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VIEW FULL ISSUE

Paper 1: Human Coach Technology Reactance Factors and their Influence on End-Users' Acceptance of e-Health Applications

Abstract: Project e-VITA is a joined research force from Europe and Japan that examines various cutting-edge e-health applications for older adult care. Those specific users do not necessarily feel technology savvy or secure enough to open up for innovative home tech systems. Thus, it is essential to provide the support that is virtual and human beside each other. Human coaches will provide this support to fulfill this role as a mediator between the technological system and the end-user. Reactance towards the system from the mediator's role could lead to the system's failure with the end user, thus failing the development. The effect of technology reactance in the integration process of a technological system can be the decisive factor in evaluating the success and failure of a technological system. We used part-standardized, problem-centered interviews to understand the human coaches' challenges. The sample included people who act as the mediator role between the user and the technological system in the test application in the study centers. The interviews focused on experienced or imagined hurdles in the communication process with the user and the mediator role as well as the later relationship dynamic between the mediator, end-user, and technological system. The described technological challenges during the testing phase led the human coaches to responsibility, diffusion and uncertainty within their role. Furthermore, they led to a feeling of not fulfilling role expectations, which in the long term could indicate missing self-efficacy for the human coaches. We describe possible solutions mentioned by the interviewees and deepen the understanding of decisive factors for sustainable system integration for e-health applications.

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Author 3: Johanna Langendorf   Author 4: Koki Kobayashi

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Author 7: Yasuyuki Taki

PDF

Paper 2: Multispectral Image Analysis using Convolution Neural Networks

Abstract: Machine learning (ML) techniques are used often to classify pixels in multispectral images. Recently, there is growing interest in using Convolution Neural Networks (CNNs) for classifying multispectral images. CNNs are preferred because of high performance, advances in hardware such as graphical processing units (GPUs), and availability of several CNN architectures. In CNN, units in the first hidden layer view only a small image window and learn low level features. Deeper layers learn more expressive features by combining low level features. In this paper, we propose a novel approach to classify pixels in a multispectral image using deep convolution neural networks (DCNNs). In our approach, each feature vector is mapped to an image. We used the proposed framework to classify two Landsat scenes that are obtained from New Orleans and Juneau, Alaska areas. The suggested approach is compared with the commonly used classifiers such as the Decision Tree (DT), Support Vector Machine (SVM), and Random Forest (RF). The proposed approach has shown the state-of-the-art results.

Author 1: Arun D. Kulkarni

PDF

Paper 3: Comparison of Four Demosaicing Methods for Facial Recognition Algorithms

Abstract: Multispectral imaging has become more important in several areas during this decade to overcome the limitations of color imaging. There are several types of multispectral acquisition systems, including single-shot cameras that incorporate Multispectral Filter Arrays (MSFA). MSFA is an extension of the color filter array. Acquisition systems that incorporate spectral filter arrays are very fast, lightweight, and able to acquire moving scenes. But these cameras are manufactured with at best software for filter positioning correction without demosaicing software. Hence there is a need to identify a suitable demosaicing algorithm in terms of image quality, computation time, and decorrelation factor. This paper presents a comparative study of four relevant demosaicing methods in the facial recognition process using images acquired with a single-shot MSFA camera designed in our laboratory. To achieve this goal, the four demosaicing methods named bilinear interpolation,

discrete wavelet transform, binary tree, and median vector were adapted to multispectral images acquired using a MSFA camera. Evaluations were first performed using the NIQE performance metric and the correlation coefficient. Then Demosaced images were used to train VGG19 neural network to know which demosacing method better contains relevant features for recognition and better computation time. Results reveal that bilinear interpolation provides the less correlated images and the binary tree gives the best quality images with a NIQE of 8.99 and an accuracy of 100% for face recognition.

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Author 3: Pierre GOUTON   Author 4: Guy DEGLA

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Paper 4: An Artificial Intelligence Method for Automatic Assessment of Fuzzy Semantics in English Literature

Abstract: This Online writing and evaluation are becoming increasingly popular, as is automatic literature assessment. The most popular way is to obtain a good evaluation of the essay and article is by the automatic scoring model. However, assessing fuzzy semantics contained in reports and papers takes much work. An automated essay and articles assessment model using the long-short-term memory (LSTM) neural network is developed and validated to obtain an appropriate assessment. The relevant theoretical basis of the recurrent neural network is introduced first, and the quadratic weighted kappa (QWK) elevation method is cited here to develop the model. The LSTM network is then awarded for developing the general automatic assessment model. The available model is modified to get better performance by adding a convolutional layer(s). Finally, a data set of 7000 essays is segmented based on the ratio of 6:2:2 to train, validate, and test the model. The results indicate that the LSTM network can effectively capture the general properties of the essay and articles. After adding the convolutional layer(s), the LSTM+convolutional layer(s) model can get better performance. The QWK values are higher than 0.6 and have an improvement of 0.097 to 0.134 compared with the LSTM network, which proves that the results of the LSTM network combined with the convolutional layer(s) model are overall satisfactory, and the modified model has practical values.

Author 1: Meiyan LI

PDF

Paper 5: Application of Image Style Transfer Based on Normalized Residual Network in Art Design

Abstract: With the development of computer vision technology, image style transfer technology based on deep learning has achieved vigorous

development. It has been widely applied in fields such as art design, painting creation, and film and television effect production. However, existing image style transfer methods still have shortcomings, including low efficiency and weak quality of style transfer, which cannot better meet the actual needs of various art and design activities. Therefore, a residual network structure is introduced to construct an image style transfer model based on the convolutional neural networks. Meanwhile, a normalization layer is added to the residual network results to optimize the image style transfer technology. An image style transfer model based on the normalized residual network is constructed. The experimental results show that the accuracy, recall, and F1 values of the improved image style transfer model proposed in the study are 97.35%, 96.49%, and 97.52%, respectively, which can complete high-quality image style transfer. This indicates that the image style transfer model proposed in the study has good performance, which can effectively improve the efficiency and quality of image style transfer, providing effective support for various art and design activities.

Author 1: Jing Pu   Author 2: Yuke Li

PDF

Paper 6: Establishment and Optimization of Video Analysis System in Metaverse Environment

Abstract: The current source space communication architecture has not changed. At present, the key technology of so-called metaverse media only applies its elements to existing communication architectures, and more importantly, this type of integration involves individual examples and promotional marketing methods. How to become a new growth point for the deep collaborative development of metaverse media requires strengthened research and exploration. Although AI analysis technology is powerful, its sensitivity, accuracy and adaptability could be more satisfactory due to the complexity of real-world scenarios. Given the shortcomings of existing research, we designed a video analysis system in the metaverse environment, combining virtual reality and artificial intelligence, with video perception, network, and information technology as the medium and big data as the technical support to build a full intelligence Video analysis system. The system is based on the YOLOv3 model, combined with the actual video scene, and analyzes according to the video's human behavior and environmental changes. Experiments show that the system has obvious advantages in the accuracy and recall rate of video analysis and detection, the system detection performance is significantly improved, and the video target analysis and detection of complex scenes are realized.

Author 1: Dandan WANG   Author 2: Tianci Zhang

PDF

Paper 7: An Evaluation Method of English Composition Automatic Grading Based on Genetic Optimization Algorithm

and CNN Model

Abstract: In response to the problems of traditional genetic algorithms in evaluating English compositions, the stability of automatic grading of English compositions has been further enhanced. This article evaluates the teaching effectiveness of automatic grading of English compositions using an optimization fusion algorithm combined with genetic optimization algorithm and CNN model. By analyzing genetic content and optimization algorithms, a corresponding fusion optimization model was obtained, and the automatic evaluation of English compositions was analyzed and predicted through experimental verification. The results indicate that the curves corresponding to different parameters exhibit typical segmentation features through the variation curves of individual numbers under different scale factors. And through quantitative description and analysis of the curve, it can be seen that the change in proportion factor has an absolute advantage in the impact of genetic algorithm on the number of children. As the number of samples increases, the performance of genetic optimization algorithms under the f function shows an upward trend. Research has shown that the writing content index has the greatest impact on English writing, while the corresponding grammar errors have the smallest impact on English writing. Finally, the accuracy of the optimized model was verified by comparing the model curve with experimental data. This study provides theoretical support for the use of genetic optimization algorithms and CNN models in English, and provides ideas for the use of optimization algorithms in other fields.

Author 1: Li Wang

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Paper 8: Construction of Sports Culture Recommendation Model Combining Big Data Technology and Video Semantic Comprehension

Abstract: Information blast makes it harder for clients to channel the substance they are keen on. This study aims to combine big data and video semantic comprehension technology to realize the recommendation of sports culture videos by exploring the semantics of video and taking advantage of multi-source heterogeneous information. The semantic structure of unstructured video data is defined first, and on this basis, Converse3D (C3D) - Connectionist Temporal Asifationon (CTC) is employed to complete the extraction of sub-action semantics and the integration of behaviour semantic sequences. In adjustment to break the botheration of low accurateness of the model for the semantic abstraction of unlabeled videos, this study proposes an unsupervised semantic abstraction adjustment based on Converse3D(C3D)-RAE, which completes the compression and affiliation of the semantic sequences and verifies the accurateness of both two models through experiments. In order to solve the problem of insufficient accuracy of video recommendation algorithms based on single video semantic similarity and topic similarity, this study comprehensively considers video semantic similarity and video topic similarity and proposes a multi-modal video recommendation algorithm. The experimental results show that the accuracy of the COMSIM-based algorithm is 7.8% higher than that of Video+ CNN + K-NearestNeighbor (KNN) and 15.9% higher than that of CLIP + CNN +Ncut+LDA.

Author 1: Bin Xie   Author 2: Fuye Zhang

Paper 9: Immersive Virtual Reality: A New Dimension in Physiotherapy

Abstract: Physiotherapy treatments often necessitate patients to perform exercises at home as part of their rehabilitation regimen. However, outside the clinic, patients are often left with inadequate guidance, typically provided in the form of static images or sketches on paper. The ongoing COVID-19 pandemic has further disrupted the ability for patients and physiotherapists to engage in face-to-face sessions, leading to suboptimal compliance and concerns about the accuracy of exercise performance. In recent years, there has been a growing body of scientific literature on the application of virtual reality (VR) in physiotherapy. This emerging trend highlights the potential of VR technology to enhance the guidance and effectiveness of physiotherapy regimens. This research paper aims to investigate the impact of VR-based physiotherapy on the guidance and completion of prescribed exercises. To address the limitations faced by patients unable to access in-person physiotherapy due to the pandemic or geographical constraints, we propose the FisioVR application, specifically designed for Android devices. What sets FisioVR apart is its intrinsic guidance and support from physiotherapy experts. To evaluate the effectiveness of FisioVR, we conducted tests with eight respondents who provided valuable feedback via an online form. The results clearly demonstrate that each physiotherapy session carried out using FisioVR has a positive impact and is conducive to achieving the intended therapeutic objectives, effectively promoting recovery. In summary, FisioVR has the potential to bridge the gap between patients and care providers, facilitating home-based and individualized physiotherapy. This innovative application leverages the power of virtual reality to offer a more accessible, guided, and personalized approach to physiotherapy, especially crucial during times when in-person sessions are challenging.

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Paper 10: Ensembling of Attention-based Recurrent Units for Detection and Mitigation of Multiple Attacks in Cloud

Abstract: In the recent years, number of threats to network security increases exponentially as the Internet users which poses serious threat in cloud storage application. Detection and defending against the multiple threats are currently a hot topic in industry and considered as one of the challenging research in academia. Many methodologies and algorithms devised to predict the different attacks. Still, most of the methods cannot simultaneously achieve high performance of prediction with a small number of false alarm rates. In this scenario, Deep Learning (DL) algorithms are appropriate and intelligent to categorize the multiple attacks. Still, most of the existing DL techniques are

computationally inefficient that may degrade the performance in predicting the both normal and attack information. To overcome this aforementioned problem, this paper proposes the hybrid combination of attention maps with deep recurrent networks to mitigate the multiple attacks with low computational overhead. Initially, the pre-processing step is proposed to the inputs in a specified range. Later on, input data are fed into the Attention Enabled Gated Recurrent Networks (AEGRN) which is used to remove the redundant features and select the optimal features that aids for the better classification. Further to enhance the faster response, deep feed forward layers are proposed to replace the traditional deep neural networks. Numerous metrics for performance, including accuracy, precision, recall, specificity, and F1-score, are examined and analyzed as part of the thorough experimentation utilizing multiple datasets, including NSL-KDD-99, UNSW -2019, and CIDC-001. Comparisons of performance between the method that is suggested and existing models developed with DL are used to demonstrate the proposed algorithm's supremacy. The suggested framework surpasses the other DL models and has the best accuracy in predicting with little computational overhead, according to an investigation.

