture the temporal information of the target object present in the sequences of frames, making them unsuitable for capturing changes in the target's appearance over time. This leads to suboptimal performance in real-world scenarios where the target's appearance can change significantly due to variations such as occlusions, deformations, and abrupt movements. To overcome this limitation, a Transformer-based tracking framework is introduced that simultaneously captures the spatial and temporal features of the target object and utilizes that knowledge to accurately locate the target. This is achieved by adapting the standard Transformer encoder architecture, enabling the direct extraction of spatiotemporal features of the target object from a sequence of frames. As the first step, the sequences of template frames and search region are partitioned into non-overlapping spatiotemporal patches, which are then tokenized and processed by the Transformer encoder to capture spatiotemporal features. Additionally, the Transformer encoder is initialized with spatiotemporal masked autoencoders, which are trained to capture the relationship between patches through selfsupervised learning. Extensive experiments on the GOT-10k benchmark dataset demonstrate that our tracker surpasses current state-of-the-art methods, achieving an average overlap of 70.9%, a success rate of 82.4% at a 0.5 threshold, and a success rate of 66.3% at a 0.75 threshold on test data, while maintaining real-time processing speed of 47 frames per second on an NVIDIA P100 GPU.

Keywords

Transformer Tracking, Spatiotemporal Tracking, Visual Object Tracking



Integration Artificial Intelligence with Conventional X-Ray Inspection for Improved Solder Void Detection in SSDC SiC Modules

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Faculty of Electronics and Computer Technology and Engineering, Universiti Teknikal Malaysia Melaka, Melaka, Malaysia
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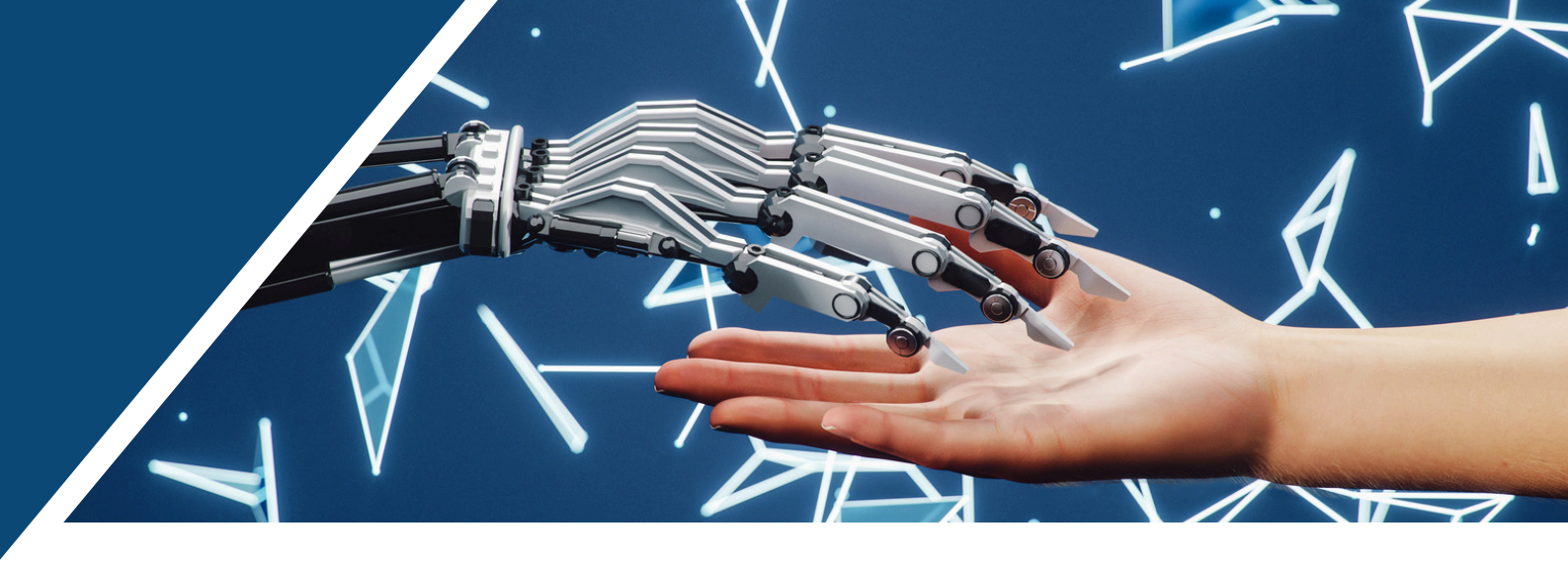
Abstract
In the context of electric vehicles (EVs), the demand for advanced power modules has grown significantly. Single Side Direct Cooling Silicon Carbide (SSDC SiC) is a key platform in the Onsemi VE-Trac™ Family, designed for EVtraction inverters. This platform features advanced cooling and semiconductor technologies to ensure high performance and reliability. However, one of the critical challenges in manufacturing SSDC SiC modules is the detection of solder voids. Solder voids can significantly compromise the reliability and performance of power modules by reducing the effectiveness of heat dissipation and leading to potential failures. Conventional inspection methods relying solely on Xray machines are often time-consuming and prone to human error, highlighting the need for a more efficient and accurate approach. The primary aim of this research is to develop an Artificial Intelligence (AI) based system to serve as a secondary validation layer for void detection in SSDC SiC modules. This system works in conjunction with X-ray machines, providing independent and accurate results for solder void inspections. This study leverages semantic segmentation techniques by using deep learning approach which is Convolutional Neural Networks (CNN), specifically U-Net, to classify void pixels from the background in X-ray images. The system processes output images from X-ray machines, differentiating void pixels from the background with high precision. Preliminary results indicate that the AI-based system can accurately classify solder voids, significantly reducing false positives and negatives compared to conventional inspection methods. The integration of this system with existing X-ray inspection processes promises enhanced detection, contributing to the improved solder void detection of SSDC SiC modules.

Keywords
CNN, Deep Learning, SSDC, SiC, X-ray, U-Net



Courier System with Data Analyzer Using Time Series Forecasting and Recommender Model

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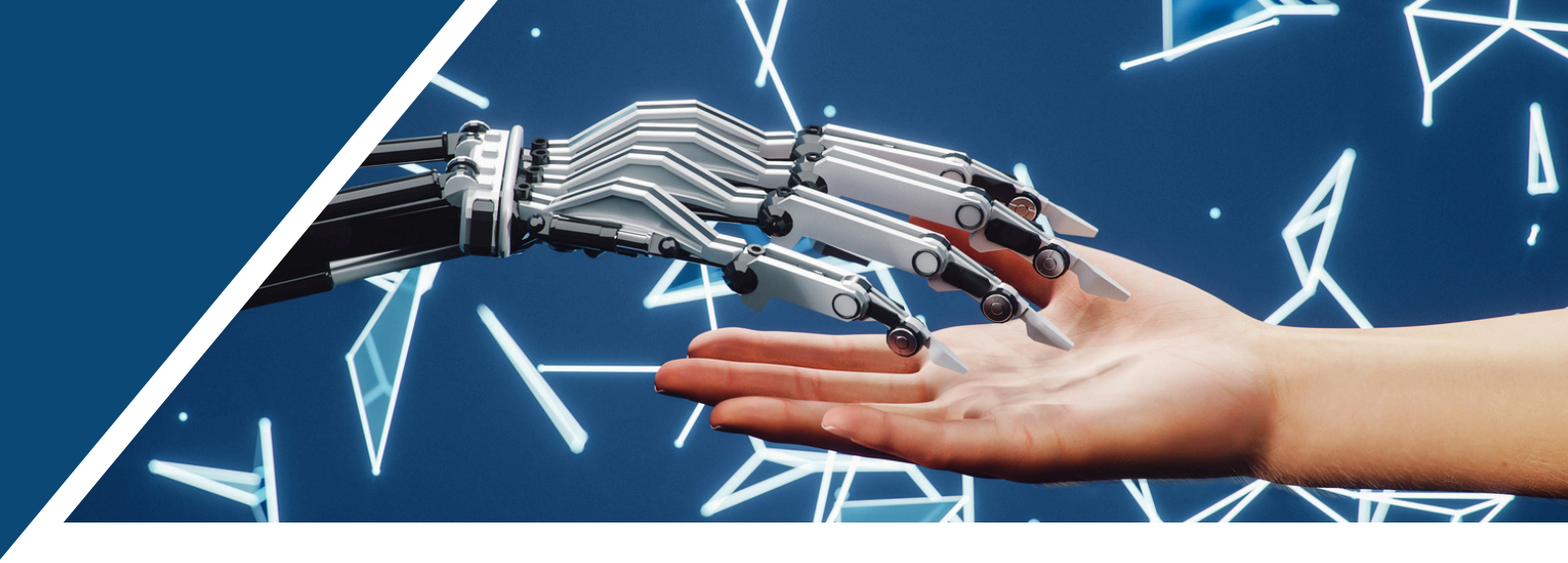
Abstract

A traditional courier service provider in the Philippines operating region-wide, is commended to innovate their business process by leveraging technologies in response to digital civilization. A courier system curated to meet the business needs of the courier service provider is developed in this study. The Scrum methodology was followed in developing the system. It incorporates descriptive analytics, forecasting and recommendation analytics to assist the top-level management in decision making. Notably, the FastAPI framework was used to develop the recommender model and implement time series forecasting using ARIMA. The designed system was evaluated by 66 stakeholders, it gained a mean average score of 4.43, indicating that user expectations towards the system's quality are highly accepted.

Keywords

Courier System, QR Code, Email and SMS Notification, Time Series Forecasting, Recommender Model



Unsupervised Human Action Recognition for Quality Control in Industrial Environments

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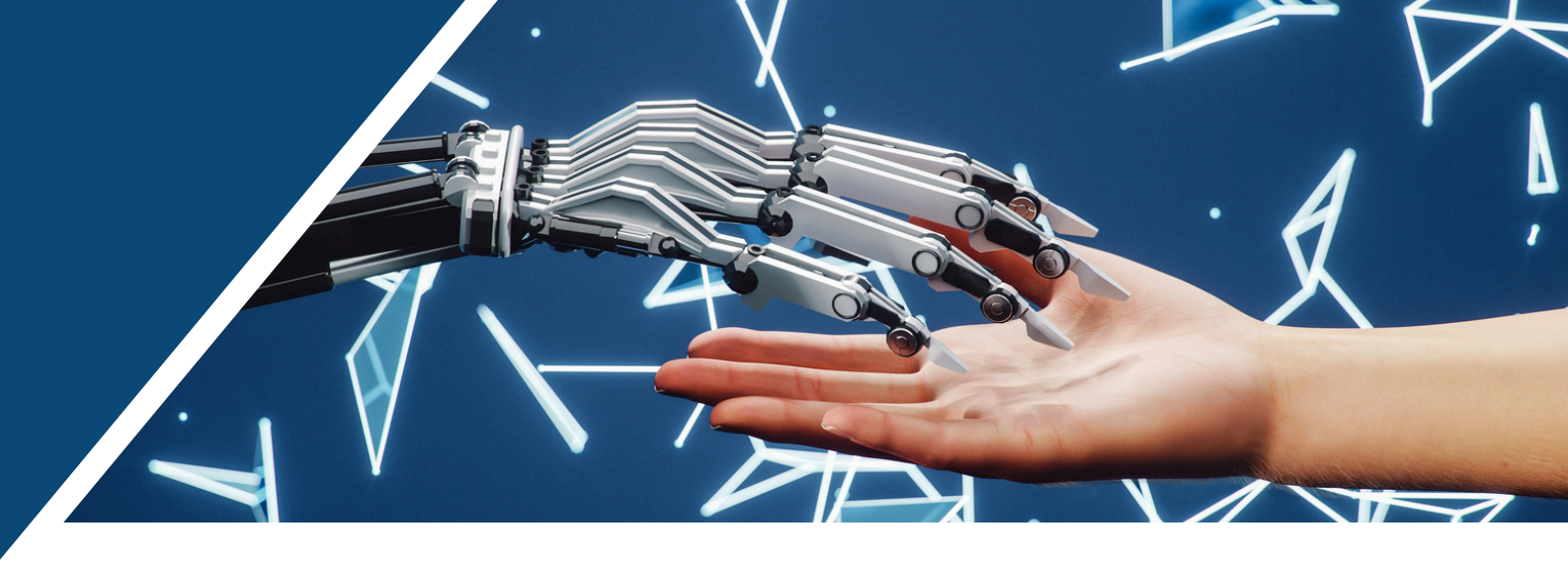
School of Information, Computer, and Communication Technology, Sirindhorn International of Technology, Thammasat University Phatum Thani, Thailand
School of Management Technology, Sirindhorn International of Technology, Thammasat University Phatum Thani, Thailand
National Electronics and Computer Technology Center, National Science and Technology Development Agency, Thailand
SMART Sense Industrial Design Co., Ltd, Bangkok, Thailand

Abstract

Ensuring robust and efficient quality control in industrial environments is critical as automation and artificial intelligence continue to advance. Human action recognition (HAR) plays a vital role in monitoring and maintaining the accuracy and safety of industrial processes. Traditional HAR methods rely on supervised learning, requiring extensive labeled datasets, and are often impractical due to high costs and time constraints. This research addresses these gaps by proposing a hybrid model integrating Beta Variational Autoencoders (β-VAE) with various clustering algorithms to enhance unsupervised human action recognition in industrial environments. The method begins with extracting 2D keypoints from video data using MediaPipe, a powerful tool for keypoint detection. These keypoints are then processed through a β-VAE to extract a latent space representation, capturing the essential features of the actions. Various clustering algorithms, including K-means, DBSCAN, spectral clustering, hierarchical clustering, and mean shift, are applied to the latent space to group similar actions. Evaluation of these clustering methods shows that hierarchical clustering performs the best, achieving an accuracy of 91.67%, indicating that the approach effectively groups similar actions, enhancing the reliability of HAR systems in industrial environments.

Keywords

Unsupervised Learning, Industrial Environments, Beta Variational Autoencoders, Clustering Algorithms, MediaPipe, Quality Control



Optimized Convolutional Neural Network Using Genetic Algorithm for Music Genre Classification

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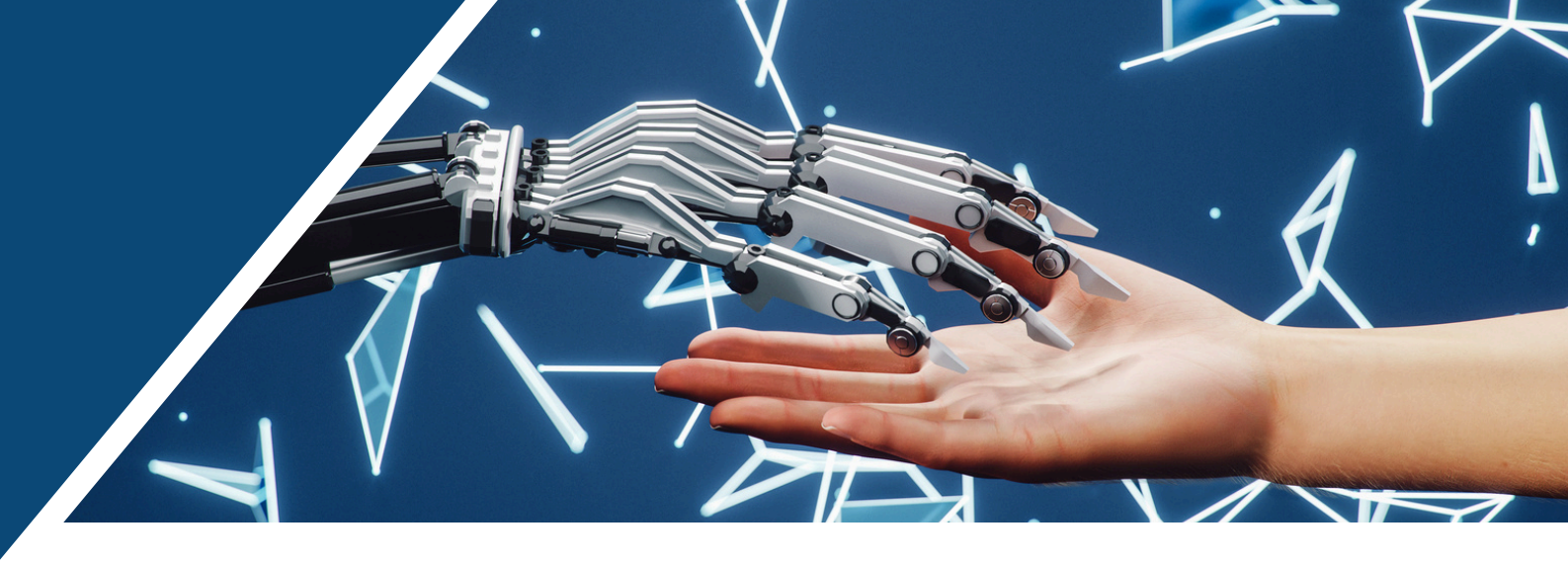
Creative Advanced Machine Intelligence Research Center, Faculty of Computing and Informatic, Universiti Malaysia Sabah

Abstract

Music genre classification plays an important role in identifying and classifying music tracks into genre. Due to the enormous number of genres available nowadays, music genre classification has been automated through analyzing the features of audio files of music by using machine learning specifically the Convolutional Neural Network (CNN) method. However, the hyperparameter setting of CNN has not yet been optimized to ensure accurate classification. It has been found that the classification effectiveness of CNN can be further enhanced with the right setting of hyperparameter in many different domains. Hence, this paper proposes to optimize the hyperparameter setting of CNN by using Genetic Algorithm (GA) for music genre classification. Several experiments have been conducted to evaluate the performance of the optimized CNN algorithm by comparing it to a baseline CNN method. The results show that the optimized CNN can classify music genre well.