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Paper 11: An Efficient Method for Implementing Applications of Smart Devices Based on Mobile Fog Processing in a Secure Environment

Abstract: Smart technology and the Internet of Things (IoT) are advancing and growing daily in the modern world. The demand for solutions to execute complex applications and protect user security and privacy increases as the number of smart devices in our surroundings increases. Mobile fog processing aids us in this situation by providing a fresh and effective method for running smart device applications in a safe setting. Due to the delay and high volume of requests, the centralized and traditional architecture of cloud processing cannot handle the high user demand and effectively implement delay-sensitive and real-time programs. To address these issues, a virtual mobile fog processing architecture that establishes a layer between mobile apps and the cloud layer was developed in this work. In this layer, storage, processing, and encrypted communication occur on separate nodes not connected to the cloud. These nodes are virtually implemented on a single server. An Android smart system-based augmented reality application that uses a marker to display dynamic 3D objects has been introduced. Its functioning has been assessed in both the cloud-based architecture and the suggested architecture in two 4G and telecom mobile internet networks. The evaluation findings demonstrate the suggested architecture's superior performance in both communication networks. The suggested mobile fog-based architecture makes use of the Internet of Telecommunications to create high-volume 3D models quickly and to the satisfaction of a real-time application. In addition to these accomplishments, the results demonstrate that the suggested architecture outperforms typical cloud-based architecture in terms of lowering overall energy consumption by up to 34%.

Author 1: Huaibao Ding   Author 2: Xiaomei Ding

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PDF

Paper 12: Automatic Configuration of Deep Learning Algorithms for an Arabic Named Entity Recognition System

Abstract: Word embedding models have been widely used by many researchers to extract linguistic features for Natural Language Processing (NLP) tasks. However, the creation of an adequate Word embedding model depends on choosing the right language model method and architecture, in addition to finetuning the various parameters of the language model. Each parameter combination could result in a different model, and each model can behave differently according to the targeted NLP task. In this paper, we present an approach that combines a range of Word embedding models, multiple clustering and classification methods, and Irace for automatic algorithm configuration. The goal is to facilitate the construction of the most accurate Arabic Named Entity Recognition (NER) model for our dataset. Our approach involves the creation of different Word embedding models, the implementation of these models in different classification and clustering methods, and finetuning these implementations with different parameter combinations to create an Arabic NER System with the highest accuracy rate.

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Paper 13: Greenhouse Horticulture Automation with Crops Protection by using Arduino

Abstract: Agriculture significantly contributes to economic growth, generating employment opportunity also simulating the small-scale agriculture experiences. However, unforeseeable weather patterns, natural disasters, and unwelcome intruders are significant threat which brings severe financial losses for the owner. To overcome these challenges, this study aims to develop IoT-based automation greenhouse integrated with intrusion detection and prevention system. Automation greenhouse provides optimal environmental conditions for crop growth and enhances agricultural productivity, additionally inclusion of intrusion detection and prevention practices could detect and give immediate responses towards intrudes approaches. The automation greenhouse with intrusion detection and prevention with IoT-based provides the real-time monitoring and control as instant intrusion notification will be send to user through mobile application remotely. Thus, IoT-based automation greenhouse invention provides the sustainable environment condition for crop growth and reducing crop losses from treats.

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PDF

Paper 14: Reinforcement Learning-based Answer Selection with Class Imbalance Handling and Efficient Differential Evolution Initialization

Abstract: Answer selection (AS) involves the task of selecting the best answer from a given list of potential options. Current methods commonly approach the AS problem as a binary classification task, using pairs of positive and negative samples. However, the number of negative samples is usually much larger than the positive ones, resulting in a class imbalance. Training on imbalanced data can negatively impact classifier performance. To address this issue, a novel reinforcement learning-based technique is proposed in this study. In this approach, the AS problem is formulated as a sequence of sequential decisions, where an agent classifies each received instance and receives a reward at each step. To handle the class imbalance, the reward assigned to the majority class is lower than that for the minority class. The parameters of the policy are initialized using an improved Differential Evolution (DE) technique. To enhance the efficiency of the DE algorithm, a novel cluster-based mutation operator is introduced. This operator utilizes the K-means clustering approach to identify the winning cluster and employs an upgrade strategy to incorporate potentially viable solutions into the existing population. For word embedding, the DistilBERT model is utilized, which reduces the size of the BERT (Bidirectional encoder representations from transformers) model by 40% and improves computational efficiency by running 60% faster. Despite the decrease, the DistilBERT model maintains 97% of its language comprehension abilities by utilizing knowledge distillation in the pretraining phase. Extensive experiments are carried out on LegalQA, TrecQA, and WikiQA datasets to assess the suggested model. The outcomes showcase the superiority of the proposed model over existing techniques in the domain of AS.

Author 1: Jia Wei

PDF

Paper 15: Evaluation Method of Physical Education Students' Mental Health based on Multi-source and Heterogeneous Data

Abstract: To enhance the ability to evaluate the mental health status of physical education students, a method of evaluating the mental well-being state of physical education students based on multi-source heterogeneous data mining is proposed. A fuzzy information detection model of multi-source heterogeneous data on the mental health status of physical education students is constructed, with four factors as dependent variables: compulsion,

interpersonal sensitivity, hostility, and depression. Combined with the hierarchical index parameter detection and analysis method, the statistical analysis of multi-source heterogeneous info is accomplished. Based on the factor extraction outcomes of multi-source heterogeneous info, combined with the subspace heterogeneous fusion method, an estimated parameter feature clustering model is established. Combining the results of characteristic distributed clustering and linear regression analysis, the psychological well-being state evaluation of physical education students is realized. The results of empirical analysis show that this method has higher accuracy and better feature resolution in the evaluation of the mental well-being state of physical education students, which improves the reliability and confidence level of the assessment of the mental well-being status of physical education students.

Author 1: YongCheng WU

PDF

Paper 16: Systematic Review of Rubric Ontology in Higher Education

Abstract: Assessing students is a common practice in educational settings. Students will be evaluated using several methods or tools to determine how well they have acquired knowledge or progressed. There are two distinct types of assessment is summative and formative. Rubrics are used to evaluate student performance. However, the development of the rubric is challenging because subject-matter expertise is required. Ontology has been utilized in certain research to communicate knowledge relevant to rubrics, but these studies do not map to the important learning outcomes. Rubrics are developed in Malaysia to support outcome-based education (OBE) based on the Malaysia Qualification Framework (MQF). It is essential to discover if the technology supports rubrics that leverage learning outcomes to produce the best possible rubric. A systematic review of the literature (SLR) was used to carry out this analysis. In the years 2018 through 2022, 42 papers were reviewed. In conclusion, the key finding of this work is that rubric-based outcome learning is the most recent research area to get attention and that only a small number of studies have used ontologies to develop rubrics based on learning outcomes.

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PDF

Paper 17: A Prediction of South African Public Twitter Opinion using a Hybrid Sentiment Analysis Approach

Abstract: Sentiment analysis, a subfield of Natural Language Processing, has garnered a great deal of attention within the research community. To date,

numerous sentiment analysis approaches have been adopted and developed by researchers to suit a variety of application scenarios. This consistent adaptation has allowed for the optimal extraction of the authors emotional intent within text. A contributing factor to the growth in application scenarios is the mass adoption of social media platforms and the bondless topics of discussion they hold. For government, organizations and other miscellaneous parties, these opinions hold vital insight into public mindset, welfare, and intent. Successful utilization of these insights could lead to better methods of addressing said public, and in turn, could improve the overall state of public well-being. In this study, a framework using a hybrid sentiment analysis approach was developed. Various amalgamations were created – consisting of a simplified version of the Valence Aware Dictionary and sEntiment Reasoner (VADER) lexicon and multiple instances of classical machine learning algorithms. In this study, a total of 67,585 public opinion-oriented Tweets created in 2020 applicable to the South African (ZA) domain were analyzed. The developed hybrid sentiment analysis approaches were compared against one another using well known performance metrics. The results concluded that the hybrid approach of the simplified VADER lexicon and the Medium Gaussian Support Vector Machine (MGSVM) algorithm outperformed the other seven hybrid algorithms. The Twitter dataset utilized serves to demonstrate model capability, specifically within the ZA context.

Author 1: Matthew Brett Shackleford

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PDF

Paper 18: Analysis of Depression in News Articles Before and After the COVID-19 Pandemic Based on Unsupervised Learning and Latent Dirichlet Allocation Topic Modeling

Abstract: As of 2023, South Korea maintains the highest suicide rate among OECD countries, accompanied by a notably high prevalence of depression. The onset of the COVID-19 pandemic in 2020 further exacerbated the prevalence of depression, attributed to shifts in lifestyle and societal factors. In this research, differences in depression-related keywords were analyzed using a news big data set, comprising 45,376 news articles from January 1st, 2016 to November 30th, 2019 (pre-COVID-19 pandemic) and 50,311 news articles from December 1st, 2019 to May 5th, 2023 (post-pandemic declaration). Latent Dirichlet Allocation (LDA) topic modeling was utilized to discern topics pertinent to depression. LDA topic modeling outcomes indicated the emergence of topics related to suicide and depression in association with COVID-19 following the pandemic's onset. Exploring strategies to manage such scenarios during future infectious disease outbreaks becomes imperative.

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PDF

Paper 19: Construction of an Intelligent Robot Path Recognition System Supported by Deep Learning Network Algorithms

Abstract: In recent years, intelligent robots have been widely used in fields such as express transportation, industrial automation, and healthcare, bringing great convenience to people's lives. As one of the core technologies of intelligent robots, path planning technology has become a research highlight in the field of robotics. To achieve path planning in unknown environments, a path planning algorithm based on an improved dual depth Q-network is proposed. In both simple and complex grid environments, the planned path inflection points for the improved dual depth Q-network is 4 and 9, respectively, with path lengths of 27.21m and 28.63m, respectively. Both are less than double depth Q network and adaptive Ant colony optimization algorithms. The average reward values of the improved dual depth Q network in simple and complex environments are 1.12 and 1.02, respectively, which are higher than those of the dual depth Q network. In a random environment, the lowest probability of the improved dual depth Q network successfully reaching the destination without colliding with obstacles is 95.1%, which is higher than the other two algorithms. In the Gazebo environment, when the number of iterations reaches 2000, the average cumulative reward value is positive. The average cumulative reward value in the range of iterations from 3500 to 4000 and iterations from 4000 to 4500 exceeds 500. The average cumulative reward value of the dual depth Q network is only positive within the two intervals of iterations 2500-3000 and 3000-3500. The average cumulative reward value does not exceed 100. According to the findings, the path planning ability of the improved dual depth Q network is better than that of the dual depth Q network and the adaptive Ant colony optimization algorithms.

Author 1: Jiong Chen

PDF

Paper 20: Harnessing Ensemble in Machine Learning for Accurate Early Prediction and Prevention of Heart Disease

Abstract: Cardiovascular diseases (CVDs) remain a significant global health concern, demanding precise and early prediction methods for effective intervention. In this comprehensive study, various machine learning algorithms were rigorously evaluated to identify the most accurate approach for forecasting heart disease. Through meticulous analysis, it was established that precision, recall, and the F1-score are critical metrics, overshadowing the mere accuracy of predictions. Among the classifiers explored, the Decision Tree (DT) and Random Forest (RF) algorithms emerged as the most proficient, boasting remarkable accuracy rates of 96.75%. The DT Classifier exhibited a precision rate of 97.81% and a recall rate of 95.73%, resulting in an exceptional F1-score of 96.76%. Similarly, the RF Classifier achieved an outstanding precision rate of 95.85% and a recall rate of 97.88%, yielding an exemplary F1-score of 96.85%. In stark contrast, other methods, including Logistic Regression, Support Vector Machine, and K-Nearest Neighbor, demonstrated inferior predictive capabilities. This study conclusively establishes the combination of Decision Tree and Random Forest algorithms as the most potent and dependable approach for predicting cardiac illnesses, providing a

groundbreaking avenue for early intervention and personalized patient care. These findings signify a significant advancement in the field of predictive healthcare analytics, offering a robust framework for enhancing healthcare strategies related to cardiovascular diseases.

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Author 5: Mohammad Ashiquee Rasool

Author 6: Mohammad Rashid Hussain

Author 7: Muhammad Shahid Dildar

PDF

Paper 21: Virtual Reality in Training: A Case Study on Investigating Immersive Training for Prisoners

Abstract: This study addresses the pressing issue of prison rehabilitation by comparing traditional and Virtual Reality (VR) based training services offered by the General Directorate of Prisons in Saudi Arabia. Utilising Technology Acceptance Model (TAM) metrics such as perceived usefulness, ease of use, and enjoyment, the study evaluates the acceptance of VR technologies across two different headset platforms. Findings reveal that VR-based training services received significantly higher acceptance ratings than traditional methods. Both VR platforms were highly rated in terms of perceived usefulness, ease of use, and enjoyment but showed no significant differences between the headsets. These results indicate that VR-based methods could be more effective, engaging, and safer alternatives in correctional rehabilitation programs. Importantly, this research contributes to the field of Human-Computer Interaction (HCI) by suggesting design frameworks tailored for effective interventions in training and rehabilitative contexts where safety and psychological health are of high concern.