Keywords

Music Genre Classification, Deep Learning, Convolutional Neural Network (CNN), GTZAN Dataset, Genetic Algorithm (GA), Optimization



Feature Engineering for Optimizing AI-Driven Classification Models in Non-Proliferative Diabetic Retinopathy Stage Detection

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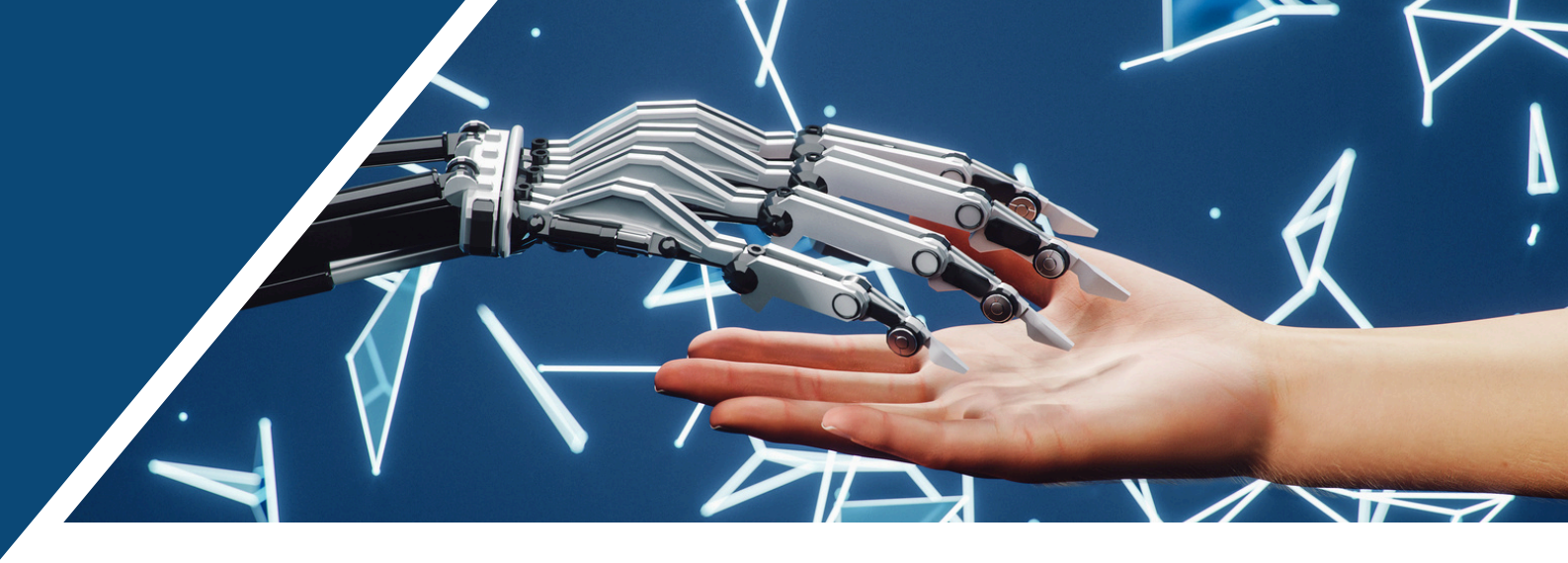
Abstract

Early detection of the stages of NonProliferative Diabetic Retinopathy (NPDR) is crucial for timely treatment, which can prevent the progression to severe stages and vision loss from the disease. AI shows significant potential in automating the detection of NPDR stages with enhanced efficiency and accuracy using fundus images. This paper presents an AI-driven approach for the automatic stage detection of NPDR using a hierarchical method of Random Forest (RF) machine learning models combined with feature engineering techniques. Three RF models, each serving as a binary classifier, were employed with their feature scores to study the influence of extracted features from image segmentation on the classification stages of NPDR. Utilizing 17 features that are commonly used in NPDR classification, the optimal feature combination, indicating the highest accuracy for each classification stage, was identified through the tested methods. The hierarchical RF model with the selected highperforming feature sets achieved an overall accuracy of 95.1%, while the all-class RF classifier accuracy was only 86.9%. The results highlight the impact of feature selection on automatic NPDR classification while providing a robust model with improved classification accuracy using the selected optimal feature sets.

Keywords

Artificial Intelligence (AI), Feature Score Analysis, Non-Proliferative Diabetic Retinopathy (NPDR), Random Forest (RF) Classifier



A Multi-Modal Approach for Predicting Depression Risk using Social Media Data

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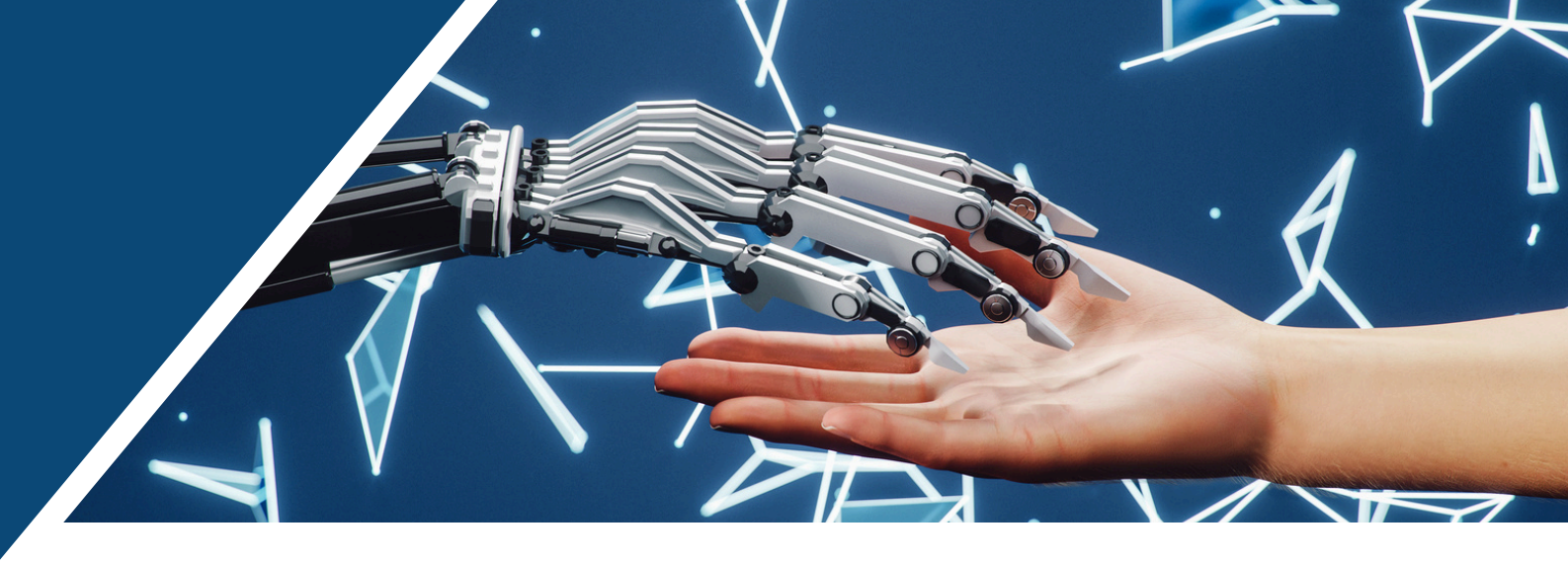
Faculty of Engineering and Technology, TAR University of Management & Technology, Kuala Lumpur, Malaysia

Abstract

Depression affects many people and can disrupt people from functioning normally in their daily lives. Treatment for depression is lengthy and expensive, especially in its late stages. Social media is widely used and studied to recognize users' mental health through information shown in posts. There is a lack of research on multi-modality in this field, with many studies focusing on text modality processing alone. This paper proposes a multi-modal approach to predict depression using social media data. Utilizing and combining text and image modality posted by social media users allows for a better and more accurate prediction. Preliminary results show that our method has performed better than the current multi-modal state-of-the-art with an F1-score of 97.9 %. Furthermore, our experiments have shown that accurate prediction can be made with minimal number of posts, highlighting the potential of predicting early risks of depression.

Keywords

Mental Health, Multimodal Learning, Early Fusion, Social Media, Depression Detection



Classification of Razor Clams Through Shape and Size via YOLOv8

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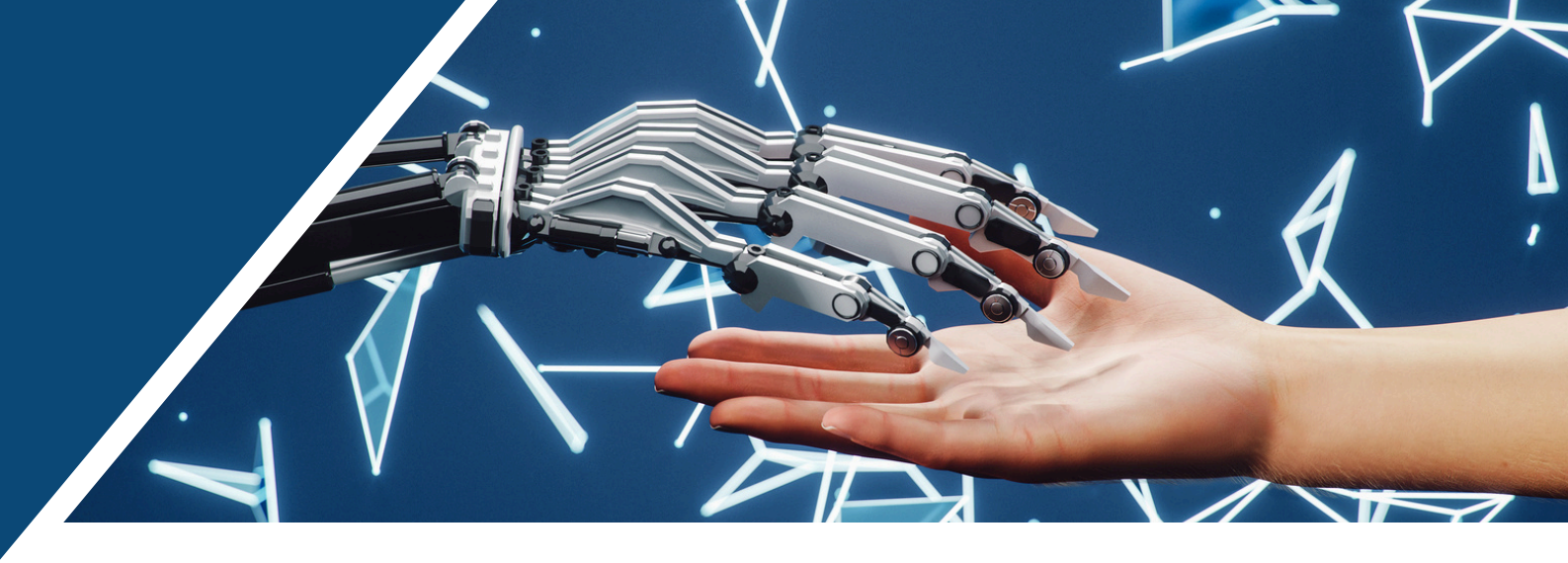
Abstract
Clams are bivalve mollusks found in coastal freshwater and saltwater areas, with razor clams being highly prized for their taste. Published studies have focused on environmental and health issues related to razor clams, alongside classifications of snails and the design of anchoring tools mimicking their shape. This study explores the effectiveness of YOLOv8 object detection in classifying razor clams by size and shape. Researchers propose using a webcam system to capture images of three specific razor clam species: Rich Man's Finger, Atlantic Jackknife, and Pacific razor clams. YOLOv8 successfully classified these clams, achieving over 90% accuracy. This study marks the first application of YOLOv8 for classifying razor clam species based on their physical characteristics. The developed system offers real-time identification through image processing, benefiting both buyers and researchers in the field.

Keywords
Razor Clam, YOLOv8, Bivalve, Shellfish, Machine Learning



Cervical Cancer Detection Using Deep Learning on Liquid-based Cytology Pap Smear Images

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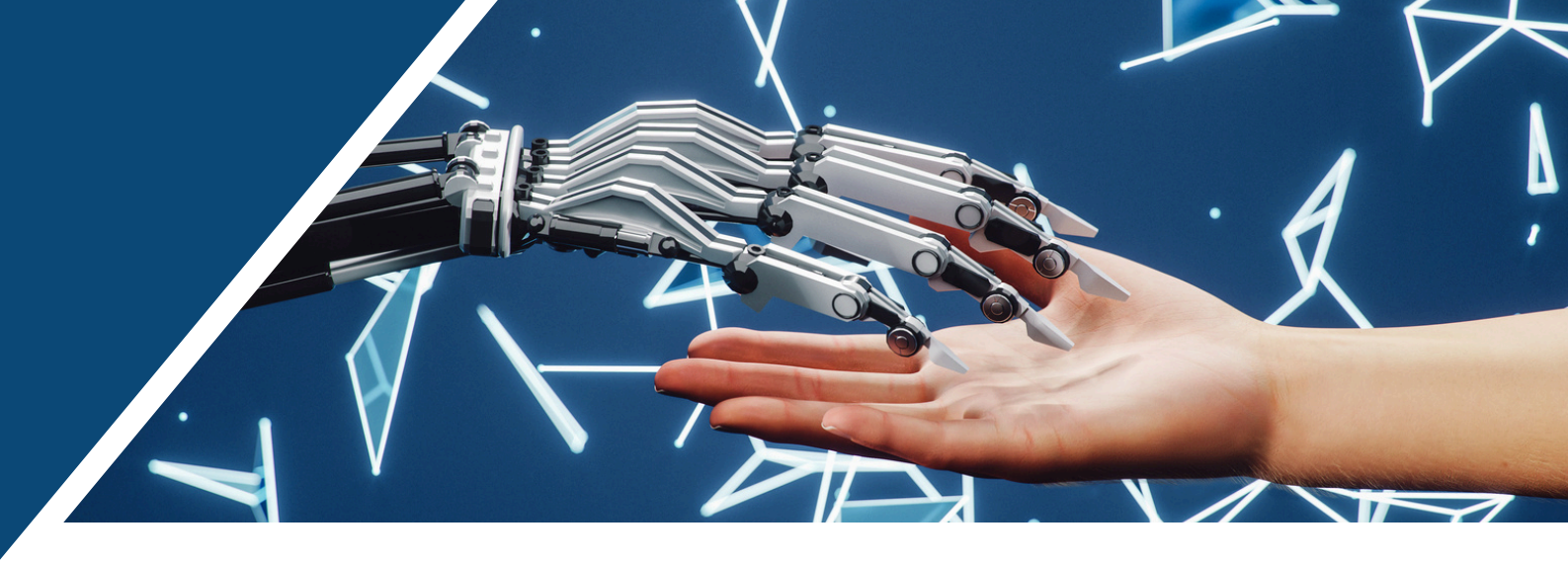
AIClub Research Institute, Santa Clara, California, USA

Abstract

Cervical cancer is a significant cause of death around the world. In 2022, 660,000 individuals have been diagnosed with the disease around the world and 350,000 individuals have died as a result of it. Current methods of diagnosis require pathologists to look at the cells under a microscope, which is subjective and time-consuming. We present a deep learningbased detection method to automatically classify four different stages (High squamous intra-epithelial lesion, Negative for intra-epithelial malignancy, Low squamous intra-epithelial lesion, and Squamous cell carcinoma) of cervical cancer. In this study, we choose to experiment with a lightweight model like the MobileNetV2 model which can be deployed in hardware-constrained scenarios, to evaluate its performance in the preliminary diagnosis of cervical cancer. Our model achieved a validation accuracy of 98.95% and a test accuracy of 94.68%. These results demonstrate the potential effectiveness of the MobileNetV2 model in aiding the early detection of cervical cancer, highlighting its applicability in medical diagnosis tasks.