Author 1: Abdulaziz Alshaer

PDF

Paper 22: Benchmarking the LGBM, Random Forest, and XGBoost Models Based on Accuracy in Classifying Melon Leaf Disease

Abstract: Leaf diseases in melon plants cause losses for melon farmers. However, melon plants become less productive or even die. Downy mildew is a foliar disease that spreads rapidly in melon plants. Determining the level of downy mildew in melon leaves is important. Determining the level of downy mildew disease, farmers can carry out preventive treatment according to the severity level of downy mildew disease. This study aimed to create a

classification model for the level of downy mildew disease on melon leaves using combined features and to compare the classification models, namely the LGBM, Random Forest, and XGBoost models. The combined features consist of colour, texture, Shannon entropy, and Canny edge features. The combined features are used as input for a classification model to predict the level of downy mildew leaf disease in melon plants. Model evaluation was carried out with three scenarios of data sharing: the first scenario, 90% training data and 10% test data; the second scenario, 80% training data and 20% test data; and the third scenario, 70% training data and 30% test data. The results of the evaluation of the model with the confusion matrix show that for the first and second scenarios, the highest accuracy was achieved by the Random Forest algorithm, with 72% and 73% accuracy, respectively. For the third scenario, the highest accuracy was obtained using the XGBoost algorithm.

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PDF

Paper 23: A Vision-based Human Posture Detection Approach for Smart Home Applications

Abstract: Effective posture identification in smart home applications is a challenging topic for people to tackle in order to decrease the occurrence of improper postures. Vision-based posture identification has been used to construct a system for identifying people's postures. However, the system complexity, low accuracy rate, and slow identification speed of existing vision-based systems make them unsuitable for smart home applications. The goal of this project is to address these issues by creating a vision-based posture recognition system that can recognize human position and be used in smart home applications. The suggested method involves training and testing a You Only Look Once (YOLO) network to identify the postures. This Yolo-based approach is based on YOLOv5, which provides a high accuracy rate and satisfied speed in posture detection. Experimental results show the effectiveness of the developed system for posture recognition on smart home applications.

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PDF

Paper 24: Object Detectors in Autonomous Vehicles: Analysis of Deep Learning Techniques

Abstract: Autonomous vehicles have emerged as a transformative technology with wide-ranging implications for smart cities, revolutionizing transportation systems and optimizing urban mobility. Object detection plays a crucial role in autonomous vehicles, accurately identifying and localizing pedestrians,

vehicles, and traffic signs for safe navigation. Deep learning-based approaches have revolutionized object detection, leveraging deep neural networks to extract intricate features from visual data, enabling superior performance in various domains. Two-stage algorithms like R-FCN and Mask R-CNN focus on precise object localization and instance-level segmentation, while one-stage algorithms like SSD, RetinaNet, and YOLO offer real-time performance through single-pass processing. To advance object detection for autonomous vehicles, comprehensive studies are needed, particularly on two-stage and one-stage algorithms. This study aims to conduct an in-depth analysis, evaluating the strengths, limitations, and performance of R-FCN, Mask R-CNN, SSD, RetinaNet, and YOLO algorithms in the context of autonomous vehicles and smart cities. The research contributions include a thorough analysis of two-stage algorithms, a comprehensive examination of one-stage algorithms, and a comparison of different YOLO variants to highlight their advantages and drawbacks in object detection tasks.

Author 1: Lei Du

PDF

Paper 25: A Survey of Structural Health Monitoring Advances Based on Internet of Things (IoT) Sensors

Abstract: Structural Health Monitoring (SHM) is a technique that ensures the safety and reliability of structures through continuous and real-time monitoring. IoT-based sensors have become a popular solution for implementing SHM systems, and research in this area is essential for improving the accuracy and reliability of SHM systems. A review of the current state-of-the-art is necessary to identify the challenges and opportunities for further development of SHM systems based on IoT sensors. This study presents a survey to comprehensively review of SHM, focusing on IoT sensors. Secondly, the categorization of the current civil structural monitoring methods is established, and the advantages and disadvantages of the methods are addressed. Thirdly, an analysis is performed, and the result is compared to civil structural monitoring methods. Finally, key features of the methods are discussed and summarized, and at last, some directions for future studies are presented.

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PDF

Paper 26: Whale Optimization Algorithm for Energy-Efficient Task Allocation in the Internet of Things

Abstract: The Internet of Things (IoT) represents a new paradigm where various physical devices interact and collaborate to achieve common goals. This technology encompasses sensors, mobile phones, actuators, and other smart devices that work together to perform tasks and applications. In order to ensure optimal performance of these tasks and applications, task allocation becomes a critical aspect in IoT networks. Task allocation in IoT networks is a

complex problem due to the intricate connections and interactions among devices. The task allocation issue is generally recognized as NP-hard, necessitating the development of effective optimization solutions. This paper proposes a solution using the Whale Optimization Algorithm (WOA) to address the task allocation problem in IoT networks. By leveraging the capabilities of the WOA, our algorithm aims to improve energy efficiency and enhance network stability. The performance of the algorithm was tested comprehensively on the MATLAB simulation platform. Our algorithm outperforms existing algorithms in the literature, especially in terms of energy efficiency, as per the findings.

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Keywords: Task allocation; internet of things; energy efficiency; optimization; whale optimization algorithm

PDF

Paper 27: An Optimized Deep Learning Method for Video Summarization Based on the User Object of Interest

Abstract: Surveillance video is now able to play a vital role in maintaining security and protection thanks to the advancement of digital video technology. Businesses, both private and public, employ surveillance systems to monitor and track their daily operations. As a result, video generates a significant volume of data that needs to be further processed to satisfy security protocol requirements. Analyzing video requires a lot of effort and time, as well as quick equipment. The concept of a video summary was developed in order to overcome these limitations. To work past these limitations, the concept of video summarization has emerged. In this study, a deep learning-based method for customized video summarization is presented. This research enables users to produce a video summary in accordance with the User Object of Interest (UOoI), such as a car, airplane, person, bicycle, automobile, etc. Several experiments have been conducted on the two datasets, SumMe and self-created, to assess the efficiency of the proposed method. On SumMe and the self-created dataset, the overall accuracy is 98.7% and 97.5%, respectively, with a summarization rate of 93.5% and 67.3%. Furthermore, a comparison study is done to demonstrate that our proposed method is superior to other existing methods in terms of video summarization accuracy and robustness. Additionally, a graphic user interface is created to assist the user with summarizing the video using the UOoI.

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Keywords: Video summarization; deep learning; user object of interest; surveillance systems; SumMe

PDF

Paper 28: Enhanced System for Computer-Aided Detection of

MRI Brain Tumors

Abstract: The categorization of brain images into normal or abnormal categories is a critical task in medical imaging analysis. In this research, we propose a software solution that automatically classifies MRI brain scans as normal or abnormal, specifically focusing on glioblastoma as an abnormal condition. The software utilizes first-order statistical features extracted from brain images and employs seven different classifiers, including Support Vector Machine (SVM) and K-Nearest Neighbors (KNN), for classification. The performance of the classifiers was evaluated using an open-source dataset, and our findings showed that SVM and KNN classifiers performed equally well in accurately categorizing brain scans. However, further improvements can be made by incorporating more images and features to enhance the accuracy of the classifier. The developed software has the potential to assist healthcare professionals in efficiently identifying abnormal brain scans, particularly in cases of glioblastoma, which could aid in early detection and timely intervention. Further research and development in this area could contribute to the advancement of healthcare technology and patient care.

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PDF

Paper 29: Entanglement Classification for Three-qubit Pure Quantum System using Special Linear Group under the SLOCC Protocol

Abstract: Quantum technology has been introduced in the IR 4.0, breeding a new era of advanced technology revolutionizing the future. Hence, understanding the key resources of quantum technology, quantum entanglement is vital. Growing interests in quantum technologies has raised comprehensive studies of quantum entanglement, especially on the entanglement classification. Special Linear group, SL(n) of multipartite entanglement classification under the SLOCC protocol is not widely studied due to its complex structure, creating a curb in developing its classification method. Therefore, this paper developed and delivered a classification method of pure multipartite, three-qubit quantum state using a combination of Special Linear group, SL(2) x SL(2) x SL(2) model operator under the SLOCC, classifying entanglement using the model operator with certain selected parameters. Further analysis was done resulting in the determination of the six subgroups, namely fully separable (A-B-C), bi-separable (A-BC, B-AC and C-AB) and genuinely entangled (W and GHZ).

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Paper 30: Dance Motion Detection Algorithm Based on Computer Vision

Abstract: Human posture recognition is an essential link in the development of human-computer interaction. Currently, the existing dance movement training methods often require students to constantly watch videos or find a tutor to correct them during practice to achieve good results, which not only takes a lot of time and energy but also creates some difficulties and challenges for students. The research goal of this paper was to use computer recognition technology to detect dance movements and identify body postures. This paper develops a Kinect dance auxiliary training system based on the body skeleton tracking technology of the Kinect 3D sensor, combined with auxiliary dance training. This article not only introduced a fixed axis-based expression method for joint angles to improve the stability of joint angles but also improved the body position detection algorithm using the angle of joint spots to realize the accurate recognition of human body posture. In the experiment, the trainee's arm was raised to the highest position, which could not meet the requirements, and the trainer's wrist should be raised by another 200 mm. Moreover, retracting the hand was too fast, which did not meet the standard action. The test results showed that the system could effectively improve the dance movements of the students.

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Paper 31: Seamless Data Exchange: Advancing Healthcare with Cross-Chain Interoperability in Blockchain for Electronic Health Records

Abstract: The rapid digitization of healthcare records has led to the accumulation of vast amounts of sensitive patient data, stored across various systems and platforms. To ensure the secure and efficient exchange of Electronic Health Records (EHRs) among healthcare providers, researchers, and patients themselves, the concept of cross-chain interoperability within blockchain technology emerges as a promising solution. Nevertheless, existing blockchain platforms exhibit several limitations. In order to address the issue of non-interoperability, the suggested method involves creating a connection between two similar blockchain networks. This solution is exemplified through the use of an Electronic Health Records (EHR) structure, which is distributed across distinct Ethereum Testnets and implemented via a Solidity Smart Contract. The paper aims to demonstrate the viability of bridging the gap and fostering seamless interoperability between blockchain networks. However, establishing effective communication between these smart contracts proves to be a complex endeavor, whether within a singular blockchain or spanning multiple blockchains. This complexity presents a formidable obstacle, particularly when diverse hospitals require the sharing or exchange of critical information. Consequently, a solution becomes imperative to facilitate cross-

chain communication among smart contracts. This solution provides seamless operation both within the confines of a single blockchain and across disparate blockchains. By achieving this, cross-chain interoperability can be realized, enabling distinct blockchain networks to mutually comprehend and actively engage with each other.

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PDF

Paper 32: A Comparison of Sampling Methods for Dealing with Imbalanced Wearable Sensor Data in Human Activity Recognition using Deep Learning

Abstract: Human Activity Recognition (HAR) holds significant implications across diverse domains, including healthcare, sports analytics, and human-computer interaction. Deep learning models demonstrate great potential in HAR, but performance is often hindered by imbalanced datasets. This study investigates the impact of class imbalance on deep learning models in HAR and conducts a comprehensive comparative analysis of various sampling techniques to mitigate this issue. The experimentation involves the PAMAP2 dataset, encompassing data collected from wearable sensors. The research includes four primary experiments. Initially, a performance baseline is established by training four deep-learning models on the imbalanced dataset. Subsequently, Synthetic Minority Over-sampling Technique (SMOTE), random under-sampling, and a hybrid sampling approach are employed to rebalance the dataset. In each experiment, Bayesian optimization is employed for hyperparameter tuning, optimizing model performance. The findings underscore the paramount importance of dataset balance, resulting in substantial improvements across critical performance metrics such as accuracy, F1 score, precision, and recall. Notably, the hybrid sampling technique, combining SMOTE and Random Undersampling, emerges as the most effective method, surpassing other approaches. This research contributes significantly to advancing the field of HAR, highlighting the necessity of addressing class imbalance in deep learning models. Furthermore, the results offer practical insights for the development of HAR systems, enhancing accuracy and reliability in real-world applications. Future works will explore alternative public datasets, more complex deep learning models, and diverse sampling techniques to further elevate the capabilities of HAR systems.

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PDF

Paper 33: Design of an Advanced Distributed Adaptive Control

for Multi-SMA Actuators

Abstract: Aerospace applications place high demands on designing Shape Memory Alloy (SMA) actuators, including accuracy, dependability, high-performance criteria, and cooperative activation. Because of their portability, durability, and performance under extreme conditions, SMAs have found a home in the aerospace industry as single and array actuators. This paper presents the development of a control scheme for thermally activating rotary SMA actuators as single and cooperative actuators. The control scheme is a hybrid adaptive robust control abbreviated as HARC. The immersion and invariance adaptive (I&I adaptive) and L2-gain control frameworks are utilized in developing the HARC approach. To create stable transient responses despite parametric and non-parametric errors, recursive backstepping is utilized for asymptotic stability. At the same time, L2-gain control is applied to ensure the global stability of the transient closed-loop system. Both techniques are used in conjunction with one another. In contrast to the conventional I&I, the robust control law can be developed without needing a target system or the solution of PDEs to satisfy the I&I condition. The parametric uncertainty is estimated with the help of an adaptive rule, and the non-parametric uncertainty brought on by the phase change of the SMA material and modeling mistakes is accounted for with the help of asymptotic nonlinear functions. The designed HARC is then extended to cover the actuation of multi-SMA or array actuators to respond to the increasing demand for cooperative controllers using distributed control protocols. It has been demonstrated through simulation testing on a rotational NiTi SMA actuator that the suggested control approach is both practical and resilient.

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Keywords: Adaptive backstepping; hysteresis; I&I control; L2-gain control; rotary actuator; shape memory alloy

PDF

Paper 34: Dimensionality Reduction with Truncated Singular Value Decomposition and K-Nearest Neighbors Regression for Indoor Localization

Abstract: Indoor localization presents formidable challenges across diverse sectors, encompassing indoor navigation and asset tracking. In this study, we introduce an inventive indoor localization methodology that combines Truncated Singular Value Decomposition (Truncated SVD) for dimensionality reduction with the K-Nearest Neighbors Regressor (KNN Regression) for precise position prediction. The central objective of this proposed technique is to mitigate the complexity of high-dimensional input data while preserving critical information essential for achieving accurate localization outcomes. To validate the effectiveness of our approach, we conducted an extensive empirical evaluation employing a publicly accessible dataset. This dataset covers a wide spectrum of indoor environments, facilitating a comprehensive assessment. The performance evaluation metrics adopted encompass the Root Mean Squared Error (RMSE) and the Euclidean distance error (EDE)—widely embraced in the field of localization. Importantly, the simulated results demonstrated promising performance, yielding an RMSE of 1.96 meters and an average EDE of 2.23 meters. These results surpass the achievements of prevailing state-of-the-art techniques, which typically attain localization

accuracies ranging from 2.5 meters to 2.7 meters using the same dataset. The enhanced accuracy in localization can be attributed to the synergy between Truncated SVD's dimensionality reduction and the proficiency of KNN Regression in capturing intricate spatial relationships among data points. Our proposed approach highlights its potential to deliver heightened precision in indoor localization outcomes, with immediate relevance to real-time scenarios. Future research endeavors involving comprehensive comparative analyses with advanced techniques hold promise in propelling the field of accurate indoor localization solutions forward.

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PDF

Paper 35: Text Simplification using Hybrid Semantic Compression and Support Vector Machine for Troll Threat Sentences

Abstract: Text Simplification (TS) is an emerging field in Natural Language Processing (NLP) that aims to make complex text more accessible. However, there is limited research on TS in the Malay language, known as Bahasa Malaysia, which is widely spoken in Southeast Asia. The challenges in this domain revolve around data availability, feature engineering, and the suitability of methods for text simplification. Previous studies predominantly employed single methods such as semantic compression, or machine learning with the Support Vector Machine (SVM) classifier consistently achieving an accuracy of approximately 70% in identifying troll sentences—statements containing threats from online trolls notorious for their disruptive online behavior. This study combines semantic compression and machine learning methods across lexical, syntactic, and semantic levels, utilizing frequency dictionaries as semantic features. Support Vector Machine and Decision Tree classifiers are applied and tested on 6,836 datasets, divided into training and testing sets. When comparing SVM and Decision Tree with and without semantic features, SVM with semantics achieves an average accuracy of 92.37%, while Decision Tree with semantics reaches 91.21%. The proposed TS method is evaluated on troll sentences, which are often associated with cyberbullying. Furthermore, it is worth noting that cyberbullying has been reported to be a significant issue, with Malaysia ranking as the second worst out of the 28 countries surveyed in Asia. Therefore, the outcomes of the study could potentially offer means, such as machine translation and relation extraction, to help prevent cyberbullying in Malaysia.

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Paper 36: A Reduced Feature-Set OCR System to Recognize Handwritten Tamil Characters using SURF Local Descriptor

Abstract: High dimensionality in variable-length feature sets of real datasets negatively impacts the classification accuracy of traditional classifiers. Convolutional Neural Networks (CNNs) with convolution filters have been widely used for handling the classification of high-dimensional image datasets. However, these models require massive amounts of high-dimensional training data, posing a challenge for many image-processing applications. In contrast, traditional feature detectors and descriptors, with a minor trade-off in precision, have shown success in various computer vision tasks. This paper introduces the Nearest Angles (NA) classifier tailored for a handwritten character recognition system, employing Speeded-Up Robust Features (SURF) as local descriptors. These descriptors make local decisions, while global decisions on the test image are accomplished through a ranking-based classification approach. Image similarity scores generated from the SURF descriptors are ranked to make local decisions, and these ranks are then used by the NA classifier to produce a global class similarity score. The proposed method achieves recognition rates of 96.4% for Tamil, 96.5% for Devanagari, and 97 % for Telugu handwritten character datasets. Although the proposed approach shows slightly lower accuracy compared to CNN-based models, it significantly reduces the computational complexity and the number of parameters required for the classification tasks. As a result, the proposed method offers a computationally efficient alternative to deep learning models, lowering the computational time multiple times without a substantial loss in accuracy.

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Keywords: Image processing; feature extraction; Convolutional Neural Networks; SURF; handwritten character recognition; optical character recognition system

Paper 37: Recyclable Waste Classification using SquezeeNet and XGBoost

Abstract: The unregulated buildup of waste results in the occurrence of flames. This phenomenon poses a substantial threat to both the ecological system and human welfare. To tackle this problem, the current study proposes the implementation of Machine Learning technology to automate the sorting of waste. The methodology being examined incorporates the utilization of SqueezeNet as an image embedding method in conjunction with XGBoost as the final classifier. This work examines the efficacy of the aforementioned technique by doing a comparative analysis with many alternative final classifiers, including LightGBM, XGBoost, CatBoost, Random Forest, SVM, Naïve Bayes, KNN, and Decision Tree. The experimental results indicate that the integration of SqueezeNet and XGBoost produces the highest level of performance in the field of garbage categorization, as supported by an F1-score of 0.931. SqueezeNet is a method employed for image embedding that enables the extraction of salient features from images. This procedure enables the recognition of unique characteristics linked to different classes. Therefore,

XGBoost may be utilized to enhance classification tasks. XGBoost has the ability to generate a feature importance score. Therefore, enabling the recognition of the most prominent attributes. This methodology possesses the capacity to alleviate the risk of fire that arises due to the accumulation of unregulated trash. This work makes a substantial contribution to environmental conservation and the improvement of public safety.

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PDF

Paper 38: An IoT-based Smart Plug Energy Monitoring System

Abstract: Over the years, considerable efforts have been made to maintain electricity. However, there is still a significant need to explore new technologies and solutions conserve and enhance electricity supply. This project discusses research studies and applications conducted in the field of energy control, including a comparison of these applications undertaken in order to highlight constraints that need to be further addressed. This can be considered as the first step in developing a system that helps building owners to control their electricity consumption using Internet of Things (IoT) technologies. The main phases of the proposed system are data collection, data analysis and mobile application development. The project utilizes Wi-Fi smart plugs to collect active power consumption data, of which analysis is conducted on the cloud. The mobile application allows the building owner to manage buildings, and to obtain active and accumulated consumption data of plugged-in devices. This paper involves the architecture design of the proposed system, and the experimentation, testing, and implementation. The application was tested and the active and accumulative consumption per device and per building were reported. To confirm the accuracy of the active power consumption measurements from the smart plugs, a comparison is performed between these values and the active power consumptions measured by the company and shown on the labels. The results showed that using IoT-based smart plugs gives accurate readings.

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PDF

Paper 39: Implementation of a Web System with Chatbot Service for Sales Management - A Review

Abstract: The objective of the research was to analyze various researches about web systems with chatbot service in the sales management process between the years 2018-2022, employing four databases, such as: Science Direct, Taylor & Francis, IEEE Xplore and Springer. The PRISMA methodology was applied, selecting 60 manuscripts where the year of highest publication was 2021 (35%), leading the USA as the country with the highest scientific production equivalent to 23.33%; in addition, the type of research that predominated were scientific articles with the percentage value of 70% and being entirely in the English language. Finally, it was found that there are two relevant components regarding the implementation of a web system with chatbot service for Sales Management, the first are the evaluated aspects, explained as those that focus on the analysis of the intelligent system, chatbot, website, Google API, e-commerce, machine learning, IBM service, mobile application, web, relationship with customer service, sales management, digital transformation, information system, algorithm and innovation and as the second component, according to the conditional factors refers to the context in which the use of chatbot in sales management occurs, being such technical features as algorithm, type of system, chatbot-customer relationship, sales and innovation and sales-system relationship.

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Keywords: Web system; chatbot; chatbot service; sales management; sales automation

PDF

Paper 40: Deep Learning Driven Web Security: Detecting and Preventing Explicit Content

Abstract: In today's digital age, the vast expanse of online content has made it increasingly accessible for users to encounter inappropriate text, images and videos. The repercussions of such exposure are concerning, impacting individuals and society adversely. Exposure to violent content can lead to undesirable human emotions, including desensitization, aggression, and other harmful effects. We utilize a machine learning approach aimed at real-time violence detection in text, images and videos embedded in the website. The foundation of this approach lies in a deep learning model, highly trained on a vast dataset of manually labeled images categorized as violent or non-violent. The model boasts exceptional accuracy in identifying violence in images, subsequently filter out violent content from online platforms. By performing all processing intensive tasks in the Cloud, and storing the data in a database, an improved user experience is achieved by completing all the necessary detection processes at a lower time frame, and also reducing the processing load on the user's local system. The detection of the violent videos is done by a CNN model, which was trained on violent and non-violent video data, and the detection of emotions in the text is taken in by a NLP based algorithm. By

implementing this highly efficient approach, web safety can undergo a significant improvement. Users can now navigate the web with confidence, free from concerns about accidentally encountering violent content, fostering improved mental health, and cultivating a more positive online environment. We are able to achieve 67% accuracy in detecting violent content at approximately 2.5 seconds at its best scenario.

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PDF

Paper 41: Detection of Autism Spectrum Disorder (ASD) from Natural Language Text using BERT and ChatGPT Models

Abstract: ASD may be caused by a combination of genetic and environmental factors, including gene mutations and exposure to toxins. People with ASD may also have trouble forming social relationships, have difficulty with communication and language, and struggle with sensory sensitivity. These difficulties can range from mild to severe and can affect a person's ability to interact with the world around them. Autism spectrum disorder (ASD) is a developmental disorder that affects people in different ways. But early detection of ASD in a child is a good option for parents to start corrective therapies and treatment. They can take action to reduce the ASD symptoms in their child. The proposed work is the detection of ASD in a child using a parent's dialog. The most popular Bert model and recent ChatGPT have been utilized to analyze the sentiment of each statement from parents for the detection of symptoms of ASD. The Bert model has been developed by the transformers which are the most popular in the natural language processing field whereas the ChatGPT model is a large language model (LLM). It is based on Reinforcement learning from human feedback (RLHF) that can able to generate the sentiment of the sentence, computer language codes, text paragraphs, etc. The sentiment analysis has been done on parents' dialog using the Bert model and ChatGPT model. The data has been prepared from various Autism groups on social sites and other resources on the internet. The data has been cleaned and prepared to train the Bert model and ChatGPT model. The Bert model is able to detect the sentiment of each sentence from parents. Any positive sentiment detection means parents should be aware of their children. The proposed model has given 83 percent accuracy according to the prepared data.

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PDF

Paper 42: Optimizing Power Management in Distribution Networks: A Mathematical Modeling Approach for Coordinated Directional Over-Current Relay Control

Abstract: Optimizing Power Management in Distribution Networks through Coordination of Directional Over-Current Relays summarizes a study or project focused on enhancing the management of power in distribution networks by optimizing the coordination of directional over-current relays. Directional over-current relays are critical components of power distribution systems, designed to safeguard the network against over-current faults while maintaining operational stability. Proper coordination of these relays is vital to ensure that faults are isolated and cleared efficiently without causing extensive disruptions. In this paper, a mathematical modeling approach is employed to address the optimization of power management in distribution networks. This approach likely encompasses the development of mathematical models and algorithms that consider factors such as fault types, fault locations, network topology, and relay settings to improve the coordination of directional over-current relays. Here, different optimization algorithms have been implemented to optimize the operating time of relays & hence power management. Cuckoo Search Algorithm (CSA), Fire-Fly Algorithm (FFA), Harmony Search Algorithm (HSA), and Jaya Algorithm are employed to solve the coordination problem for directional over-current relays (DOCRs) with different test systems. The outcomes of this research may have practical applications in power distribution systems, potentially leading to more resilient and responsive networks that better manage power distribution and reduce disruptions during faults and outages.

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PDF

Paper 43: Implementation of the REST API Model using QR Codes on Mobile Devices to Order Parking Tickets

Abstract: Many parking lots are still operate manually, and delays are commonly caused during the parking process when unforeseen events occur, such as when the parking ticket paper runs out or the ticket machines jam. New services are added to the parking system online with the aim of decreasing the amount of time that people spend waiting in line to park. This is done by conducting a parking booking system to obtain a parking ticket in the form of a QR Code as well as parking information, payment transactions, and other things that interfere with the parking process. In this study, the Forward Chaining Algorithm will be combined with the survey research method as the research methodology. The Rapid Application Development model is used for analysis and design (RAD). Representational State Transfer Application Programming Interface (REST API) is one of the solutions offered to overcome this problem. With the advent of online parking services, it is envisioned that customers who intend to park their vehicles in public spaces will be able to

reserve a parking space in advance, greatly simplifying the process and eliminating the problem of the drawn out queue process.