Keywords

Deep Learning, Pap Smear, Computer Vision, Classification, Cervical Cancer



Superficial Wound Classification Using CNN Image Classifier for Initial Wound Care

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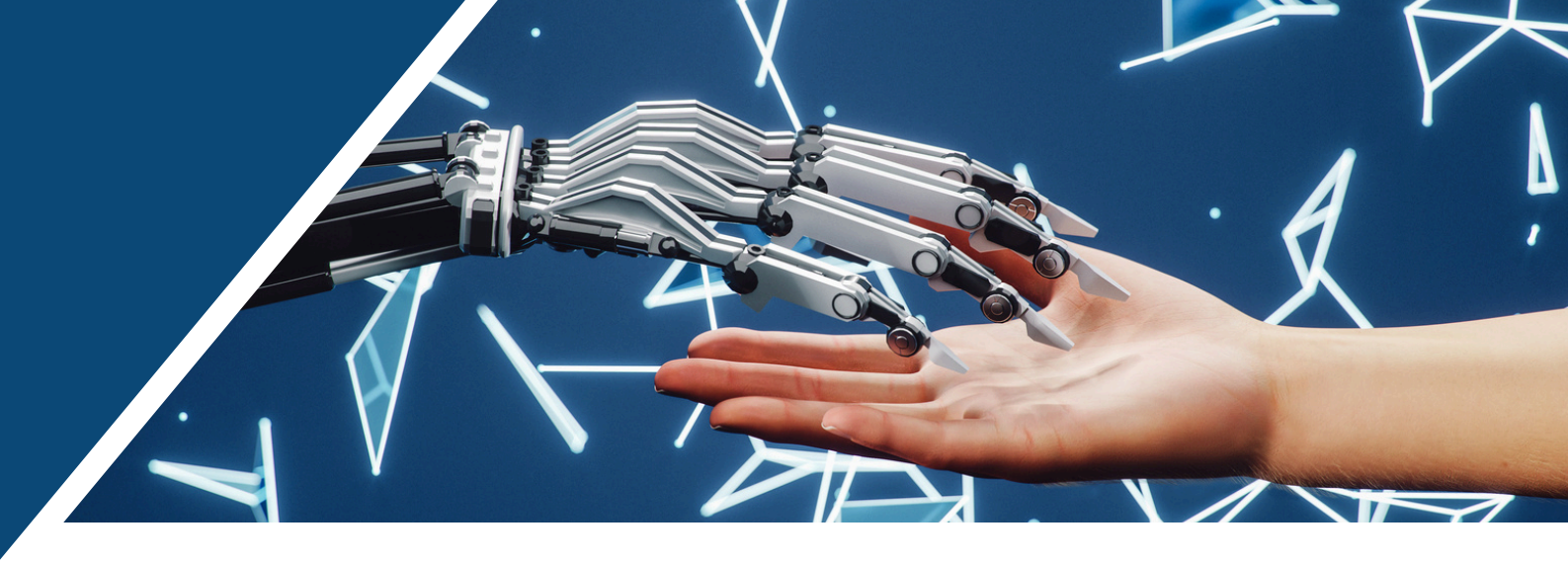
Abstract

Proper diagnosis of the types of wounds is the first step in effective wound management. Healthcare quality can be improved with the use of artificial intelligence technology. In this project, convolutional neural network (CNN) models are employed for superficial wound image classification. The goal of this project is to implement carefully selected CNN models with fine-tuned parameters (batch sizes, augmentation parameters and epoch size) to categorize superficial wounds of abrasion, bruise and superficial skin burns. The library and functions from TensorFlow, Keras, MatplotLib and OpenCv will be used alongside the Python programming language to create this project in a Google Colaboratory notebook, also widely known as Colab. This work evaluates the CNN models of VGG-16, InceptionV3 and ResNet-50 to find out which best classifies the dataset of non-fatal superficial wounds. These models have significant differences especially in their number of layers and concepts of capturing the features of images input. By utilizing these models, the accuracy rate of more than 40% is observed after models being trained and validated on 90% of the dataset (80% for training and 20 for validation), then tested and prediction with the remaining 10% of the dataset for classification report and confusion matrix generation. Out of 3 CNN models used in this study, it is observed that InceptionV3 model's highest accuracy is 44% while both ResNet50 and VGG-16 model achieved 45% accuracy against the superficial wound database (non-fatal wound).

Keywords

Superficial Wound, Classification, Deep Learning, CNN Model, ResNet50, VGG-16, InceptionV3



Optimizing Citrus Leaf Disease Detection: An Efficient Custom CNN Leveraging Efficient Training Parameters

Mahir Faisal Chowdhury, Amit Nondi, Sium Ubn Akhter, Tanjina Bilma Pathan, Dewan Ziaul Karim
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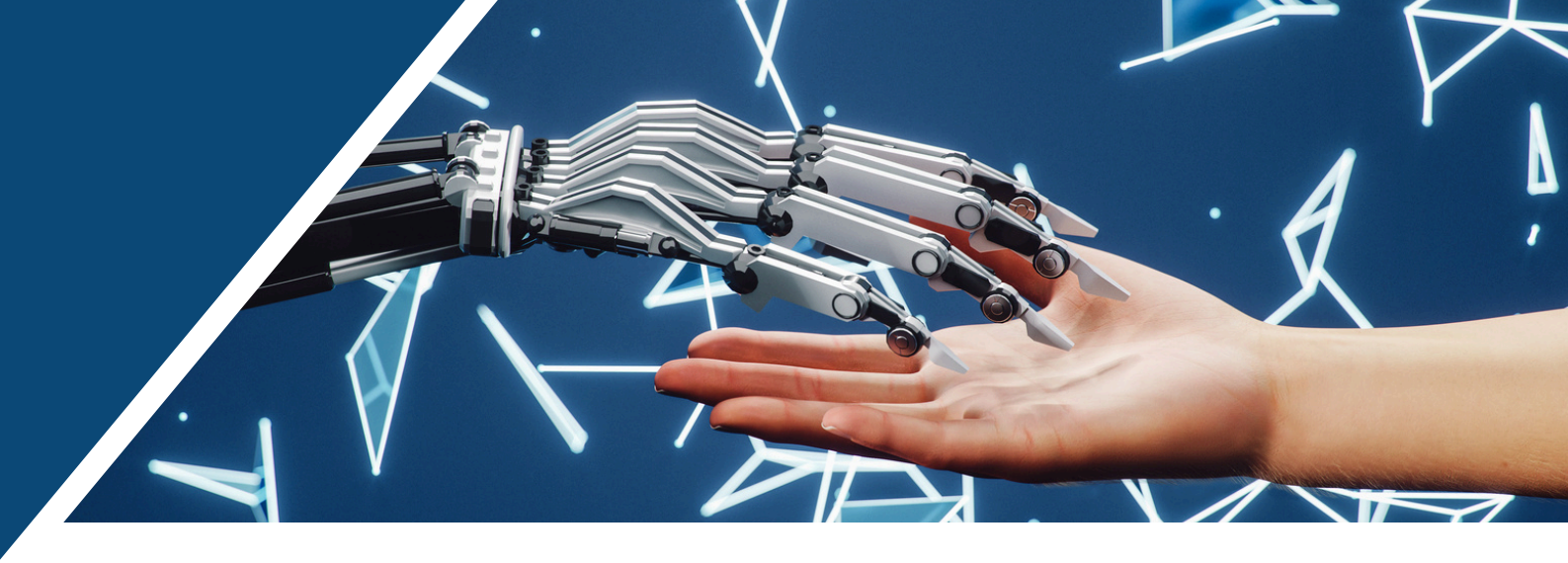
Abstract

Citrus leaf diseases threaten citrus estate profits. Early detection and proper diagnosis are essential for sickness recovery. Recent decades have seen advances in citrus leaf disease identification and categorization using deep learning approaches in image processing. We suggest employing pre-trained convolutional neural networks (CNNs) such as ResNet-50, VGG16, MobileNet-V2, InceptionV3, InceptionResNet-V2, DenseNet-201, and DenseNet-121 to automate citrus leaf disease diagnosis. A thorough data set of recognized citrus leaf images will be collected and pre-processed for this purpose. The datasets will include healthy and sick citrus canker, greening, and black spot leaves. Valuable features from leaf images is extracted utilizing deep learning models. The aforementioned models are effective and often used for image categorization. An efficient CNN model is proposed which trained on 596 images initially and after augmentation on 2800 images that are split into 3 categories: training, validation and testing. The data was split in as: 70% for training , 15% for Validation and 15% for testing purposes. This model will learn from some public data. Next, we compare results with prebuilt models. Finally, received 96% F1-score and 97.84% validation accuracy. Lastly, with a fair accuracy the proposed model has less training parameters than all other pretrained models which makes our model faster to classify the diseases.

Keywords

CNN, ResNet-50, VGG16, MobileNet-V2, Inception-V3, InceptionResNetV2, DenseNet-201, Lightweight model, Pre-processing, Augmentation, Deep Learning



A Machine Learning Framework for Change Detection with Remote Sensing Images

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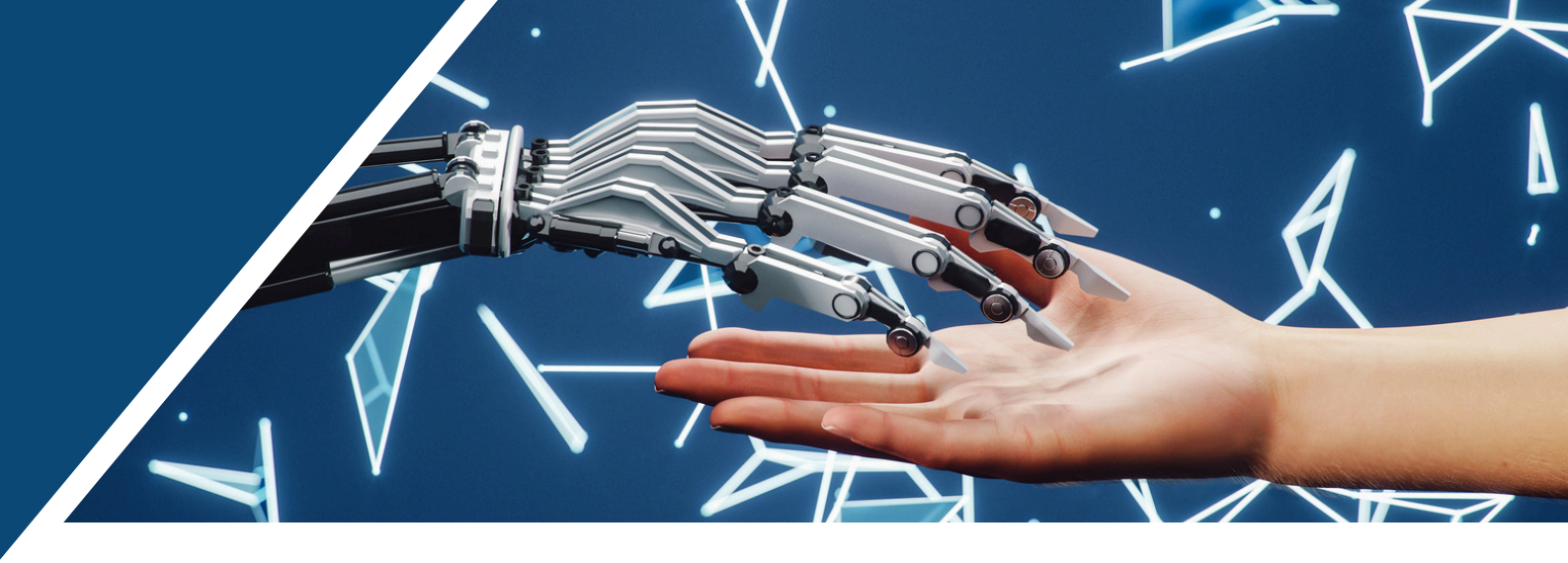
Abstract
Remote sensing change detection (CD) is an active research area due to its diverse applications in real life. Though a large number of CD techniques are discussed in the literature, accuracy of change map remains a challenge to specific applications. In this paper, we propose a novel change detection technique in the machine learning (ML) framework involving a feature extraction module and a classification module. Normalized difference image(DI) is generated from the bi-temporal images and extracted features by employing Non Subsampled Contourlet Transform (NSCT), a multi-scale, pyramidal decomposition. Further, denoising of the extracted subbands is performed. By employing a few powerful machine learning algorithms, support vector machine, decision tree, K-Nearest Neighbour, discriminant analysis and ensemble method, on the denoised NSCT feature vector, change maps are prepared. 70% of the data is taken for training and the remaining for testing. The accuracy of the change map is evaluated with different metrics - precision, recall, F1 score, and kappa statistic. The proposed NSCT feature-based change detection with machine learning algorithms outperformed over the raw DI with with ML algorithms. It is observed that the higher the number of NSCT features used, the greater the accuracy obtained. From the results, we deduce that the proposed framework can be used effecctively when the input images are noisy.

Keywords
Normalized Difference image, Non Subsampled Contourlet Transform, Machine Learning



Enhancing Electronic Document Security with Lightweight Digital Signature

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Creative Advanced Machine Intelligence Research Centre, Faculty of Computing and Informatics, Universiti Malaysia Sabah, Malaysia

Abstract

The heightened frequency and ferocity of recent security breaches and electronic document falsification pose significant concerns globally. These incidents underscore the critical need for robust security measures to protect sensitive documents from unauthorized access and tampering. While digital signatures are essential for ensuring the authenticity and integrity of electronic documents, traditional digital signature algorithms can be computationally intensive, making them unsuitable for resource-constrained environments such as IoT devices and mobile applications. This paper explores lightweight digital signature algorithms that offer robust security with minimal resource consumption. We investigate, implement, and evaluate the performance evaluation of lightweight digital signatures, highlighting their efficiency in both signature generation and verification processes. Our findings demonstrate that these algorithms can significantly enhance the security of electronic documents without compromising performance.