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PDF

Paper 44: Design of Distributed Cooperative Control for Multi-Missile System to Track Maneuvering Targets

Abstract: The current paper provides unique smooth control methods for constructing resilient nonlinear autopilot systems and cooperative control protocols for single and multi-missile systems. To develop the single autopilots, a high-order framework based on asymptotic output stability principles and local relative degree for nonlinear affine systems is first applied. Then, using asymptotic exponential functions and graph theory, free-chattering distributed protocols are constructed to allow multi-missile systems to track and intercept high-risk targets. The Lyapunov approach is used to derive the essential requirements for smooth asymptotic consensus. The proposed method minimizes computing load while enhancing accuracy. The simulation results indicate the efficacy of the recommended strategies.

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PDF

Paper 45: Cyberbullying Detection using Machine Learning and Deep Learning

Abstract: With the human passion for gaining knowledge, learning new things and knowing the news that surrounds the world, social networks were invented to serve the human need, which resulted in the rapid spread and use among people, but social networks have a dark and bright side. The dark side is that strangers or anonymous people harass some users with obscene words that the user feels wrong about, which leads to psychological harm to him, and here we try to discover how to discover electronic bullying to block this alarming phenomenon. In this context, the utility of Natural Language Processing (NLP) is employed in the present investigation to detect electronic bullying and address this alarming phenomenon. The machine learning (ML) method is moderated based on specific features or criteria for detecting cyberbullying on social media. The collected characteristics were analyzed using the K-Nearest Neighbor (KNN), Support Vector Machine (SVM), Naive Bayes (NB), Decision Trees (DT), and Random Forest (RF) methods. Naturally, there are test results that use or operate on the proposed framework in a multi-category setting and are encouraged by kappa, classifier accuracy,

and f-measure standards. These apparent outcomes show that the suggested model is a valuable method for predicting the behavior of cyberbullying, its strength, and its impact on social networks via the Internet. In the end, we evaluated the results of the proposed and basic features with machine learning techniques, which shows us the importance and effectiveness of the proposed features for detecting cyberbullying. We evaluated the models, and we got the accuracy of the KNN (0,90), SVM (0,92), and Deep learning (0,96).

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Author 3: Mohammed Alshehri

PDF

Paper 46: Modified Deep Neural Network for Object Recognition

Abstract: Object recognition has gained significance due to the rise in CCTV surveillance and the need for automated detection of objects or activities in images and videos. Lightweight process frameworks are in demand for sensor networks. While Convolutional Neural Networks (CNNs) are widely used in computer vision, many existing architectures are specialized. This paper introduces the Dimension-Based Generic Convolution Block (DBGC), enhancing CNNs with dimension-wise selection of kernels for improved performance. The DBGC offers flexibility for height, width, and depth kernels and can be applied to different dimension combinations. A key feature is the dimension selector block. Unoptimized kernel dimensions reduce computational operations and accuracy, while semi-optimized ones maintain accuracy with fewer operations. Optimized dimensions provide 5-6% higher accuracy and reduced operations. This work addresses the challenge of generic architecture in object recognition research.

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PDF

Paper 47: HHO-SMOTe: Efficient Sampling Rate for Synthetic Minority Oversampling Technique Based on Harris Hawk Optimization

Abstract: Classifying imbalanced datasets presents a significant challenge in the field of machine learning, especially with big data, where instances are unevenly distributed among classes, leading to class imbalance issues that affect classifier performance. Synthetic Minority Over-sampling Technique (SMOTE) is an effective oversampling method that addresses this by generating new instances for the under-represented minority class. However,

SMOTE's efficiency relies on the sampling rate for minority class instances, making optimal sampling rates crucial for solving class imbalance. In this paper, we introduce HHO-SMOTe, a novel hybrid approach that combines the Harris Hawk optimization (HHO) search algorithm with SMOTE to enhance classification accuracy by determining optimal sample rates for each dataset. We conducted extensive experiments across diverse datasets to comprehensively evaluate our binary classification model. The results demonstrated our model's exceptional performance, with an AUC score exceeding 0.96, a high G-means score of 0.95 highlighting its robustness, and an outstanding F1-score consistently exceeding 0.99. These findings collectively establish our proposed approach as a formidable contender in the domain of binary classification models.

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PDF

Paper 48: A Multitask Learning System for Trait-based Automated Short Answer Scoring

Abstract: Evaluating students' responses and providing feedback in the education system is widely acknowledged. However, while most research on Automated Essay Scoring (AES) has focused on generating a final score for given responses, only a few studies have attempted to generate feedback. These studies often rely on statistical features and fail to capture coherence and content-based features. To address this gap, we proposed a multitask learning system that can capture linguistic, coherence, and content-based features with Bidirectional Encoder Representations from Transformers (BERT) sentence by sentence and generate overall essay and trait scores. Our proposed system outperformed other existing models, achieving Quadratic Weighted Kappa (QWK) scores of 0.766, 0.69, and 0.701 compared to human rater scores. We evaluated our model on the Automated Student Assessment Prize (ASAP) Kaggle and operating system (OS) data set. When compared with other prescribed models proposed to multitask learning system is a promising step towards more effective and comprehensive writing assessment and feedback.

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PDF

Paper 49: Applications of Missing Data Imputation Methods in Wastewater Treatment Plants

Abstract: Missing data pose a big challenge in the field of wastewater treatment, representing a frequent issue in data quality that can result in misleading analyses and compromised decision-making accuracy. The initial step in data preprocessing involves the estimation and handling of missing values. The primary aim to conduct a comprehensive examination of the

existing research concerning missing value imputation in wastewater treatment plants (WWTPs). The focus is specifically on identifying and outlining various imputation techniques employed in this field, while paying close attention to their respective strengths and limitations. To ensure a methodical approach, this study adopts the systematic literature review (SLR) using Kitchenham's guidelines. In order to gather relevant and up-to-date papers, the research leverages the scientific database "Scopus" to retrieve and analyze all pertinent papers during the search process. By doing so, this research aims to contribute valuable insights into the different strategies used for imputing missing values in WWTPs and to shed light on their practical implications and potential drawbacks. Form 599, a total of 16 research papers were selected to assess the review questions. Finally, several recommendations were given to address the limitations identified in the reviewed studies and to contribute to more accurate and reliable data analysis and decision-making in the wastewater treatment domain.

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Author 3: Kaoutar Chkaiti

Author 4: Mohammed Laaouan

Author 5: Rqia Bourziza

Author 6: Karima Sebari

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PDF

Paper 50: Using Ensemble Learning and Advanced Data Mining Techniques to Improve the Diagnosis of Chronic Kidney Disease

Abstract: Kidney failure is a condition with far-reaching, potentially life-threatening consequences on the human body. Leveraging the power of machine learning and data mining, this research focuses on precise disease prediction to equip decision-makers with critical data-driven insights. The accuracy of classification systems hinges on the dataset's inherent characteristics, prompting the application of feature selection techniques to streamline algorithm models and optimize classification precision. Various classification methodologies, including K-Nearest Neighbor, J48, Artificial Neural Network (ANN), Naive Bayes, and Support Vector Machine, are employed to detect chronic renal disease. A predictive framework is devised, blending ensemble methods with feature selection strategies to forecast chronic kidney disease. Specifically, the predictive model for chronic kidney disease is meticulously constructed through the fusion of an information gain-based feature evaluator and a ranker search mechanism, fortified by the wrapper subset evaluator and the best first algorithm. J48, in tandem with the Info Gain Attribute Evaluator and ranker search system, exhibits a remarkable accuracy rate of 97.77%. The Artificial Neural Network (ANN), coupled with the Wrapper Subset Evaluator and the highly effective Best First search strategy, yields precise results at a rate of 97.78%. Similarly, the Naive Bayes model, when integrated with the Wrapper Subset Evaluator (WSE) and the Best First search engine, demonstrates exceptional performance, achieving an accuracy rate of 97%. Furthermore, the Support Vector Machine algorithm achieves a notable accuracy rate of 97.12% when utilizing the Info Gain Attribute Evaluator. The K-Nearest Neighbor Classifier, in conjunction with the Wrapper Subset Evaluator, emerges as the most accurate among the foundational

classifiers, boasting an impressive prediction accuracy of 98%. A second model is introduced, incorporating five diverse classifiers operating through a voting mechanism to form an ensemble model. Investigative findings highlight the efficacy of the proposed ensemble model, which attains a precision rate of 98.85%, as compared to individual base classifiers. This research underscores the potential of combining feature selection and ensemble techniques to significantly enhance the precision and accuracy of chronic kidney disease prediction.

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PDF

Paper 51: AHP-based Design of a Finger Training Device for Stroke

Abstract: This study aims to develop a stroke finger training device specifically for office hand scenes which exercises the small muscles of the fingertips and improves the hand strength of stroke patients. The device has a real-time recording function for muscle strength changes during finger muscle training and enhances interaction through the feedback of training device data, thereby improving training effectiveness. This research involves analyzing hand postures and muscle movements in computer office scenes, designing questionnaires to obtain user requirements, and using the Delphi analysis method to screen key indicators and form standards and program layers. The Analytic Hierarchy Process (AHP) evaluates and ranks the core design elements. According to the design elements, the structure and training system design are guided, and a prototype is built for experimental testing. The results show that the training device effectively improves participants' hand strength, stability, and coordination and helps restore hand function. The AHP method allows for evaluating and ranking the device's design elements, making the device design more reasonable and comprehensive. Overall, the training device significantly improves the finger muscle strength of participants.

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Author 3: Xin Li   Author 4: Hai-Xia Yan

PDF

Paper 52: A Blockchain-based Method Ensuring Integrity of Shared Data in a Distributed-Control Intersection Network

Abstract: In modern urban transportation systems, the efficient management of traffic intersections is crucial to ensure smooth traffic flow and reduce congestion. Distributed-control intersection networks, where control decisions are made collaboratively by multiple entities, offer promising solutions. However, maintaining the security and the integrity of shared data among these entities poses significant challenges, including the risk of data tampering and unauthorized modifications. This paper proposes a novel approach that leverages blockchain technology to address these integrity concerns based on intelligent agents. By utilizing the decentralized and transparent nature of blockchain, our method ensures the authenticity and immutability of shared data within the distributed-control intersection network. The paper presents a detailed architecture, highlighting the integration of blockchain into the existing infrastructure, and discusses the benefits of this approach in enhancing data integrity, trust, and overall system reliability. Through a case study and simulation results, the proposed approach demonstrates its effectiveness in maintaining the integrity of shared data, thereby contributing to the advancement of secure and efficient traffic management systems.

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Keywords: Security; data integrity; blockchain; distributed system; congestion; intelligent agent

PDF

Paper 53: Code-Mixed Sentiment Analysis using Transformer for Twitter Social Media Data

Abstract: The underrepresentation of the Indonesian language in the field of Natural Language Processing (NLP) can be attributed to several key factors, including the absence of annotated datasets, limited language resources, and a lack of standardization in these resources. One notable linguistic phenomenon in Indonesia is code-mixing between Bahasa Indonesia and English, which is influenced by various sociolinguistic factors, including individual speaker characteristics, the linguistic environment, the societal status of languages, and everyday language usage. In an effort to address the challenges posed by code-mixed data, this research project has successfully created a code-mixed dataset for sentiment analysis. This dataset was constructed based on keywords derived from the sociolinguistic phenomenon observed among teenagers in South Jakarta. Utilizing this newly developed dataset, we conducted a series of experiments employing different pre-processing techniques and pre-trained models. The results of these experiments have demonstrated that the IndoBERTweet pre-trained model is highly effective in solving sentiment analysis tasks when applied to Indonesian-English code-mixed data. These experiments yielded an average precision of 76.07%, a recall of 75.52%, an F-1 score of 75.51%, and an accuracy of 76.56%.

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Keywords: Sentiment analysis; code-mixed; BERT; bahasa Indonesia

Paper 54: Research on the Application of Random Forest-based Feature Selection Algorithm in Data Mining Experiments

Abstract: Handling high-dimensional big data presents substantial challenges for Machine Learning (ML) algorithms, mainly due to the curse of dimensionality that leads to computational inefficiencies and increased risk of overfitting. Various dimensionality reduction and Feature Selection (FS) techniques have been developed to alleviate these challenges. Random Forest (RF), a widely-used Ensemble Learning Method (ELM), is recognized for its high accuracy and robustness, including its lesser-known capability for effective FS. While specialized RF models are designed for FS, they often struggle with computational efficiency on large datasets. Addressing these challenges, this study proposes a novel Feature Selection Model (FSM) integrated with data reduction techniques, termed Dynamic Correlated Regularized Random Forest (DCRRF). The architecture operates in four phases: Preprocessing, Feature Reduction (FR) using Best-First Search with Rough Set Theory (BFS-RST), FS through DCRRF, and feature efficacy assessment using a Support Vector Machine (SVM) classifier. Benchmarked against four gene expression datasets, the proposed model outperforms existing RF-based methods in computational efficiency and classification accuracy. This study introduces a robust and efficient approach to feature selection in high-dimensional big-data scenarios.

Author 1: Huan Wang

Keywords: Random forest; SVM; machine learning; big data; feature selection; best-first search; rough set theory

Paper 55: Fortifying Against Cyber Fraud: Instrument Development with the Protection Motivation Theory

Abstract: Cybersecurity has become a trending topic in this technological era. Crimes keep happening in this medium and bring challenges for researchers and IT professionals worldwide to find the best solution to overcome this issue. Crimes primarily related to fraud on e-services have become a red alert that needs to be a concern for netizens. Instead of simply believing in the human-created network and system, individuals or users should acquire and implement protective behaviours for themselves. Thus, a few factors such as source credibility, perceived value of data, wishful thinking, perceived threat severity, perceived threat vulnerability, maladaptive rewards, and response efficacy have been investigated in this study, and the Protection Motivation Theory is used to counter cybersecurity issues faced by users. A tool has been created to facilitate the collection of empirical data necessary for verifying the proposed model. Analysis such as Content validity index (CVI) and Scale-level CVI (S-CVI) have been used to validate the item. The findings indicate that one of the items does not meet the criteria, however, it has been suggested by experts to revise and make it comprehensible to use for the main study. This paper also includes a discussion part regarding the implications of the experts' evaluation. This study, in particular, can help boost the understanding of cyber fraud and the proper methods, a user can employ to avoid becoming a victim.

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PDF

Paper 56: A Model for Pervasive Computing and Wearable Devices for Sustainable Healthcare Applications

Abstract: The user's demands in the system supported by the Internet of Things are frequently controlled effectively using the pervasive computing system. Pervasive computing is a term used to describe a system that integrates several communication and distributed network technologies. Even so, it properly accommodates user needs. It is quite difficult to be inventive in the pervasive computing system when it comes to the delivery of information, handling standards, and extending heterogeneous aid for scattered clients. In this view, our paper intends to utilize a Dispersed and Elastic Computing Model (DECM) to enable proper and reliable communication for people who are using IoT-based wearable healthcare devices. Recurrent Reinforcement Learning (RRL) is used in the suggested model and the system that is connected to analyze resource allocation in response to requirements and other allocative factors. To provide effective data transmission over wearable medical devices, the built system gives managing mobility additional consideration to resource allocation and distribution. The results show that the pervasive computing system provides services to the user with reduced latency and an increased rate of communication for healthcare wearable devices based on the determined demands of the resources. This is an important aspect of sustainable healthcare. We employ the assessment metrics consisting of request failure, response time, managed and backlogged requests, bandwidth, and storage to capture the consistency of the proposed model.

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PDF

Paper 57: Optimizing Hyperparameters for Improved Melanoma Classification using Metaheuristic Algorithm

Abstract: Melanoma, a prevalent and formidable skin cancer, necessitates early detection for improved survival rates. The rising incidence of melanoma poses significant challenges to healthcare systems worldwide. While deep neural networks offer the potential for precise melanoma classification, the optimization of hyperparameters remains a major obstacle. This paper introduces a groundbreaking approach that harnesses the Manta Rays Foraging Optimizer (MRFO) to empower melanoma classification. MRFO efficiently fine-tunes hyperparameters for a Convolutional Neural Network (CNN) using the ISIC 2019 dataset, which comprises 776 images (438 melanoma, 338 non-melanoma). The proposed cost-effective DenseNet121 model surpasses other optimization methods in various metrics during training,

testing, and validation. It achieves an impressive accuracy of 99.26%, an AUC of 99.56%, an F1 score of 0.9091, a precision of 94.06%, and a recall of 87.96%. Comparative analysis with EfficientB1, EfficientB7, EfficientNetV2B0, NesNetLarge, ResNet50, VGG16, and VGG19 models demonstrates its superiority. These findings underscore the potential of the novel MRFO-based approach in achieving superior accuracy for melanoma classification. The proposed method has the potential to be a valuable tool for early detection and improved patient outcomes.

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PDF

Paper 58: Instance Segmentation Method based on R2SC-Yolact++

Abstract: To address the problems of missed detection, segmentation error and poor target edge segmentation in the instance segmentation model, a R2SC-Yolact++ instance segmentation approach based on the improved Yolact++ is proposed. Firstly, the backbone network adopts Res2Net which introduces spatial attention mechanism (SAM) to improve the problem of segmentation error by better extracting feature information; then, high-quality masks are obtained by fusing the detail information of the shallow feature P2 as the input to the prototype mask branch; finally, the problem of missed detection was solved by introducing Cluster-NMS in order to improve the accuracy of the detection boxes. In order to illustrate the effectiveness of the improved model, experiments were conducted on two publicly available datasets, the COCO and CVPPP datasets. The experimental results show that the accuracy on the COCO dataset is 1.1% higher than the original model. And the accuracy on the CVPPP dataset is 1.7% better than before the improvement, which is better than other mainstream instance segmentation algorithms such as Mask RCNN. Finally, the improved model is applied to the insulator dataset, which can segment the shed of insulator accurately.

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PDF

Paper 59: Blockchain-Enabled Security Framework for Enhancing IoT Networks: A Two-Layer Approach

Abstract: The increasing proliferation of Internet of Things (IoT) nodes poses significant security challenges for their network's communication. Blockchain technology, with its decentralized and distributed nature, has the potential to address these security concerns within IoT networks. LEACH (Low Energy Adaptive Clustering Hierarchy) algorithm and blockchain technology enhance IoT network security, enabling energy-efficient data management and transaction integrity, enhancing network lifespan and protection. This paper presents a security model that combines the LEACH algorithm and blockchain technology to improve IoT networks' security. The LEACH algorithm forms clusters of IoT devices, with a designated cluster head (CH) responsible for data aggregation and forwarding. Our model incorporates blockchain technology's core principles and cryptographic foundations, providing additional security measures. It consists of two main layers: the LEACH clustering-based routing protocol, which forms clusters and layers, and a blockchain simulator module. The LEACH algorithm enhances energy consumption, enables efficient data management within clusters, and ensures the integrity, transparency, and immutability of transactions. Our model is implemented on a simulator, allowing for experimentation and modification to evaluate the performance and effectiveness of the security enhanced IoT network model. Our results demonstrate the effectiveness of the proposed enhanced LEACH algorithm compared to previous algorithms, in which the last node died after 1868 transactions. As well as the results of the pro-posed framework, which record 0.058% of the state rate and 2.75 Throughput. Simulation results are validated with respect to previous algorithms, and it obtained higher accuracy compared to them.

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PDF

Paper 60: Fuzzy Failure Modes Effect and Criticality Analysis of the Procurement Process of Artificial Intelligent Systems/Services

Abstract: This study focuses on the ranking of risks associated with the procurement of Artificial Intelligent (AI) systems/services for UAE public Sectors. Considering the involvement of human-based reasoning, this study proposes to use Fuzzy Failure Mode Effect and Criticality Analysis (FMECA). The risks were identified from the literature and subsequently, using 40 interviews with practitioners, the final list is developed on the basis of the presence of risks in the AI procurement process. For Fuzzy FMECA, the input data is collected from fifteen experts. The values of Severity (S), and Detection (D) for each risk element are averaged to use as input. If-Then rule-based fuzzy inference system is employed to obtain the Fuzzy Risk Priority Numbers of risk elements. The traditional RPN and Fuzzy RPN numbers are compared and it is found that fuzzy RPN gives a realistic picture of the ranking of risks. Privacy and security risks, Integration Risks, Risk of Malfunction of systems/services, and Ethical risks are found to be high priorities. This study provides valuable insight to policymakers to develop strategies to mitigate these risks for smooth procurement and implementation of AI-related Projects.

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PDF

Paper 61: An Automatic Nuclei Segmentation on Microscopic Images using Deep Residual U-Net

Abstract: Nuclei Segmentation is the preliminary step towards the task of medical image analysis. Nowadays, there exists several deep learning-based techniques based on Convolutional Neural Networks (CNNs) for the task of nuclei segmentation. In this study, we present a neural network for semantic segmentation. This network harnesses the strengths in both residual learning and U-Net methodologies, thereby amplifying cell segmentation performance. This hybrid approach also facilitates the creation of network with diminished parameter requirement. The network incorporates residual units contributes to a smoother training process and mitigate the issue of vanishing gradients. Our model is tested on a microscopy image dataset which is publicly available from the 2018 Data Science Bowl grand challenge and assessed against U-Net and several other state-of-the-art deep learning approaches designed for nuclei segmentation. Our proposed approach showcases a notable improvement in average Intersection over Union (IoU) gain compared to prevailing state-of-the-art techniques, by exhibiting a significant margin of 1.1% and 5.8% higher gains over the original U-Net. Our model also excels across various key indicators, including accuracy, precision, recall and dice-coefficient. The outcomes underscore the potential of our proposed approach as a promising nuclei segmentation method for microscopy image analysis.

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PDF

Paper 62: Diabetes Prediction Empowered with Multi-level Data Fusion and Machine Learning

Abstract: Technology improvements have benefited the medical industry, especially in the area of diabetes prediction. In order to find patterns and risk factors related to diabetes, machine learning and Artificial Intelligence (AI) are vital in the analysis of enormous volumes of data, including medical records, lifestyle variables, and biomarkers. This makes it possible for tailored management and early discovery, which might revolutionize healthcare. This study examines how machine learning algorithms may be used to identify diseases, with an emphasis on diabetes prediction. The Proposed Diabetes Prediction Empowered with Mutli-level Data Fusion and Machine Learning (DPEMDFML) model combines two distinct types of models—the Artificial Neural Network (ANN) and the Support Vector Machine (SVM)—to create a

fused machine learning technique. Two separate datasets were utilized for training and testing the model in order to assess its performance. To ensure a thorough evaluation of the model's prediction ability, the datasets were split in two experiments in proportions of 70:30 and 75:25, respectively. The study's findings were encouraging, with the ANN algorithm obtaining a remarkable accuracy of 97.43%. This indicates that the model accurately identified instances of diabetes, indicating a high degree of accuracy. A more thorough knowledge of the model's prediction ability would result from further assessment and validation of its performance using various measures.

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Keywords: Disease prediction; machine learning (ML); fused approach; artificial neural network (ANN); support vector machine (SVM); disease diagnosis; healthcare

PDF

Paper 63: A Comprehensive Comparative Study of Machine Learning Methods for Chronic Kidney Disease Classification: Decision Tree, Support Vector Machine, and Naive Bayes

Abstract: Based on the findings of the 2010 Global Burden of Disease analysis, there was an increase in the global ranking of Chronic Kidney Disease (CKD) as a major contributor to mortality, moving from 27th place in 1990 to 18th position. Approximately 10 percent of the global population experiences CKD, and every year millions of lives are lost due to limited access to adequate treatment. CKD poses a substantial global health concern, greatly affecting both the well-being and life span of individuals afflicted by the condition. This study aims to evaluate the performance of three major classification algorithms in CKD diagnosis: Decision Tree, Support Vector Machine (SVM), and Naïve Bayes. This research distinguishes it from previous studies through an innovative data processing approach. Data preprocessing involved transforming categorical values into numerical form using label encoding, as well as applying Exploratory Data Analysis (EDA) to identify outliers and test data assumptions. In addition, the handling of missing values was done with appropriate strategies to maintain the integrity of the dataset. The classification method was evaluated using a dataset of 400 samples from Kaggle with 24 attributes. Through careful experimentation, the accuracy results of each algorithm are presented and compared. The results of this study can help in the development of a more efficient and accurate decision support system for the early diagnosis of CKD.

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Keywords: Chronic kidney disease (CKD); classification; decision tree; machine learning; naïve bayes; support vector machine (SVM)

PDF

Paper 64: Deep Convolutional Neural Network for Accurate Prediction of Seismic Events

Abstract: In recent years, the realm of seismology has witnessed an increased integration of advanced computational techniques, seeking to enhance the precision and timeliness of earthquake predictions. The paper titled "Deep Convolutional Neural Network and Machine Learning Enabled Framework for Analysis and Prediction of Seismic Events" embarks on an ambitious exploration of this interstice, marrying the formidable prowess of Deep Convolutional Neural Networks (CNNs) with an array of machine learning algorithms. At the forefront of our investigation is the Deep CNN, known for its unparalleled capability to process spatial hierarchies and multi-dimensional seismic data. Accompanying this neural behemoth is LightGBM, a gradient boosting framework that offers superior speed and performance, especially with voluminous datasets. Additionally, conventional neural networks, noted for their adeptness in pattern recognition, offer a robust method to gauge the intricacies of seismic data. Our exploration doesn't halt here; the research delves deeper with Random Forest and Support Vector Machines (SVM), both renowned for their resilient performance in classification tasks. By amalgamating these diverse methodologies, this research crafts a multifaceted and synergistic framework. The culmination is a sophisticated tool poised to not only discern the minutiae of seismic activities with heightened accuracy but to predict forthcoming events with a degree of certainty previously deemed elusive. In this era of escalating seismic activities, our research offers a timely beacon, heralding a future where communities are better equipped to respond to the Earth's capricious tremors.

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PDF

Paper 65: Detecting the RPL Version Number Attack in IoT Networks using Deep Learning Models

Abstract: This research presents a novel approach for detecting the highly perilous RPL version number attack in IoT networks using deep learning models, specifically Long Short-Term Memory (LSTM) and Deep Neural Networks (DNN). The study employs the Cooja simulator to create a comprehensive dataset for simulating the attack. By training LSTM and DNN models on this dataset, intricate attack patterns are learned for effective detection. The urgency of this work is underscored by the critical need to bolster IoT network security. IoT networks have become increasingly integral in various domains, including healthcare, smart cities, and industrial automation. Any compromise in their security could result in severe consequences, including data breaches and potential harm. Traditional intrusion detection systems often struggle to counter advanced attacks like the RPL version number attack, which could lead to unauthorized access and disruption of essential services. Experimental results in this research showcase outstanding accuracy rates, surpassing traditional machine learning algorithms used in IoT network intrusion detection. This not only safeguards current IoT infrastructure but also provides a solid foundation for future research in countering this

critical threat, ensuring the continued functionality and reliability of IoT networks in these crucial applications.