Keywords

Electronic Documents, Documents Falsification, Digital Signature, Lightweight Cryptography, Information Security

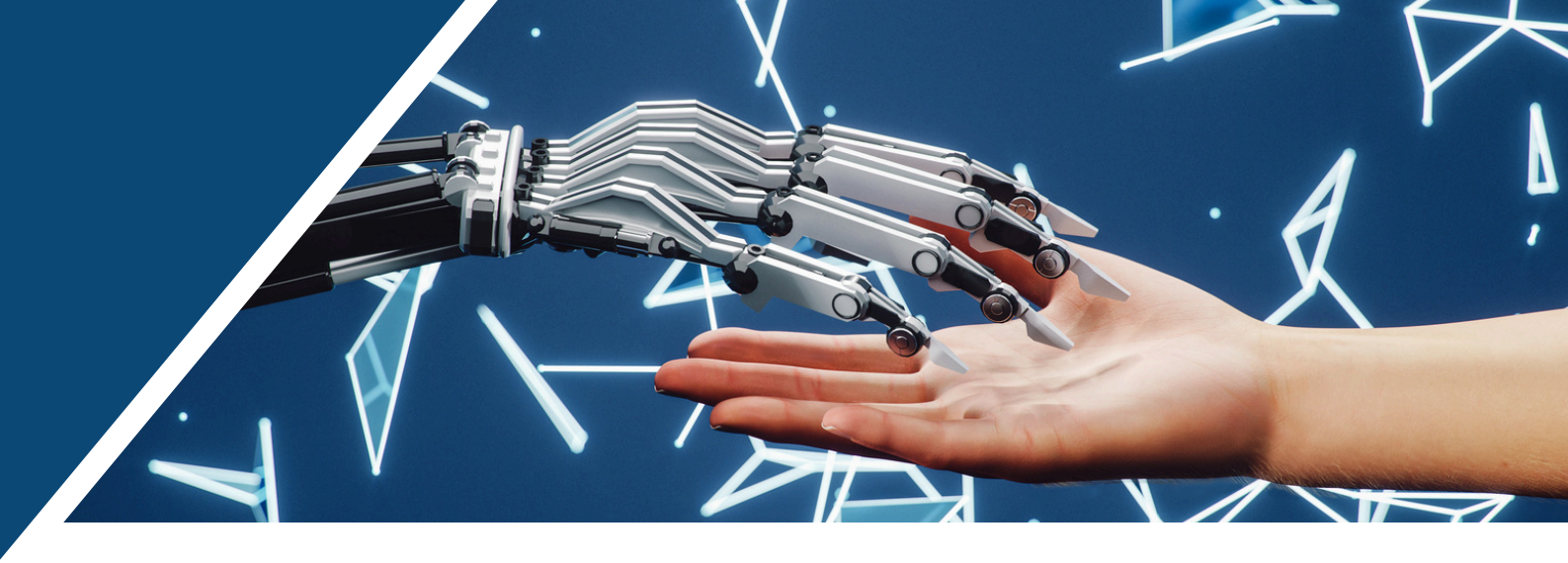

Image Recognition of Different Hamster Breeds Using Convolutional Neural Networks

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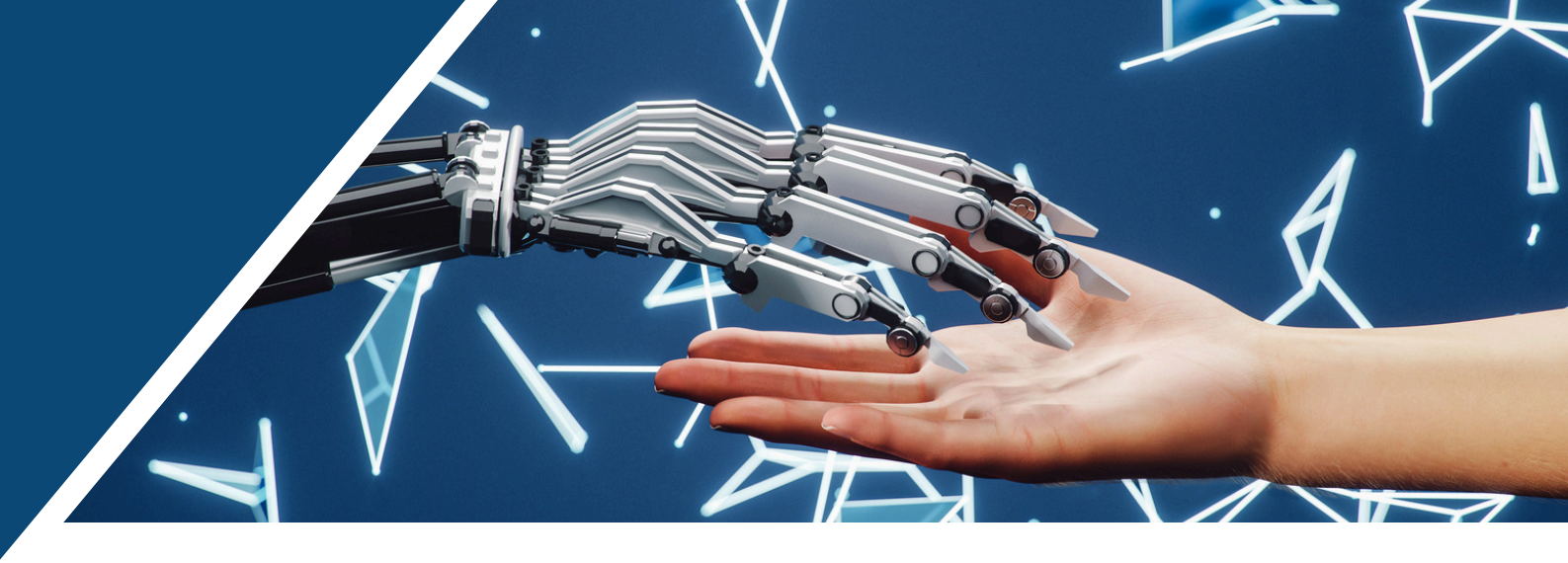
Abstract

Hamsters exhibit a variety of breeds, making breed identification challenging at first glance. This study proposes a solution using Convolutional Neural Networks (CNNs), specifically VGG16 architecture, to aid pet owners in distinguishing between hamster breeds. Researchers developed an image capturing system and a web application where users can upload hamster images to receive breed identification. The system focuses on recognizing the four most common hamster breeds: Campbell, Roborovski, Syrian, and Winter White, utilizing the VGG16 model trained and tested on a dataset collected by the researchers. The implementation involved a Raspberry Pi 4B with 4GB RAM and a webcam housed in a specially designed box for image recognition of hamsters. Evaluation using a confusion matrix demonstrated an overall accuracy of 91.67%, indicating the effectiveness of the proposed system in identifying hamster breeds. This research contributes to the development of accessible tools for pet owners and enthusiasts interested in hamster breed identification.

Keywords

VGG16, Convolutional Neural Network, Raspberry Pi, Confusion Matrix, Image Recognition



Privacy-preserving Quantum Key Distribution Ensemble Paillier Cryptosystem for Securing IoT Based Smart Metering System

Md Mehedi Hasan, Mohammad Kamrul Hasan, Ravie Chandren Muniyandi, Shayla Islam, Say Leng Goh
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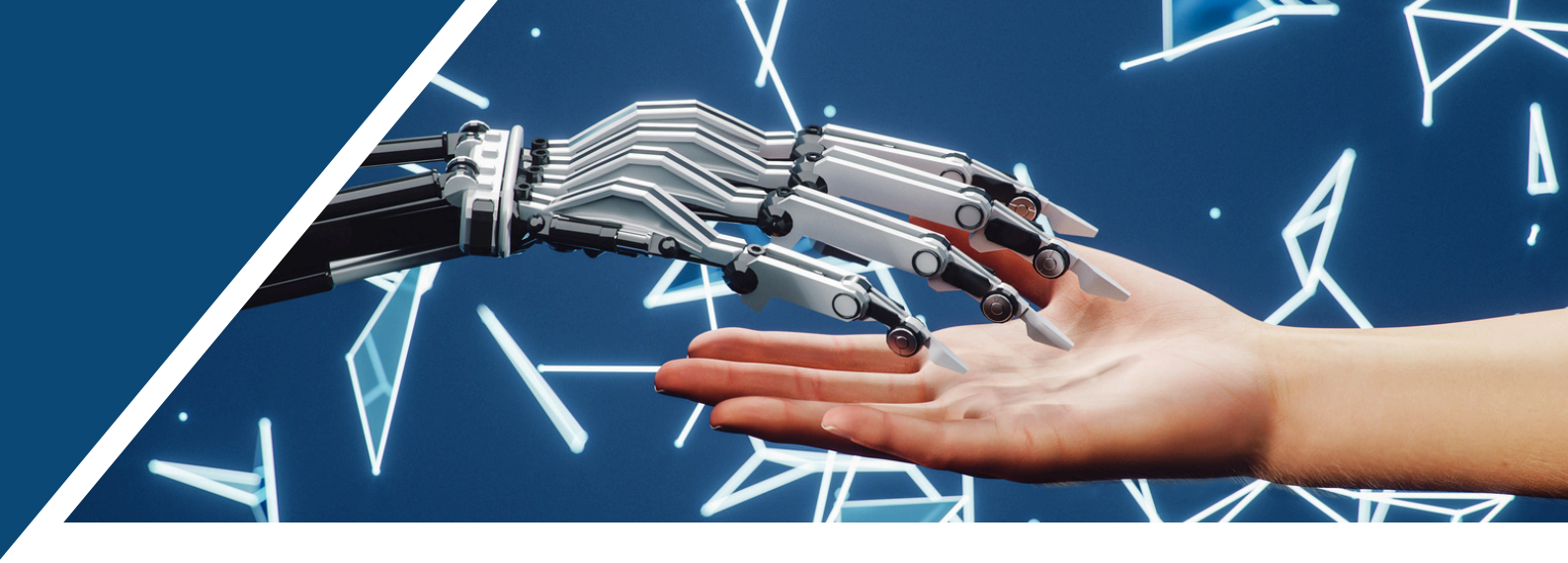
Institue of Computer Science and Digital Innovation, UCSI University Malaysia, Kuala Lumpur, Malaysia
Faculty of Computing and Informatics, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia

Abstract

The advancements of smart grid embedded Internet of things for monitor, control and collection of energy data from smart meter to data aggregator points. In this aspect two-way smart meter current challenges of data privacy and cyber-security concerns. To overcome these constraints numerous authenticated key agreements schemes considered to enhances performances and security. However, high latency and heavy cryptographic operation entails time and bits overheads. Moreover, quantum computing can break the classical encryption techniques and mathematical barriers of cyber defensive properties. Therefore, proposed quantum key distribution ensemble Paillier cryptosystem for maintains privacy-preserving and securing of smart metering infrastructures. The details security analysis showed proposed protocol can resistance various cyber-attacks with quantum computing threats. Furthermore, performances assessments based on extensive simulation of computation time and bits proposed protocols are leading position from existing schemes. Thus, the novel proposed key distribution enables efficiency, security, and data privacy which is emerging notions for the smart metering infrastructures.

Keywords

Quantum Key Distribution, Paillier Cryptography, Smart Meter, Cyber-security, Privacy, IoT



Domoic Acid Detection of Razor Clams Through Muscle Tissue via YOLOv8

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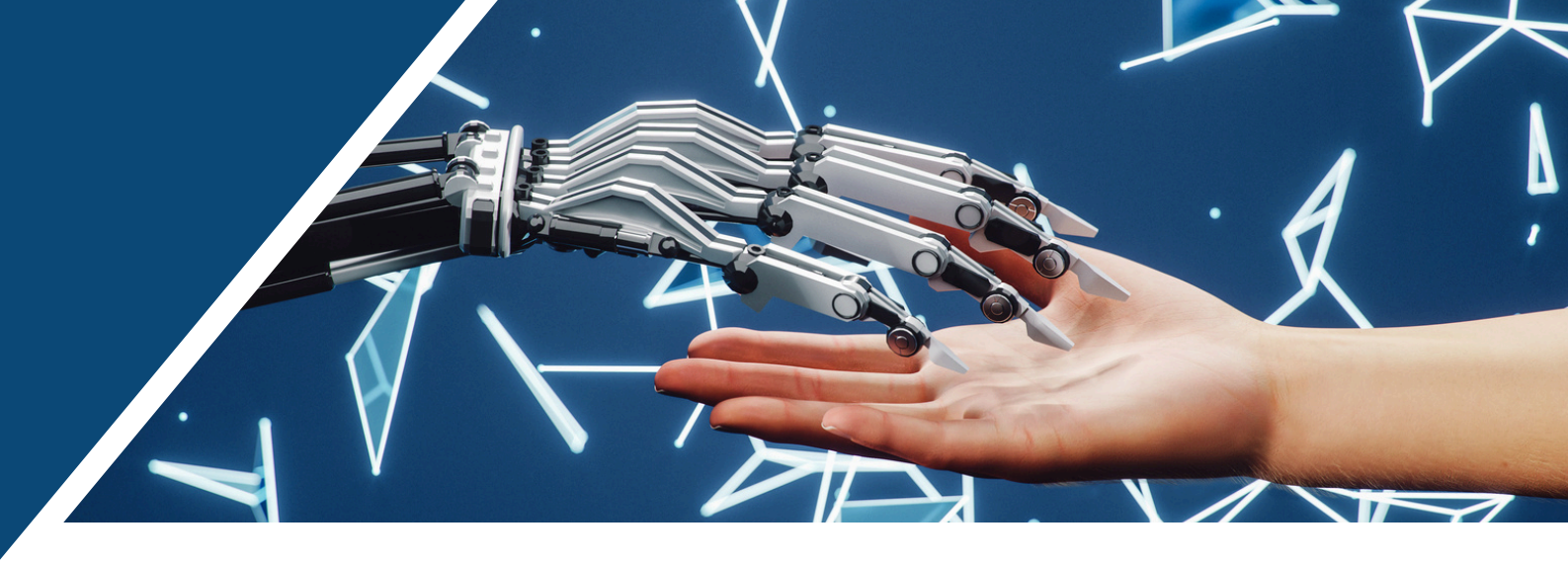
Abstract
Domoic acid is a toxin commonly found in razor clams, posing risks such as nausea, diarrhea, vomiting, and, in severe cases, death. Some studies focus on its concentration in algae, along with developing planar interdigital sensors for sensing and instrumentation. This research proposes a system using a web camera to capture images of razor clam muscle tissue. Employing Linear Contrast Stretching for feature extraction, YOLOv8 detects the presence of domoic acid. Our study aims to evaluate YOLOv8's effectiveness in achieving high accuracy for detecting domoic acid in these bivalve shells. This work introduces a potentially novel application of YOLOv8 for seafood safety inspection. The envisioned system shows promise for real-time screening of razor clams in commercial processing facilities and research laboratories. The model identified safe razor clams with 95% accuracy (57 out of 60 trials) and those with domoic acid with 81.67% accuracy (49 out of 60 trials). Future efforts should expand the dataset to include a wider variety of razor clam species and address data limitations to enhance the system's accuracy and generalizability.

Keywords
Razor Clam, YOLOv8, Linear Stretching, Domoic Acid, Machine Learning



Classification of Green Series Fischer's Lovebirds Using Fuzzy Logic Algorithm

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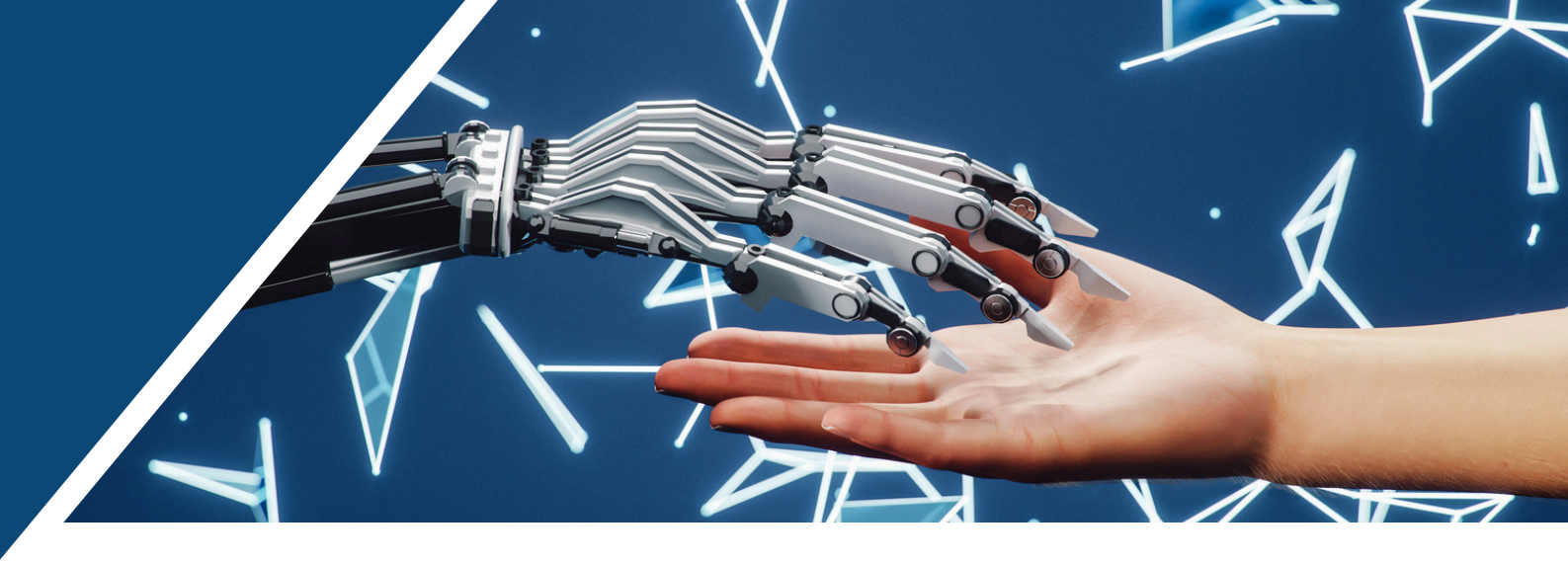
Abstract

This study explores the application of fuzzy logic on the Raspberry Pi platform for classifying Green Series Fischer's Lovebirds, specifically Green, Jade, Misty, and Olive. African Fischer's lovebirds, known for their vibrant colors and sociable nature, pose a classification challenge due to their varied color mutations. Previous techniques such as image processing, artificial neural networks, and color segmentation have been used for species identification, achieving varying degrees of success. Using a fuzzy logic algorithm combined with membership functions and fuzzy rules, the researchers achieved an accuracy of 72.5% on a testing set of 40 samples, with 10 samples per class. The system integrates a camera module and OpenCV for image capture and processing, offering an efficient alternative to traditional visual inspection methods often inadequate for untrained observers. The methodology involved capturing images using a Raspberry Pi 3 Model B and developing a fuzzy logic model for color-based feature extraction and classification. The results demonstrate the effectiveness of fuzzy logic in distinguishing subtle color differences among lovebird variations. This study underscores the potential of combining fuzzy logic and Raspberry Pi for realtime image classification, contributing to advancements in color image processing and practical applications in avian identification.

Keywords

African Fischers Lovebird, Fuzzy Logic, Image Processing, Machine Learning, Bird Classification



Wood Type Classification Through Image Processing Using YOLOv8

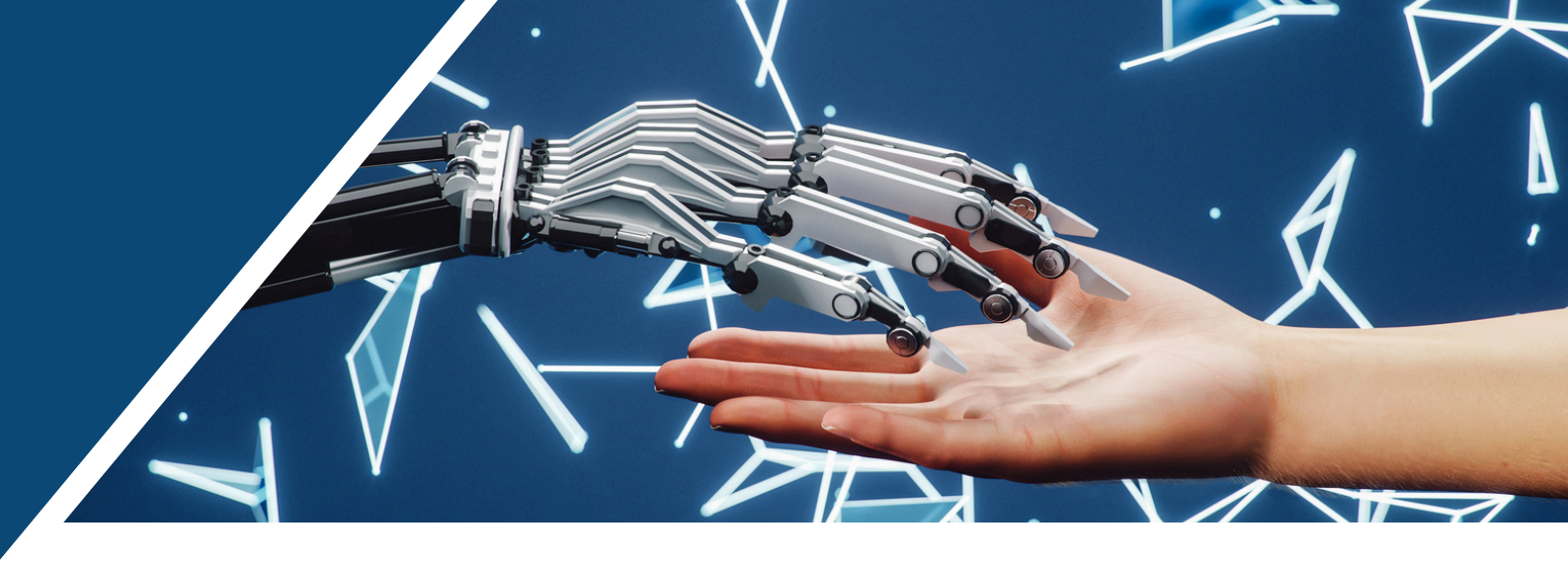
Lorenzo, Emmanuel D., Cruz, Sean Gabriel J., Manlises, Cyrel O.
School of Electrical, Electronics, and Computer Engineering, Mapua University, Manila, Philippines

Abstract

Image processing is increasingly prominent in current research and continually evolves with technology. More exotic wood types in Asian countries, such as Kamagong and Sampalok, have received less attention in research papers. This study aims to detect four different types of wood—namely, Kamagong, Agoho, Acacia, and Sampalok—using Yolov8 and Raspberry Pi 4B. The research is significant for exploring Yolov8 in terms of sample size, training data splits, and other factors. For this study, 100 samples per wood type were collected, totaling 400 samples overall. After detection, the study seeks to classify each wood sample into one of the four types. The training images were consistently lit. A multiclass confusion matrix is employed to assess the model's accuracy. Following testing, the device achieved a detection accuracy of 72.50%. Misclassifications primarily stemmed from variations in lighting conditions during result extraction.

Keywords

YOLOv8, Image Processing, Machine Learning, Wood Classification, Linear Discriminant Analysis



Enhanced Authentication Protocol for Securing Internet of Medical Things with Lightweight Post-Quantum Cryptography

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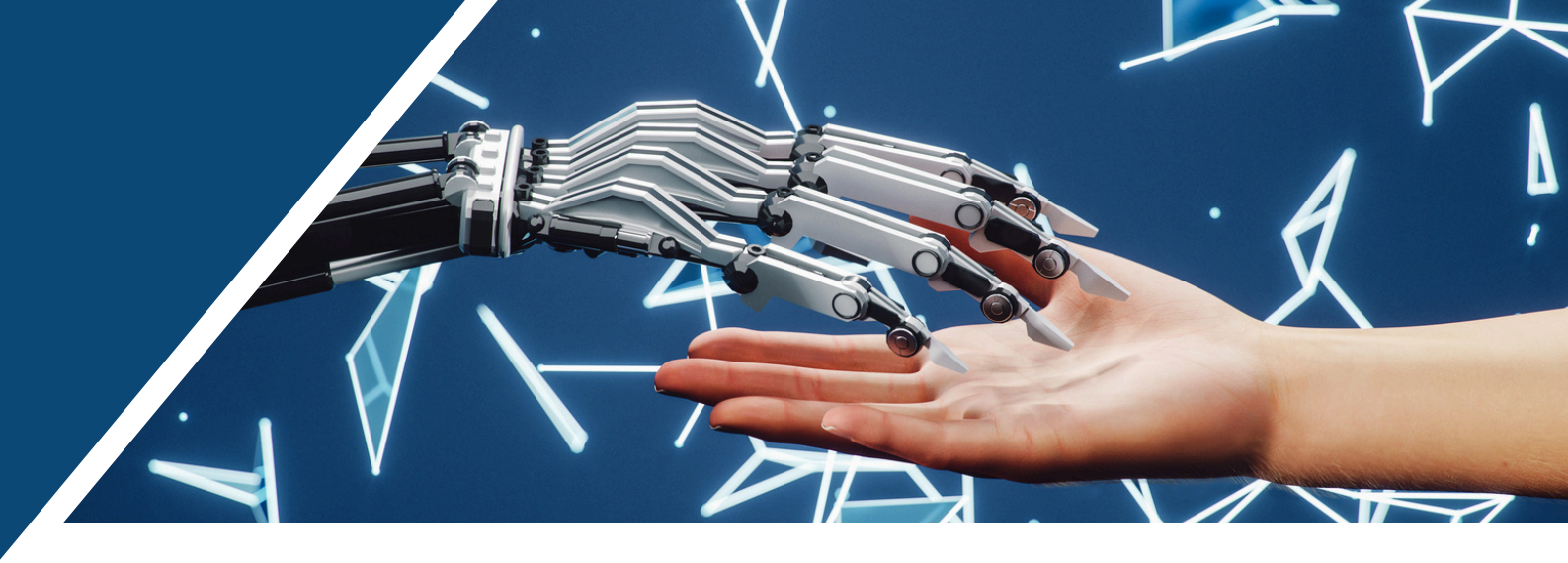
Faculty of Enginerering, Multimedia University, Cyberjaya, Malaysia

Abstract

As the healthcare sector transitions to the Internet of Medical Things (IoMT), it promises significant improvements in productivity by streamlining processes, reducing administrative burdens, and automating routine tasks. However, the current authentication methods are vulnerable due to reliance on simple passwords and a lack of additional protective layers, posing a heightened risk of data breaches. Given the significant value of medical data, security measures for medical devices remain inadequate, especially in safeguarding user and device identities against future quantum computing threats. This paper proposes an enhanced authentication protocol aimed at ensuring the confidentiality and integrity of medical data. The protocol validates user and device identities while incorporating post-quantum cryptography to address upcoming challenges posed by quantum technology.

Keywords

Secure Communication, Post-quantum Cryptography, Lattice-based Cryptography, Authentication Protocol



Distance Recognition Using QR Code Marker

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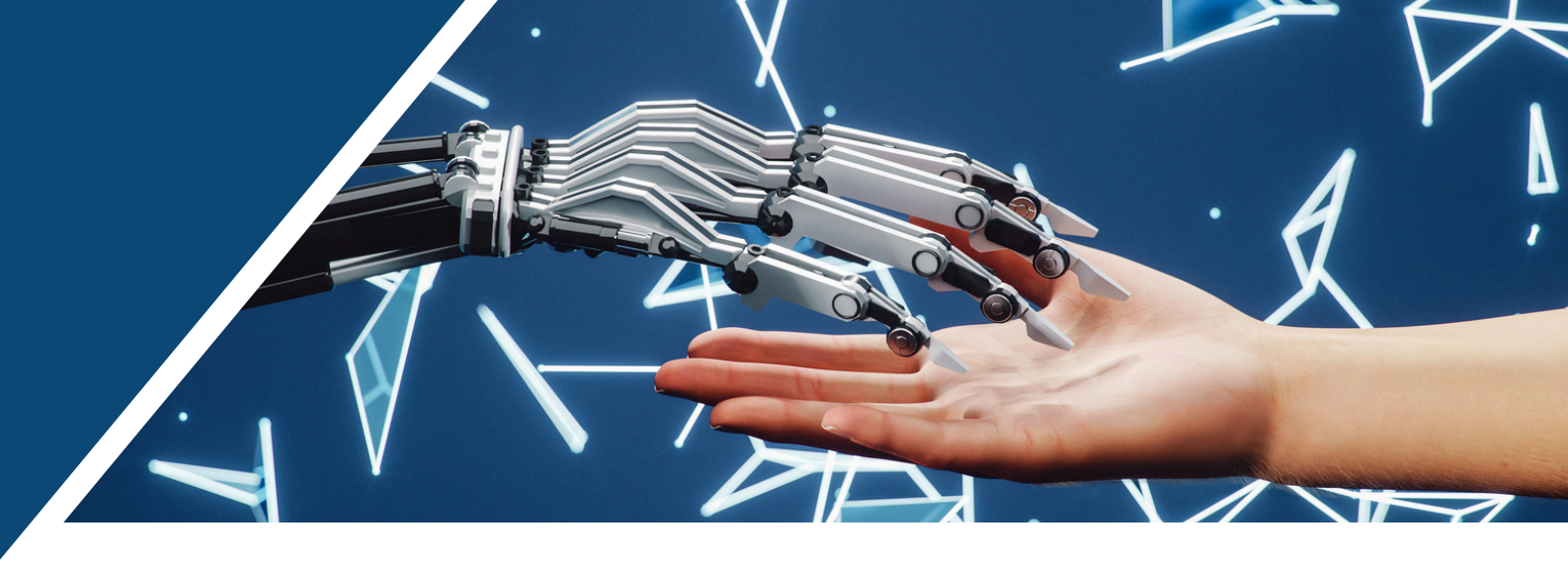
Biomechatronic Research Laboratory, Faculty of Engineering, Universiti Malaysia Sabah, Kota Kinabalu, Sabah
Electrical & Electronic Engineering, Faculty of Engineering, Universiti Malaysia Sabah Kota Kinabalu, Sabah
High Voltage Power Energy Research, Faculty of Engineering Universiti Malaysia Sabah Kota Kinabalu, Sabah

Abstract
Existing distance measuring technologies such as ultrasonic distance sensor and laser range finders are commercially viable but have considerable drawbacks together with significant advantages. There is no balanced distancing solution when factoring together cost, size, maximum range and minimum clearance. This study proposes an incremental distancing solution which could minimize the individual drawbacks of the current absolute distancing solutions while maintaining most of their advantages. The solution consists of a device with a camera and processor that is capable of capturing two distance markers in a single frame and decode the encoded information in the distance markers. This solution will provide measurement precision more than each individual marker can provide itself based on the resolution of the camera and also the length between the two markers in frame. QR codes will be used as the distance marker due to their widespread use, error correction and royalty-free standard. The distance markers will have to be placed at a fixed distance interval onto a measuring surface. Millimeter precision is possible based on the calculations performed and verified with experimental results.