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PDF

Paper 66: Lung Cancer Detection using Segmented 3D Tensors and Support Vector Machines

Abstract: Tumor is currently the second most prevalent cause of mortality, and its prevalence is expanding rapidly. The development of pulmonary nodules inside the lungs is suggestive of the existence of lung cancer. The detection of cancer is achieved using nodules detected in computer tomography (CT) images obtained from the LUNA 16 dataset. This study uses the Python library "PyTorch" for this purpose. A three-dimensional model has been used to train and extract the nodular segments from CT-Scan images, referred to as CT-scan chunks. It is done due to the impracticality of handling the whole CT scan image due to its vast size. The previously mentioned chunks are then transformed into PyTorch tensors. The tensors are subsequently input into a deep learning model to extract features, which are then passed through a sequence of machine learning classifiers for the purpose of classification. These classifiers include Support Vector Machines, Multi-layer Perceptron, Random Forest Classifier, Logistic Regression, K Nearest Neighbor, and Linear Discriminant Analysis. Our research has shown that the use of chunk extraction from CT-Scan images, coupled with the creation of tensors using segmented CT scans, has significantly enhanced the precision of various machine learning algorithms. Additionally, this approach has the advantage of reducing the computational time during runtime. In our study, the use of Support Vector Machines yielded the best degree of accuracy, reaching 99.68%. The findings of this study have the potential to be valuable in the practical implementation of real-time lung nodule identification applications.

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PDF

Paper 67: Early Detection and Defense Countermeasure Inference of Ransomware based on API Sequence

Abstract: Currently, ransomware attacks have become an important threat in the field of network security. The detection and defense of ransomware has become particularly important. However, due to the insufficient data and behavior patterns collected dynamically to detect variants and unknown ransomware, there is also a lack of specialized defense strategies for ransomware. In response to this situation, this article proposes a ransomware

early detection and defense system (REDDS) based on application programming interface (API) sequences. REDDS first dynamically collects API sequences from the pre-encryption stage of the ransomware, and calculates the API sequences as feature vectors using the n-gram model and TF-IDF algorithm. Due to the limitations of dynamic data collection, API sequences were enhanced using Wasserstein GAN with Gradient Penalty (WGAN GP), and then machine learning classification algorithms were used to train the enhanced data to detect ransomware. By mapping the malicious API of ransomware to public security knowledge bases such as Adversarial Tactics, Techniques, and Common Knowledge (ATT&CK), a Ransomware Defense Countermeasures Ontology (RDCO) is proposed. Based on the ontology model, a set of inference rules is designed to automatically infer the defense countermeasures of ransomware. The experimental results show that WGAN-GP can more effectively enhance API sequence data than other GAN models. After data augmentation, the accuracy of machine learning detection models has significantly improved, with a maximum of 99.32%. Based on malicious APIs in ransomware, defense countermeasures can be inferred to help security managers respond to ransomware attacks and deploy appropriate security solutions.

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PDF

Paper 68: The Holistic Expression Factors of Emotional Motion for Non-humanoid Robots

Abstract: The development of technology and the increasing prevalence of solitary living have transformed non-humanoid robots, such as robotic sweepers and mechanical pets, into potential sources of emotional support for individuals. Nevertheless, the majority of non-humanoid robots currently in existence are task-oriented and lack features such as facial expressions and sound. Existing research primarily emphasizes the details of human motion in robot motion design, while devoting less attention to the analysis of universal emotional expression factors and methods rooted in human recognition patterns. In our initial step, a theoretical framework and holistic expression factors were proposed based on Gestalt theory and SOR theory. These factors encompass vertical and horizontal motion direction, stimulation, and vertical repetition. Subsequently, animation simulation tests were conducted to confirm and examine the contributions of each factor to the recognition of emotional expressions. The results indicate that both vertical and horizontal movements can convey emotional valence. However, if both of them exist, there is no leading direction to the valence recognition result. When both vertical and horizontal movements are present, valence recognition is influenced by the combined effects of stimulation, vertical repetition, and movement direction. Simultaneously, non-humanoid robots can display recognizable emotional content when influenced by holistic expression factors. This framework can serve as a universal guide for emotional expression tasks in non-humanoid robots, proving the hypothesis that Gestalt theory is applicable in dynamic

emotional recognition tasks. At the same time, these findings propose a new holistic perspective for designing emotional expression methods for robots.

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PDF

Paper 69: Deep CNN for the Identification of Pneumonia Respiratory Disease in Chest X-Ray Imagery

Abstract: Addressing the challenges of diagnosing lower respiratory tract infections, this study unveils the potential of Deep Convolutional Neural Networks (Deep CNN) as transformative tools in medical image interpretation. Our research presents a tailored Deep CNN model, optimized for distinguishing pneumonia in chest X-ray images, a task often complicated by subtle radiological differences. We utilized an extensive dataset comprising 12,000 chest X-rays, which incorporated both pneumonia-affected and healthy samples. Through rigorous pre-processing, encompassing noise abatement, normalization, and data augmentation, a fortified training set emerged. This set was the basis for our Deep CNN, marked by intricate convolutional designs, planned dropouts, and modern activation functions. With 85% of images used for training and the balance for validation, the model manifested an impressive 98.1% accuracy, surpassing preceding approaches. Crucially, specificity and sensitivity metrics stood at 97.5% and 98.8%, highlighting the model's precision in segregating pneumonia cases from clear ones, thus reducing diagnostic errors. These results emphasize Deep CNN's transformative capability in pneumonia diagnosis via X-rays and suggest potential applications across various medical imaging facets. However, as we champion these outcomes, we must cognizantly assess potential hurdles in clinical application, encompassing ethical deliberations, model scalability, and its adaptability to ever-changing pulmonary disease profiles.

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PDF

Paper 70: A Novel Digital Recognition Method Based on Improved SVD-DHNN

Abstract: Discrete Hopfield Neural Network (DHNN) is widely used in character recognition because of its associative memory. It is a fully connected neural network. Its weight initialization is a random process. In order to give full play to the associative memory of DHNN and overcome the problems of pseudo-stable points and complex structure caused by random initialization, an improved SVD-DHNN model is proposed. Firstly, the weight of DHNN is optimized by the global search capability of PSO to help the model jump out of the pseudo stable point; secondly, the weight matrix of DHNN is readjusted by singular value decomposition (SVD). The contribution rate is used to trim the

weights of DHNN, which can reduce the complexity of the network structure; finally, the validity and applicability of the new model are verified by means of digital recognition.

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PDF

Paper 71: The GSO-Deep Learning-based Financial Risk Management System for Rural Economic Development Organization

Abstract: Financial risk management has always been a key concern for major enterprises. At the same time, with the continuous attention to impoverished rural areas worldwide, financial risk management tools have become an important component of rural economic development organizations to avoid financial risks. With the rapid development of artificial intelligence technologies such as neural networks and deep learning, and due to their strong learning ability, high adaptability, and good portability, some financial risk management tools are gradually adopting technologies such as neural networks and machine learning. However, existing financial risk management tools based on neural networks are mostly developed for large enterprises such as banks or power grid companies, and cannot guarantee their full applicability to rural economic development organizations. Therefore, this study focuses on the financial risk management system used for rural economic development organizations. In order to improve the accuracy of deep learning algorithms in predicting financial risks, this paper designs an improved Glowworm Swarm Optimization (IGSO) algorithm to optimize Deep Neural Networks (DNN). Finally, the effectiveness of the financial risk management tool based on IGSO-DNN proposed in this article was fully validated using data from 45 rural economic development organizations as a test set.

Author 1: Weiliang Chen

PDF

Paper 72: Sustainable Smart Home IoT to Open and Close the House Fence using a Scanning Method

Abstract: A home that is connected to the Internet allows all of its appliances and systems to communicate with one another via the Internet of Things (IoT), making it a component of a sustainable smart home. The issue with this study's findings is that some homes still utilize manual gates, which must be opened and closed by pushing a gate. Considering that a building's gate is its primary form of security, this is viewed as being less effective. Additional locks are required on the fence to overcome its frail defenses, which do not deter criminals. This project aims to create a smart home by using the internet to

automate the process of opening and closing home gates based on IoT. Prototyping is a strategy used in software development, whereas card barcode objects are found using scanning. The findings demonstrated that Radio Frequency Identification (RFID), which is connected to a smartphone as a communication medium between the device and the user, is connected to each other between the microcontroller and the stepper motor so that it can operate the home gate automatically. The test findings indicate that when the user taps in the RFID card as the drive for the gate, the reaction time of the RFID to the stepper is between 7.35 and 10.10 seconds. Future research can use long-range RFID technology, which has a reading distance of more than 5-12 meters with a radio frequency band refarming process of 800 - 900 Mhz for any smart home or smart building. The accuracy of reading RFID cards with an RFID reader is about 1 - 5 cm, which is the limitation in this study. According to the test findings, it can be said that the development of an automatic fence control system increases the effectiveness of home security and allows for direct control from a smartphone. Using a Long-RFID instrument with a reading precision distance of 5–12 meters and a radio frequency band refarming method of 800–900 Mhz is anticipated to be sustainable in this research.

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Author 4: Deshinta Arrova Dewi   Author 5: Rudy Sofian

Author 6: Muhammad Faridh Rizaldy

PDF

Paper 73: Investigating the Role of Machine Learning Algorithms in Predicting Sepsis using Vital Sign Data

Abstract: Objective: In hospitals, sepsis is a common and costly condition, but machine learning systems that utilize electronic health records can enhance the timely detection of sepsis. The purpose of this research is to verify the effectiveness of a machine learning tool that makes use of a gradient boosted ensemble for sepsis diagnosis and prediction in relation. San Francisco University of California, (SFUC) Medical Center and the Medical Information Mart for Intensive Care (MIMIC) databases were consulted for historical information. The study encompassed adult patients who were admitted without sepsis and had a minimum single logging of six vital signs (SpO2, temperature, heart rate, respiratory rate, diastolic blood pressure and systolic). Using the area under the receiver operating characteristic (AUROC) curve, the performance of the machine learning algorithm was compared to commonly used scoring systems, and its accuracy was determined. Performance of the MLA (machine learning algorithm) was evaluated at sepsis onset, as well as 24 and 48 hours before sepsis onset. The AUROC for the MLA was 0.88, 0.84, and 0.83 for sepsis onset, 24 hours prior, and 48 hours prior, respectively. At the time of onset, these values were superior to those of SOFA, MEWS, qSOFA, and SIRS. Using UCSF data for training and MIMIC data for testing, the sepsis onset AUROC was 0.89. The MLA can safely predict sepsis up to forty-eight hours before it occurs and the accuracy in detecting the onset of sepsis is higher in comparison to traditional instruments. When trained and

evaluated on distinct datasets, the MLA maintains high performance for sepsis detection.

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PDF

Paper 74: A Novel and Efficient Point Cloud Registration by using Coarse-to-Fine Strategy Integrating PointNet

Abstract: The registration of the point cloud plays a critical and fundamental role in the computer vision domain. Although quite good registration results have been obtained by using the global, local, and learning-based registration strategies, there are still many problems to solve. For example, the local methods that are based on geometric features are very sensitive to attitude deviation, the global shapes-based methods are easy to result in inconsistency when the distribution differences are obvious and the learning-based registration methods have highly relied on the huge label data. A novel and effective registration method for the point cloud data integrating the coarse-to-fine strategy and the improved PointNet network is proposed to overcome the above-mentioned drawbacks and improve registration accuracy. The improved Random Sample Consensus (RANSAC) algorithm is developed to effectively deal with the initial attitude deviation problem in the coarse registration procedure and the improved Lucas and Kanade (LK) algorithm is proposed based on the classical PointNet framework to reduce the errors of the refine registration, and the whole registration procedure is implemented under a trainable recurrent deep learning architecture. Compared with the state-of-the-art point cloud registration methods, experimental results fully prove that the proposed method can effectively handle the significant attitude deviation and partial overlap problem and achieves stronger robustness and higher accuracy.

Author 1: Chunxiang Liu   Author 2: Tianqi Cheng

Author 3: Muhammad Tahir   Author 4: Mingchu Li

Author 5: Zhouqi Liu   Author 6: Lei Wang

PDF

Paper 75: Surface Reconstruction from Unstructured Point Cloud Data for Building Digital Twin

Abstract: This study highlights on the methods used for surface reconstruction from unstructured point cloud data, characterized by simplicity, robustness and broad applicability from 3D point cloud data. The input data consists of

unstructured 3D point cloud data representing a building. The reconstruction methods tested here are Poisson Reconstruction Algorithm, Ball Pivoting Algorithm, Alpha Shape Algorithm and 3D surface refinement, employing mesh refinement through Laplacian smoothing and Simple Smoothing techniques. Analysis on the algorithm parameters and their influence on reconstruction quality, as well as their impact on computational time are discussed. The findings offer valuable insights into parameter behavior and its effects on computational efficiency and level of detail in the reconstruction process, contributing to enhanced 3D modeling and digital twin for buildings.