Keywords
QR code, OpenMV, Distance Measurement, Camera



Structural Optimization Design of the Rotary Blowout Preventer Shell Based on an Adaptive Sand Cat and Whale Optimization Algorithm

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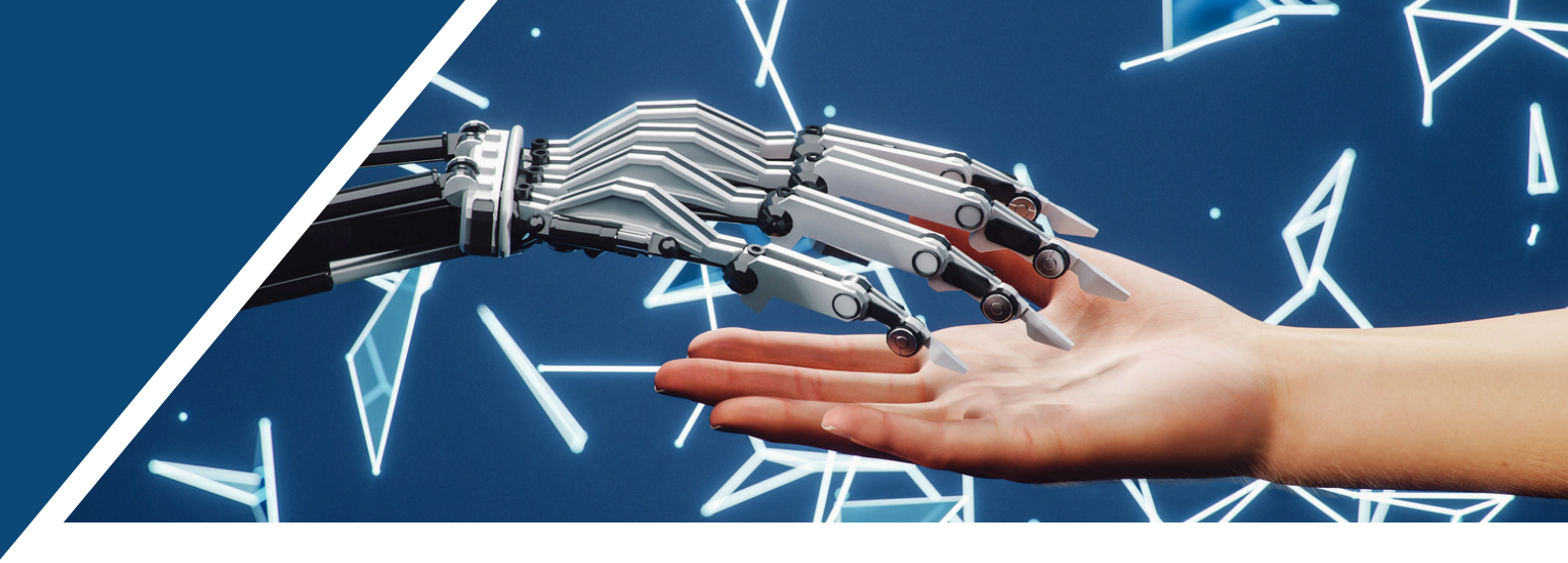
Faculty of Engineering, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia

Abstract

A critical component of the Rotary Blowout Preventer (RBOP) is the rotating assembly, essential for its "drill-in circulation" functionality. The bottom of the outer cylinder of the rotating assembly endures significant hydrostatic pressure, leading to substantial deformation. This study establishes a finite element analysis model of the outer cylinder of the rotating assembly in ANSYS Workbench and validates the strength of the assembly shell by analyzing the stress distribution. The radii of curvature at the interface between the rotating assembly and the clamp, along with five shell thicknesses at different locations along the outer cylinder, are designated as independent variables. To minimize the mass of the shell, a mathematical model is formulated using Von Mises stress as the state variable. Optimization computations are conducted using the Adaptive Sand Cat and Whale Optimization Algorithm (SCWOA). By adjusting the radii of curvature, the concentration of maximum stress is reduced, optimizing the stress distribution, thinning the wall thickness, and reducing the outer cylinder's weight. Compared to optimization results using the hybrid penalty function in ANSYS Workbench, SCWOA demonstrates faster convergence, achieving near-optimal solutions in fewer iterations, making it suitable for addressing challenging engineering optimization problems. Furthermore, the optimized results provide a theoretical foundation for subsequent repair and remanufacturing studies.

Keywords

Blowout Preventer (RBOP), Finite Element Analysis (FEA), Adaptive Sand Cat and Whale Optimization Algorithm (SCWOA), Stress Distribution, Hydrostatic Pressure, Structural Optimization



Ensemble Machine Learning Method for Health Insurance Premium Prediction

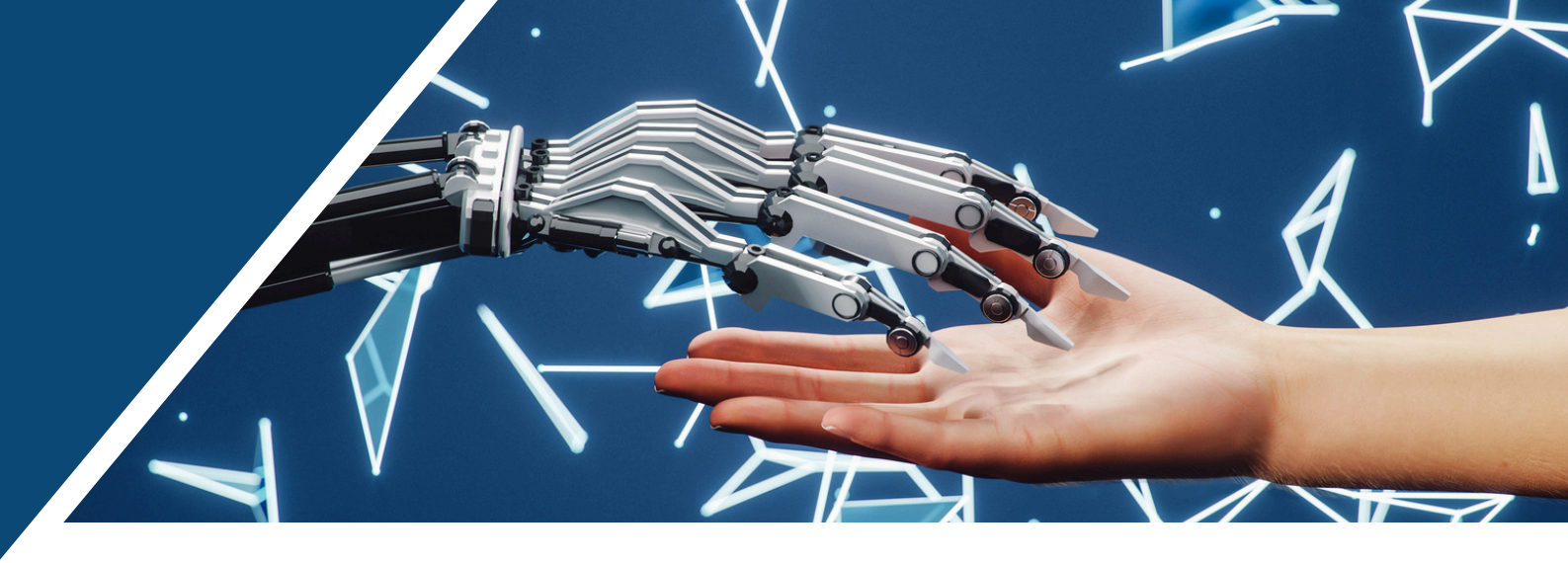
Lee Sijie, Florence Sia, Rayner Alfred, Ervin Gubin Moung
Creative Advanced Machine Intelligence Research Center, Faculty of Computing and Informatic, Universiti Malaysia Sabah

Abstract

The insurance industry remains as one of the most challenging sectors in the business world as the pricing issues are difficult to tackle due to inflation, compliance with regulatory requirements, customer perceptions and purchasing behavior as well as competition from other rival companies. Consequently, pricing has become a complex task for the insurance companies as they struggle to determine the suitable price range of health insurance premium that can be affordable by everyone. Machine learning methods have been widely used to predict the premium of health insurance in order to provide a highly accurate pricing. However, there are various ensemble machine learning methods that have not been exploited for the health insurance premium prediction. This paper aims to investigate the performance of ensemble method that integrates Artificial Neural Network with another machine learning algorithm through the stacking technique to predict the premium of health insurance. The experiment results show that the ensemble model has the capability to outperform the traditional single machine learning model in predicting the health insurance premium on the US Health Insurance dataset.

Keywords

Health Insurance Premium, Machine Learning, Ensemble Machine Learning, Artificial Neural Network, Prediction



Yield Optimization for Exothermic Batch Process Using Particle Swarm Optimization

Min Keng Tan, Matthew Laurentius Bansing, Huiyi Xu, Helen Sin Ee Chuo, Heng Jin Tham, Kenneth Tze Kin Teo
Modelling, Simulation & Computing Laboratory, Faculty of Engineering, Universiti Malaysia Sabah Kota Kinabalu, Malaysia
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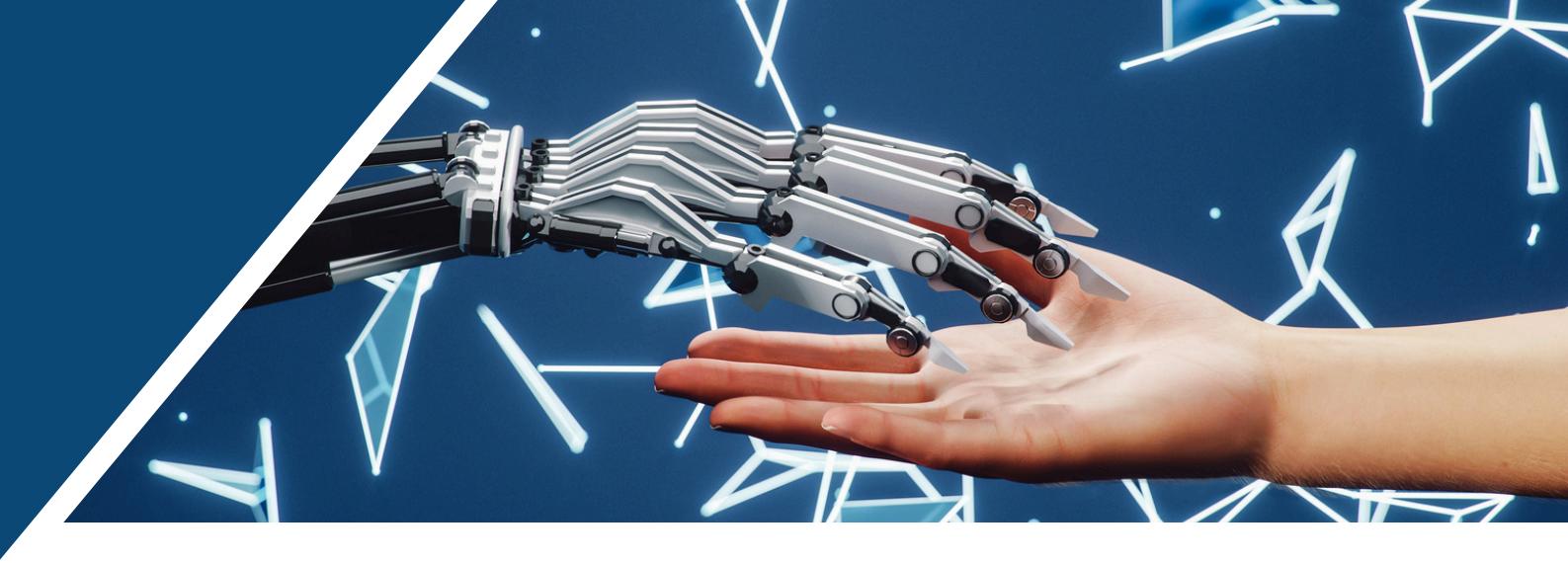
Abstract

Modern advancements in optimizing processes have been explored by various researchers, particularly for exothermic batch processes, which are prolific in the chemical and pharmaceutical industries. This paper proposes using artificial intelligence, specifically particle swarm optimization (PSO), to enhance these exothermic batch processes. Given that most exothermic batch processes utilize generic model control (GMC), the PSO algorithm will primarily focus on optimizing the control of the GMC within the process. The precise control of the controllers will aim to maintain the reactor temperature during the processes, ensuring stability and efficiency. This approach leverages AI to improve process performance, highlighting the potential of PSO in industrial applications. The proposed algorithm is shown to be able to produce a result of an increase of 4.5% of production of the desired product, while decreasing by-product production of 97%. The time it takes for the production of the desired product is also improved by 11.8%. This shows an efficiency increase of the entire exothermic batch processes, The results show that an improvement of the efficiency of the process makes the proposed algorithm a great method to improve the controller of the processes.

Keywords

Particle Swarm Optimization, Exothermic Batch Process, Yield Optimization



Effect of Cooling Channel Structure on Permanent Magnet Synchronous Motor

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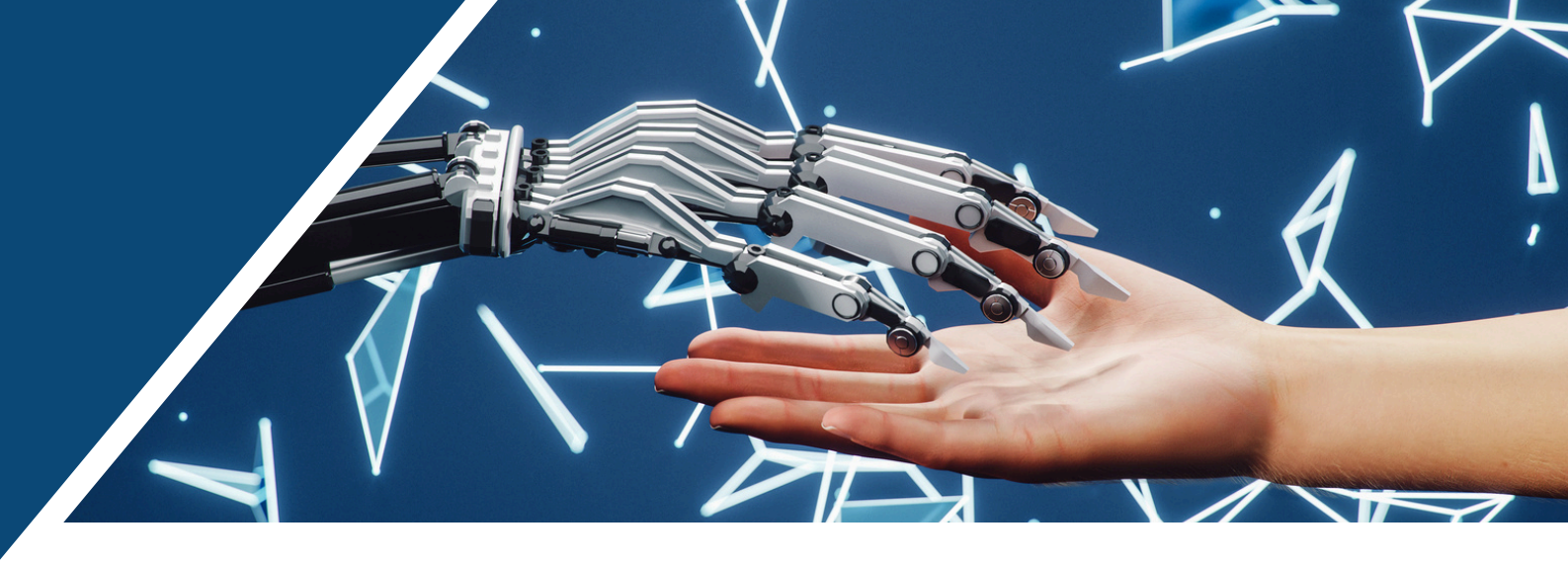
Abstract
Taking the 135kW magnet synchronous motor as the research object, the CFD simulation was used to analyze the influence of spiral-type runner, single-channel circumferential Z-type runner, and axial Z-type runner on the heat dissipation performance of the motor. The maximum temperature of the inner wall of the shell is 358.93K, compared with the single-channel circumferential Z-type runner and axial Z-type runner decreased by 1.69K, 10.65K and 46.47K, respectively. The velocity uniformity and pressure loss of the helical runner is optimal, and the coefficient of velocity uniformity and the difference between import and export pressure are 0.948 and 14.78kpa, respectively; the runner structure of the PM synchronous motor can be preferred to consider the use of the helical runner form

Keywords
Cooling Effect, Channel Structure, Synchronous Motor, Numerical Simulation



Impact of Helical Channel Number on Synchronous Motor Cooling Performance

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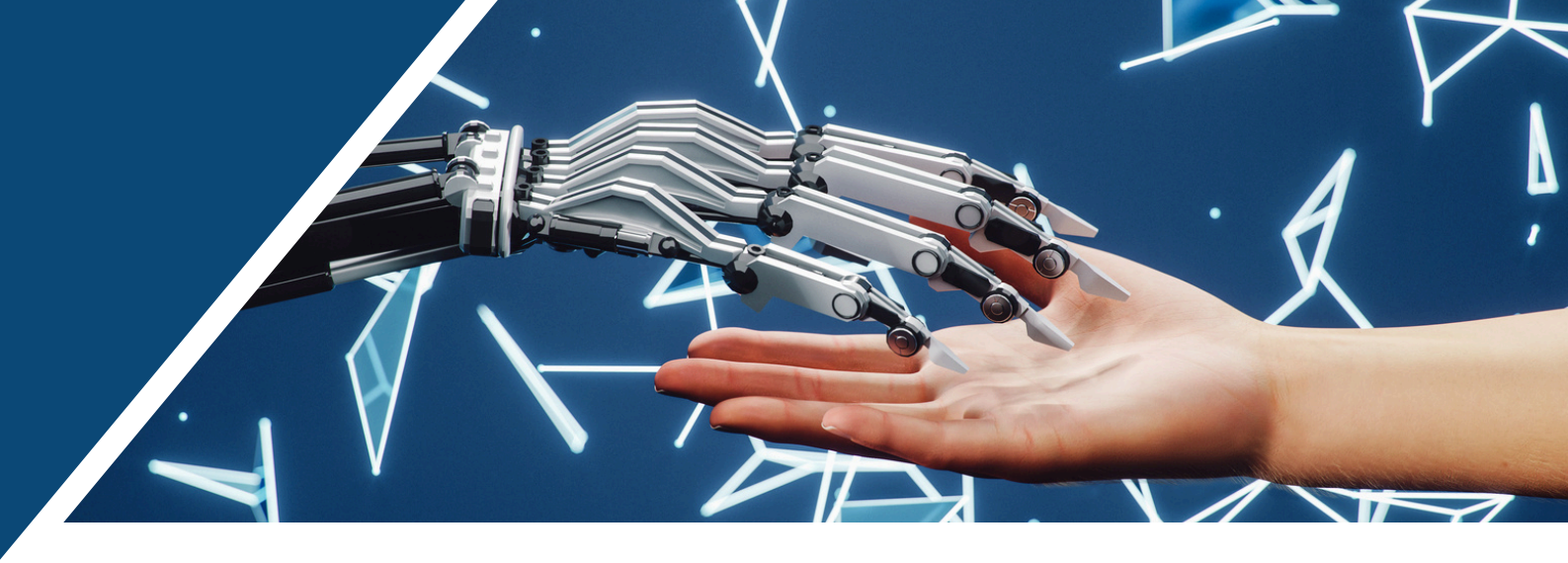
Abstract
In order to deeply explore the specific influence of the number of helical channels on the cooling performance of a motor, we carefully constructed a three-dimensional fluidsolid coupling calculation model of the flow channel with the help of CFD simulation technology. For the helical flow channels of the 135-k water-cooled permanent magnet synchronous motor shell, we conducted detailed numerical simulation calculations of the temperature field, velocity field, and pressure field. The results show that the number of helical channels has a direct impact on the cooling performance of the motor. Specifically, when the number of channels increases from 3 to 7, the maximum temperature on the inner wall of the shell decreases significantly by 94.41-k, and the velocity uniformity coefficient also increases by 0.05. However, this change also leads to an increase in the flow resistance within the channels, resulting in an increase in the pressure difference between the inlet and outlet of the channels by 4.73-kpa. These findings provide powerful data support for us to further optimize motor design and improve cooling performance

Keywords
Cooling Performance, Number of Flow Channels, Synchronous Motor, Numerical Simulation



Adaptive Exponential Feeding Control for a Fedbatch Yeast Fermentation Process Using Reinforcement Learning

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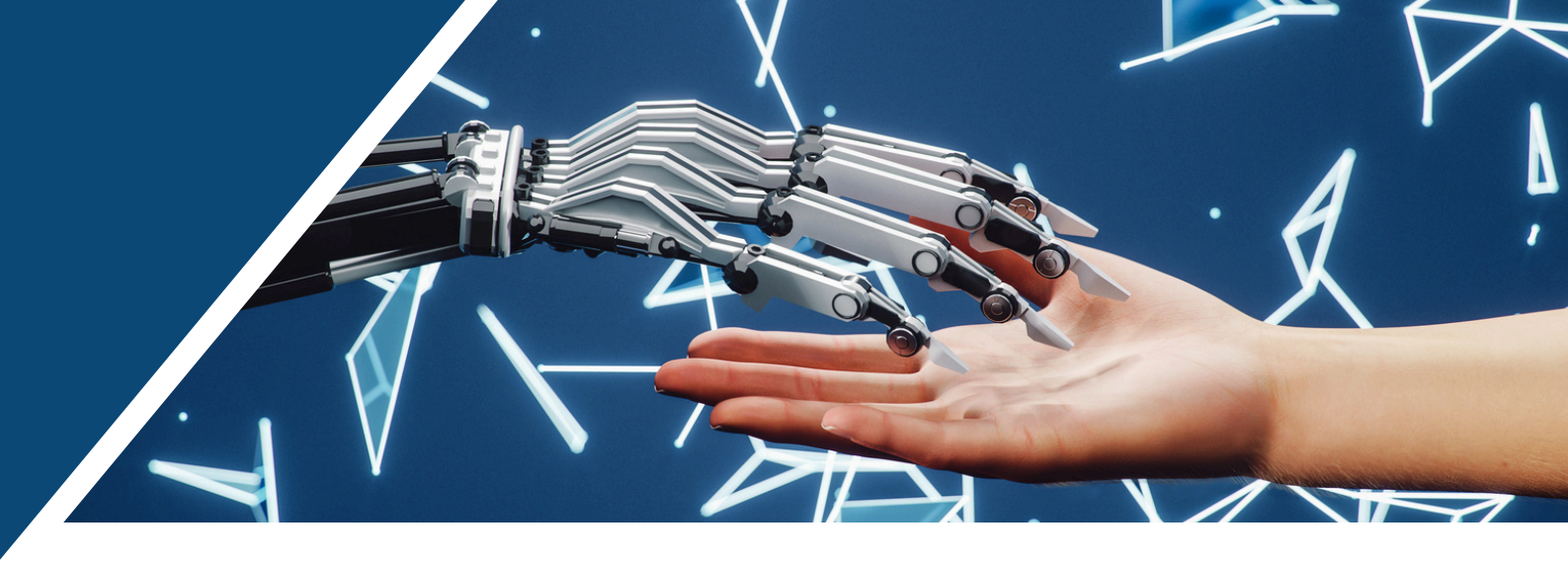
Abstract

The fermentation process is complex and nonlinear because the growth pattern of microorganisms is sensitive to environmental conditions. Exponential feeding (EF) is a common and simple control strategy for regulating substrate feed flow rates using a pre-determined calculation based on growth kinetics. However, this method does not adapt to changes in the fermentation process. Reinforcement Learning (RL) is a subset of Artificial Intelligence (AI) that focuses on teaching optimal behaviors through interaction with an environment using rewards or penalties. This work explores an Adaptive Exponential Feeding (AEF) control using RL to determine the gain value of the feeding rate, aimed at maximizing yeast concentration and minimizing the byproduct formation in a fed-batch baker's yeast fermentation. The kinetic and dynamic behavior of the fermentation process was modeled and simulated using MATLAB. The AEF approach uses an RL agent to optimize the feeding rate by interacting with the fermentation environment and selecting actions based on yeast concentration, glucose levels, and ethanol changes. The gain value ranges from 0 to 2.5 with a 0.1 interval. After iterations, the optimal policy is obtained. Simulations with four different initial yeast and substrate concentrations showed that AEF significantly improved the fermentation performance, yielding a higher yeast concentration of 64.86 g/L compared to 44.68 g/L with EF, a 45.17 % increase, and reducing ethanol formation by 0.15 g/L. This adaptive approach demonstrates potential for enhanced efficiency and productivity in industrial fermentation processes.

Keywords

Fermentation, Reinforcement Learning, Exponential Feeding, Baker's Yeast



Predictive Maintenance using Deep Reinforcement Learning

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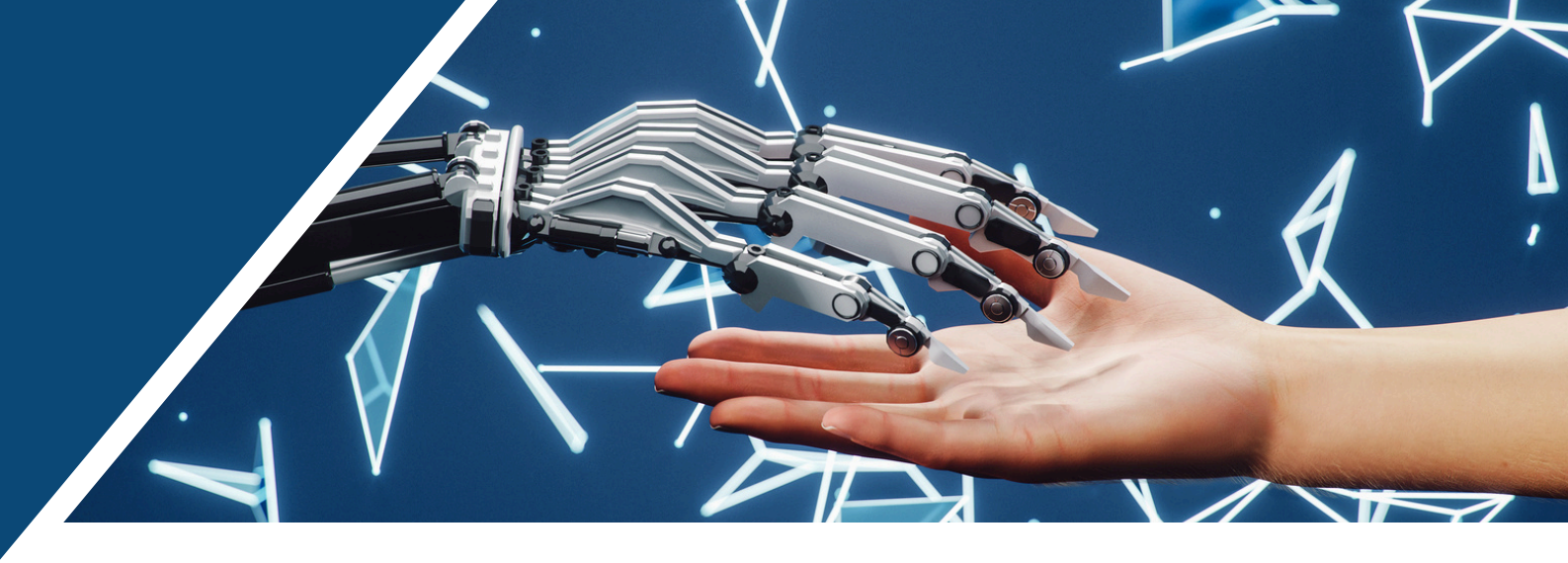
Abstract

Industrial Revolution 4.0 (IR 4.0) have impacted many sectors in many ways. In machine and equipment related industries, one of the requirements to keep aligned with IR 4.0 is to make sure the supply to customers is always ready without any interruption. So, the machine or equipment need to be always ready to and perform maintenance on the right time to prevent downtime. Previously, Predictive Maintenance (PdM) predicts the maintenance of a machine or equipment using Deep Learning (DL) methods, which able to indicate when is the right time to perform maintenance. But, we unable to estimate the optimized policy of when is the right time to perform the maintenance for a particular machine or equipment. For this reason, Predictive Maintenance using Deep Reinforcement Learning (DRL) is proposed. By using the benefits of both Deep Learning (DL) and Reinforcement Learning (RL), we able to predict the right time to predict the maintenance and also the optimal policy to perform the maintenance. RNN and CNN is used and their performance on the prediction and policy optimization will be discussed in this paper.

Keywords

Predictive Maintenance, Reinforcement Learning, Deep Reinforcement Learning, CNN, RNN, NASA CMAPSS, PdM, DRL, RL, DL



Ant Colony Optimization based Multi-Hop Wireless Transmission for Enhanced Network Reliability

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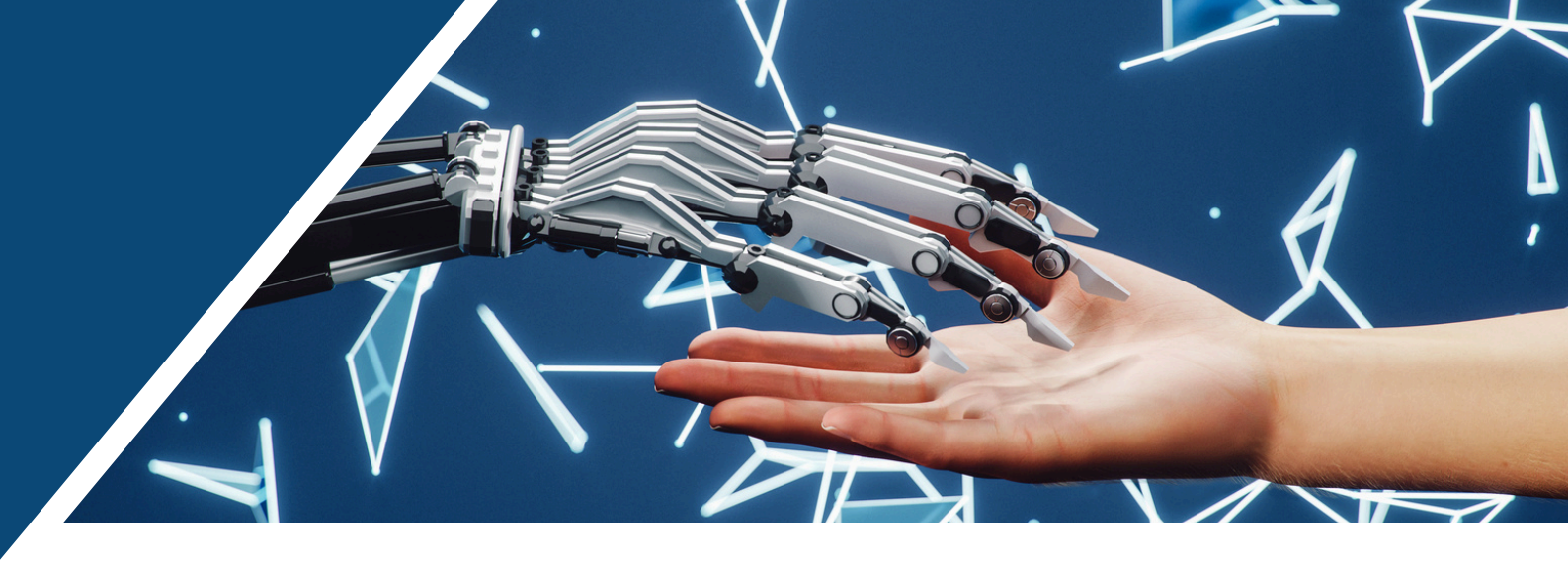
Abstract

Wireless multi-hop transmission is a technology that has been used for data transfer in an area with no internet connectivity and electricity. Wireless sensor networks (WSNs) are created for many different purposes, such as for everyday civilian uses and military applications. However, multi-hop transmissions are also popular with challenges like uneven terrain shape, low data transfer rates, and easy loss of connectivity when it comes to design phase. The current control strategy for multi-hop routing is based on the pre-configuration setting. The nodes only communicate with preset nodes and the malfunction of any single transceiver can disrupt the entire transmission route, causing connection losses and decreasing network reliability. Additionally, overlapping coverage of omnidirectional transceivers causes other nodes to receive data that is not for them. Thus, this study explores the potential of optimizing multi-hop wireless communication by implementing artificial algorithms in omnidirectional transceiver. A simulation model is designed in MATLAB to represent the real WSN situation. Several parameters such as number of nodes, area size and transmission range are considered during the simulation platform setup. The output of the simulation will provide a list of shortest routes that the control algorithm can discover when dead nodes are increasing. The Euclidean distance formula is utilized to calculate node distance using their x and y coordinates. Simulation results showed that Ant Colony Optimization (ACO) algorithm has better average hops and its first dead node appears longer when compared to other routing controls.

Keywords

Wireless Sensor Network, Routing Protocols, Ant Colony Optimization



Non-Intrusive Biomass Estimation in Aquaculture using Structure from Motion within Decision Support Systems

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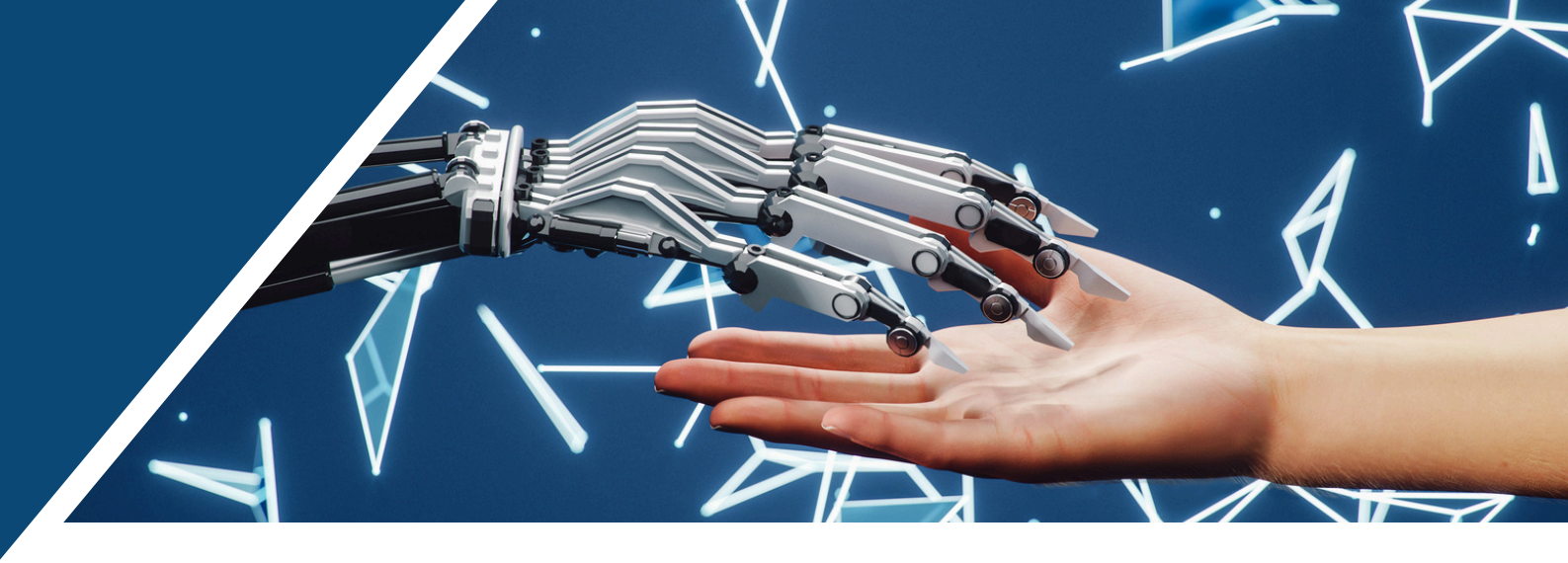
Abstract

This paper details an advanced implementation of Structure from Motion (SfM) techniques within Decision Support Systems (DSS) for non-intrusive fish weight measurement in Precision Fish Farming (PFF). Unlike conventional methods that often require physical handling or intrusive sensors, this study utilizes a synchronized multicamera array strategically positioned underwater to capture high-resolution images across multiple viewpoints. Employing sophisticated algorithms, the research meticulously handles image distortion typical in underwater environments through tailored rectification processes, enhancing feature detection and matching accuracy under variable lighting and turbidity. Our approach integrates dense point cloud generation and sophisticated 3D mesh reconstruction to derive volumetric measurements of fish, which are then correlated with biomass estimations through empirical models refined with machine learning techniques for predictive accuracy. Initial validations against standard physical weighing methods demonstrate a significant enhancement in measurement precision and repeatability, with a reduced error margin by over 30%. These advancements not only streamline operational efficiencies but also pave the way for more sustainable fish farming practices by minimizing human-fish interactions and the associated stressinduced behavioral alterations.

Keywords

Structure from Motion, Decision Support Systems, Precision Fish Farming, Non-intrusive Measurement, Biomass Estimation, Machine Learning



AIoT-Driven Machine Learning for Anomaly Detection in Structural Health Monitoring

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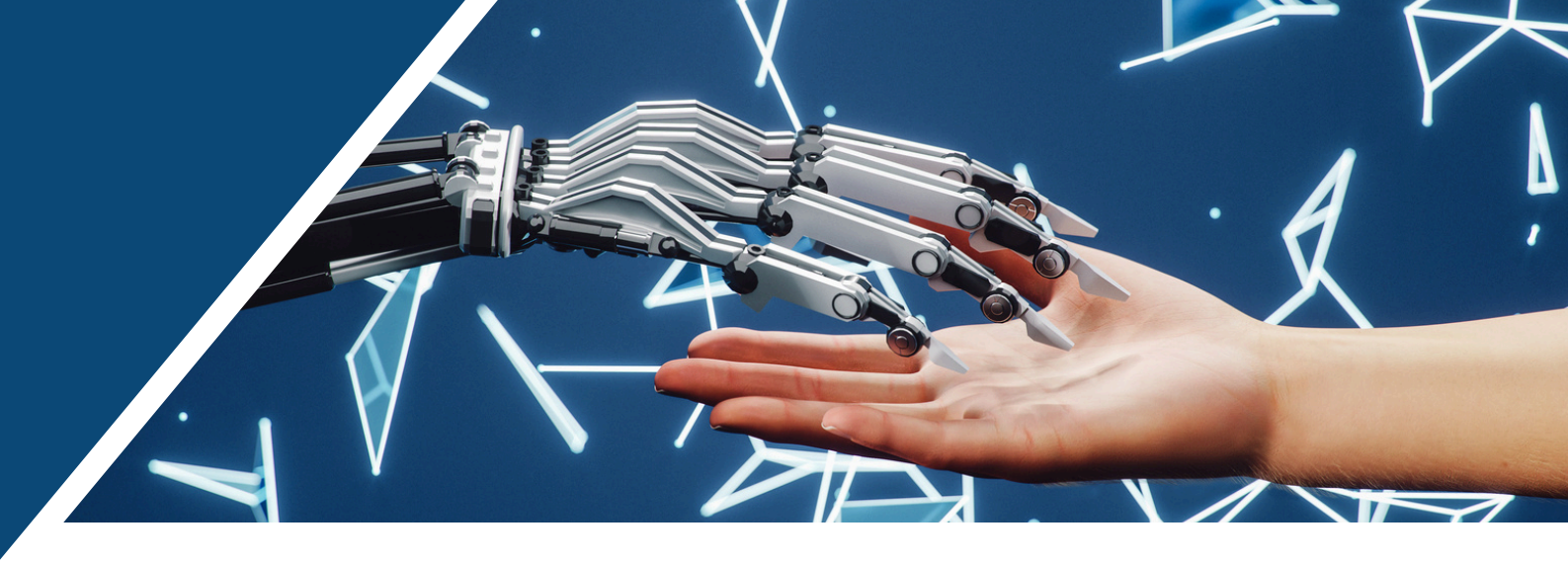
Abstract

Structural health monitoring (SHM) is crucial for real-time assessment of structures to preemptively detect anomalies that may lead to failures. This study explores the integration of Artificial Intelligence of Things (AIoT) principles to enhance anomaly detection using acceleration and gyroscopic sensor data. The study involved setting up hardware comprising acceleration and gyroscopic sensors, integrated with a web server for real-time data monitoring. Issues with the raw dataset, including noise and variability, were addressed through preprocessing techniques. Four machine learning models, Support Vector Machine (SVM), Random Forest, Gradient Boosting, and Neural Network were evaluated on preprocessed data, focusing on recall as critical for anomaly detection in SHM. Models trained on reduced datasets showed varied performance compared to those using large, raw datasets, which, while computationally intensive, exhibited similar performance. SMOTE significantly improved recall, achieving 93.94% in Random Forest after correcting class imbalance and reducing dataset size. The findings underscore the potential of AIoT-driven machine learning approaches, to significantly enhance SHM modelling. By leveraging these technologies, infrastructure management can be fortified with more reliable anomaly detection capabilities, ensuring heightened safety and resilience in the AIoT era.

Keywords

AIoT, Structural Health Monitoring, Anomaly Detection, Machine Learning, Neural Network



CNN-LSTM Neural Network-based Short-Term PV Power Generation Forecaster

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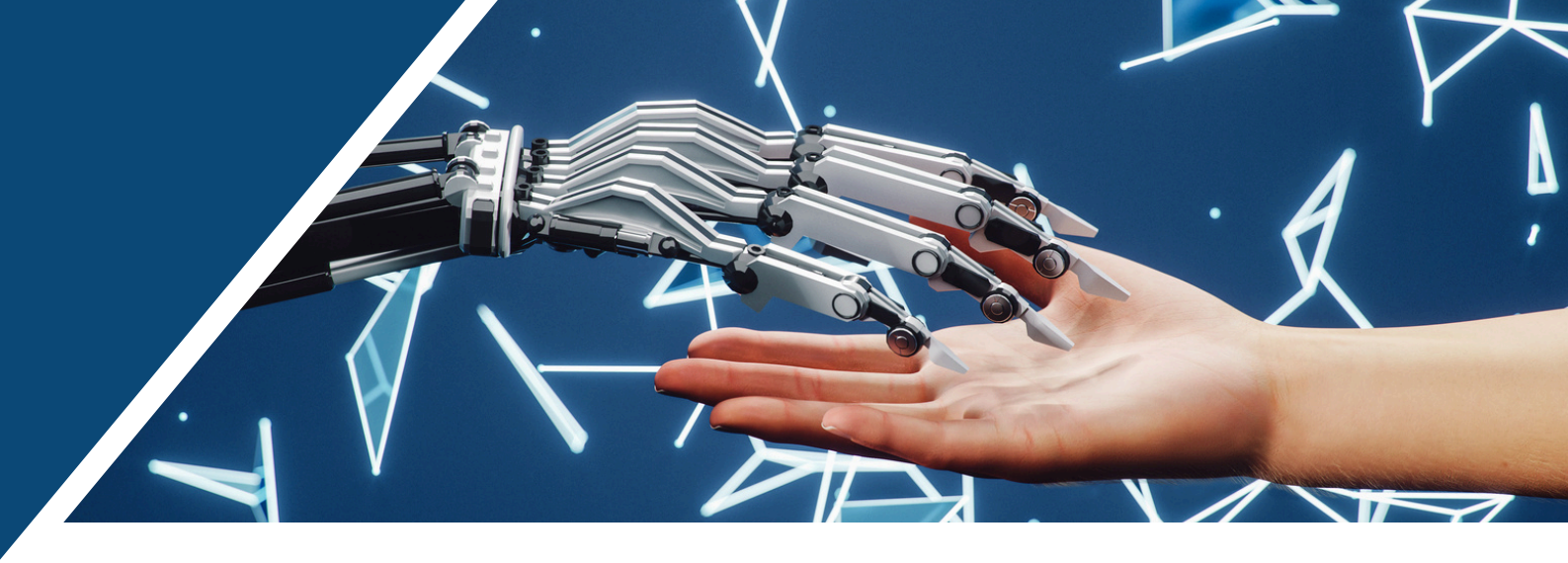
Abstract

Solar renewable energy technology is vastly applied across the globe to tackle consumer's energy demand. Power generation through solar energy is heavily influenced by the uncertainty of meteorological conditions and surrounding facilities. Establishing model predictive control (MPC) through hybrid deep learning (DL) forecaster is crucial to closely monitor and provide systematic planning for the solar power generation station. A hybrid deep learning through convolutional long-short-term memory (CNN-LSTM) model is proposed to forecast the hourly power generation. The proposed CNN-LSTM model excluded the usage of max pooling layer in its structure which is typically utilized in other studies. A comparison of the forecasting performance between the proposed CNN-LSTM and CNN-LSTM max pooling model is conducted throughout the study for forecasting training, validation, and testing datasets. Transfer learning by feeding new datasets from other stations is conducted to testify the ability of each model in adapting new datasets. Developing an accurate DL forecaster for MPC in solar power generation stations will substantially enhance the productivity of energy generation.

Keywords

Hybrid Deep Learning, Regression, Solar Power Generation, Supervised Learning, Data Pipeline Generation



Evaluation of Theoretical and Empirical Log-Normal Models for Wi-Fi Fingerprint Mapping in Indoor Positioning

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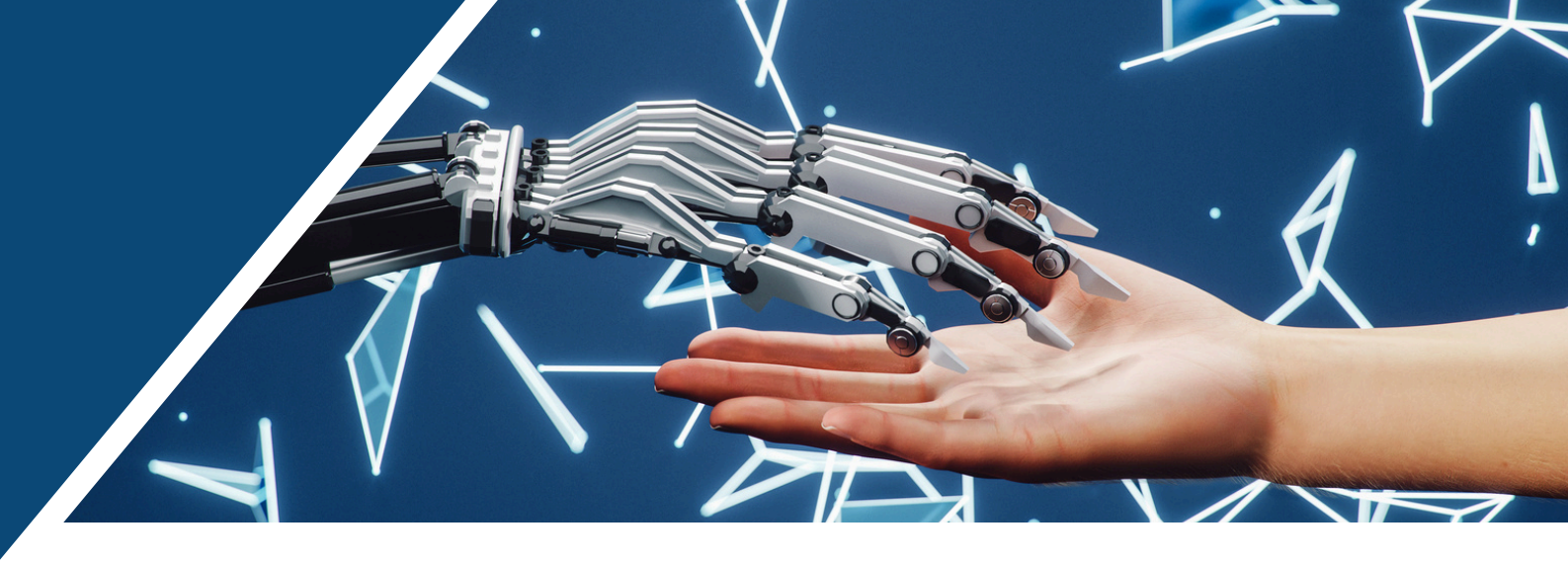
Abstract

This paper evaluates both the theoretical and empirical log-normal models for Wi-Fi fingerprint mapping in indoor positioning systems. Wi-Fi fingerprinting, leveraging the ubiquitous IEEE 802.11 protocol, offers a practical solution for indoor localization where Global Positioning System (GPS) is ineffective. It involves generating empirical data by systematically measuring Wi-Fi Received Signal Strength (RSS) within a complex indoor environment and formulating a log-normal path loss model to predict signal behavior. A comparative analysis was conducted between the theoretical model, calibrated with empirical RSS data, and the actual RSS measurements. The results showed that while the theoretical model captured overall signal propagation trends, the empirical data revealed variations due to multipath effects and environmental obstacles. It demonstrated the practical use of Wi-Fi fingerprint mapping, theoretical modeling, and comparative analysis. The findings underscore the importance of empirical validation in refining theoretical models and optimizing deployment strategies for accurate and reliable indoor positioning. Future research should focus on mitigating multipath effects and enhancing the theoretical model accuracy through optimized access point (AP) placement and advanced signal processing techniques.

Keywords

Wi-Fi Signal Strength, Path Loss Model, RSS Fingerprint Map, Indoor Positioning, Empirical Model, Theoretical Model



Machine Learning-Based Classification of Termite Genera

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Abstract

This paper presents an approach for the automatic identification of termite species based on the measurements of various body parts and the use of a random forest classifier model. Termites are known for causing significant economic damage worldwide, particularly in tropical regions. Accurate identification of termite species is essential for effective management and control. This study presents an AI-driven approach for the automatic classification of termite genera. Utilizing Random Forest and other machine learning algorithms, our method achieves a classification accuracy of 99%, significantly enhancing the efficiency of entomological research. The model's robustness was validated against a comprehensive dataset, demonstrating its potential in automated pest identification and management. The research provides a detailed methodology, critical analysis of the results, and discusses the implications of using AI in biological classification.

Keywords

Termites, Classification, Random Forest, Morphology, Machine Learning