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Keywords: Surface reconstruction; point cloud; building reconstruction; 3D mesh

PDF

Paper 76: A Cost-Effective Method for Detecting and Tracking Moving Objects using Overlapping Methods

Abstract: Overlay approaches for moving object detection and tracking have recently received attention as a crucial field for computer science and computer vision research. Using pixel overlap and visual attributes, these techniques enable the recognition and tracking of objects in movies or video data. Two color and edge features for the suggested method are presented in this article. The suggested approach uses the SED algorithm, and since the edges have a lower volume than the entire image, the processing process will be faster with the reduction of information. The characteristic of color is the HSV (hue, saturation and value) histogram because it is close to human vision. However, because the margins tidy up the shapes in the human eye, they contain important information. These concerns lead to the conclusion that the histogram of gradient angles based on regional binary patterns is the edge feature of the suggested system. There are two justifications for employing local binary patterns. First, the principal edges are emphasized by using local binary patterns. Another point is that the image produced by this method displays the image's texture; in other words, the shape's feature is taken from the context of the texture, which is regarded as a type of combination of features. Several criteria were evaluated in order to assess the suggested approach for tracking images in comparison to related systems; the most significant of these are the precision, recall, and similarity criteria. In comparison to other works, the findings for precision have generally increased accuracy by 25%, recall by 17%, and similarity by 12%.

Author 1: Yuanyuan ZHANG

Keywords: Tracking; moving object detection; image processing; binary patterns; HSV histogram

PDF

Paper 77: Exploring the Utilization of Program Semantics in Extreme Code Summarization: An Experimental Study Based on Acceptability Evaluation

Abstract: With the rise of deep learning methods, neural network architecture adopted from neural machine translation has been widely studied in code summarization by learning the sequential content of code. Given the inherent nature of programming languages, learning the representation of source code from the parsed structural information is also a typical way for constructing code summarization models. Recent studies show that the overall performance of the neural models for code summarization can be improved by utilizing sequential and structural information in a hybrid manner. However, both of these two kinds of information fed to the neural models for code summarization fail to embrace the semantics of source code snippets in an explicit way. Is it really a good way to just leave the semantics as hidden things in the source code and have the neural models capture whatever they can get? To observe the utilization of program semantics in automatic code summarization, we conducted an experimental study by analyzing the acceptability of the extreme code summaries generated from neural models. To make the models aligned in the same context for this experimental study and to focus on the observation of the semantics, we re-implement the neural models from three selected studies as extreme code summarization solutions. After an intuitive observation and exploration of the generated summaries with the models trained from a Java dataset, we identify five acceptability aspects: (1) function name format; (2) function naming style; (3) semantic level similarity; (4) the differences in hitting rate of representative words; and (5) the correlation between extreme code summaries with function body. Based on the false negative and false positive phenomena in the results, ablation experiments have shown that the use of program semantics has a positive effect on generating high-quality abstracts in neural models. Our work proves the potential of utilizing the program semantics explicitly in code summarization, and the possible directions are also indicated.

Author 1: Jiuli Li   Author 2: Yan Liu

PDF

Paper 78: Using Topic in Summarization for Vietnamese Paragraph

Abstract: This article delves into the realm of refining the precision of automated text summarization tasks by harnessing the underlying themes within the documents. Our training data draws upon the VNDS dataset (A_Vietnamese_Dataset_for_Summarization), encompassing a total of 150,704 samples aggregated from diverse online news sources like vnexpress.net, tuoitre.vn, and more. These articles have been meticulously processed to ensure they align with our training objectives and criteria. This paper presents an approach to text summarization that is theme-oriented, utilizing Latent Dirichlet Allocation to delineate the document's subject matter. The data subsequently have been fed into the BERT model, which constitutes one of the subtasks within the broader domain of abstractive summarization— summarizing content based on pivotal concepts. The results attained, although modest, underscore the challenges we've confronted. Consequently, our model necessitates further development and refinement to unlock its full potential.

Author 1: Dat Tien Dieu   Author 2: Dien Dinh

Paper 79: Incorporating Natural Language Processing into Virtual Assistants: An Intelligent Assessment Strategy for Enhancing Language Comprehension

Abstract: The study introduces a comprehensive technique for enhancing the Natural Language Processing (NLP) capabilities of virtual assistant systems. The method addresses the challenges of efficient information transfer and optimizing model size while ensuring improved performance, with a primary focus on model pertaining and distillation. To tackle the issue of vocabulary size affecting model performance, the study employs the SentencePiece tokenizer with unigram settings. This approach allows for the creation of a well-balanced vocabulary, which is essential for striking the right balance between task performance and resource efficiency. a novel pre-layernorm design is introduced, drawing inspiration from models like BERT and RoBERTa. This optimization optimizes the placement of layer normalization within transformer layers during the pretraining phase. Teacher models are effectively trained using masked language modeling objectives and the Deepspeed scaling framework. Modifications to model operations are made, and mixed precision training strategies are explored to ensure stability. The two-stage distillation method efficiently transfers knowledge from teacher models to student models. It begins with an intermediate model, and the data is distilled carefully using logit and hidden layer matching techniques. This information transfer significantly enhances the final student model while maintaining an ideal model size for low-latency applications. In this approach, innovative measurements, such as the precision of filling a mask, are employed to assess the effectiveness and quality of the methods. The findings demonstrate substantial improvements over publicly available models, showcasing the effectiveness of the strategy within complete virtual assistant systems. The proposed approach confirms the potential of the technique to enhance language comprehension and efficiency within virtual assistants, specifically addressing the challenges posed by real-world user inputs. Through extensive testing and rigorous analysis, the capability of the method to meet these objectives is validated.

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Paper 80: A Novel Multidimensional Reference Model for Heterogeneous Textual Datasets using Context, Semantic and

Syntactic Clues

Abstract: With the advent of technology and use of latest devices, they produce voluminous data. Out of it, 80% of the data are unstructured and remaining 20% are structured and semi-structured. The produced data are in heterogeneous format and without following any standards. Among heterogeneous (structured, semi-structured and unstructured) data, textual data are nowadays used by industries for prediction and visualization of future challenges. Extracting useful information from it is really challenging for stakeholders due to lexical and semantic matching. Few studies have been solving this issue by using ontologies and semantic tools, but the main limitations of proposed work were the less coverage of multidimensional terms. To solve this problem, this study aims to produce a novel multidimensional reference model using linguistics categories for heterogeneous textual datasets. The categories in such context, semantic and syntactic clues are focused along with their score. The main contribution of MRM is that it checks each tokens with each term based on indexing of linguistic categories such as synonym, antonym, formal, lexical word order and co-occurrence. The experiments show that the percentage of MRM is better than the state-of-the-art single dimension reference model in terms of more coverage, linguistics categories and heterogeneous datasets.

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PDF

Paper 81: Application of Lightweight Deep Learning Model in Landscape Architecture Planning and Design

Abstract: The holistic view of garden construction is firstly reflected in the integration of the elements that make up the garden, and the primary and secondary are distinguished from the perspective of the whole city, the continuation of the upper planning, the coordination with the surrounding groups and the harmony of the internal gardening elements. The primary goal of ANN (artificial neural network) learning is to understand the drawings and to convert information such as plant numbers and positions in digital drawings into standard digital formats for storage. In front of the SSD (Single Shot Multi-box Dettor) network model, a standard architecture network for image classification is adopted, called the basic network and is fused for comprehensive detection. This paper proposes the network model flow of the 3D object voxel modeling method based on the lightweight DL (Deep learning) model. The cyclic 2D encoder, cyclic 3D decoder and view planner are integrated into a unified framework responsible for feature extraction and fusion, feature decoding and view planning. The results show that the pixel accuracy, the average accuracy and the average IU value are the highest, with the pixel accuracy as high as 90.44%, the average accuracy as high as 93.15%, and the average IU value as 92.72%. In landscape image processing, it provides a certain foundation for future landscape planning and design.

Author 1: Linyu Zhang

PDF

Paper 82: Investigations of Modified Functional Connectivity at Rest in Drug-Resistant Temporal Lobe Epilepsy Patients

Abstract: In this experimental study patients with temporal lobe epilepsy and controls have been compared for functional connectivity (FC) using resting-state functional magnetic resonance imaging (rs-fMRI). This research work examines the alterations to better understand the issues with brain activity of individuals suffering from Temporal Lobe epilepsy (TLE), during the rest state. The major objective of this study is to investigate FC-related alterations in the resting state to fully comprehend the complex nature of epilepsy. It is observed that FC gets altered in specific regions in the case of patients suffering from left-sided Temporal Lobe Epilepsy and right-sided Temporal Lobe Epilepsy as compared to controls. Using rs-fMRI, it is found that the right-sided TLE patient group had altered hippocampus networks than the control right-side group. There are considerable differences between the left and right areas of control and the groups with mesial temporal hippocampal sclerosis on the left and right sides. When compared to control left brain regions, the left-side TLE group exhibits reduced connection between the anterior cingulate gyrus and the affected hippocampus and increased regional connectivity between the affected hippocampus and the default posterior cingulate cortex region.

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PDF

Paper 83: Blockchain-based Teaching Evaluation System for Ensuring Data Integrity and Anonymity

Abstract: The significance of student feedback within educational institutions cannot be overstated, as it serves as a pivotal tool for evaluating faculty performance and identifying potential gaps in course content. Blockchain technology has emerged as an increasingly promising solution for diverse digital applications, owing to its distinctive attributes and robust security features. This study endeavors to explore the use of blockchain technology for secure student feedback systems in education, specifically for analyzing faculty performance in a course. However, a noteworthy challenge that plagues existing feedback systems is their inability to ensure complete anonymity, leading to students' hesitancy in providing candid and honest feedback. Furthermore, these conventional systems often rely on databases for data storage, rendering them susceptible to tampering and data breaches. In response to these pressing concerns, the present paper proffers a comprehensive and innovative solution. The crux of the proposed approach revolves around the implementation of a blockchain-based student feedback

system, artfully designed to guarantee both student anonymity and tamper-proof data storage, thereby facilitating the evaluation of teaching effectiveness. By leveraging the potential of an Ethereum-based blockchain, a secure and trusted platform is meticulously established, catering to the sensitive realm of student feedback in an impervious and confidential manner. Concomitantly, a user-friendly web application is deftly developed to complement the proposed system, meticulously documenting the implementation process, Smart Contract and project code. It is noteworthy that this cutting-edge feedback system provides an invaluable layer of security, fostering heightened user trust and engendering an environment conducive to genuine and authentic evaluations.

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PDF

Paper 84: Dynamic Routing Using Petal Ant Colony Optimization for Mobile Ad-hoc Networks

Abstract: A Mobile Ad-hoc Network (MANET) is a temporary wireless network that configures itself as needed. Each MANET node has a finite number of resources and serves as both a node and a router at the same time. MANET nodes are mobile and move from one location to another. Because MANET nodes are dynamic, choosing an optimal node for data transfer is a difficult issue. Because packets must propagate in a multi-hop manner, they take a longer path and may endure a longer delay, causing them to become lost in the network. The network's overall performance suffers as a result of the re-transmission of those lost packets. We propose a modified version of a nature-inspired algorithm called Petal Ant based Dynamic Routing (PADR) in this research study, which reconstructs data packets to traverse inside a given region and achieves minimal delay during data transmission. The PADR is simulated in Network Simulator (NS2) and compared against nature-inspired routing protocols like PAR and SARA, as well as traditional routing protocols like AODV.

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PDF

Paper 85: Hybrid Syntax Dependency with Lexicon and Logistic Regression for Aspect-based Sentiment Analysis

Abstract: Aspect-based Sentiment Analysis (ABSA) is a fine-grained form of SA that greatly benefits customers and the real world. ABSA of customer reviews has become a trendy topic because of the profuse information that is shared through these reviews. While SA also known as opinion mining helps to find opinion, ABSA greatly impact business world by converting these reviews to finer form with aspects and opinion or sentiment. These review words are

interwoven internally, which depends on the semantics besides syntax, and sometimes there are long dependencies. Recently, the hybrid methods for ABSA are popular, but most of them merely considered if the syntax and long dependency exist, thus missing the inclusion of multi and infrequent aspects. In addition, in most literature, sentiment classification is shown directly without calculating the sentiment scores in ABSA. To this effect, this paper proposes a hybrid with syntax dependency and the lexicon for aspect, sentiment extraction, and polarity classification by Logistic Regression (LR) classifier to overcome the issues in ABSA. The proposed method is able to address the challenges of ABSA in a number of ways. First, it is able to extract multi-word and infrequent aspects by using syntactic dependency information. Second, it is able to calculate sentiment scores, which provides a more nuanced understanding of the overall sentiment expressed towards an aspect. Third, it is able to capture long dependencies between words by using syntactic dependency and semantic information. The proposed hybrid model outperformed the other methods by an average of 8-10 percent with the standard public dataset in terms of accuracy.

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PDF

Paper 86: A Comparative Study of Cloud Data Portability Frameworks for Analyzing Object to NoSQL Database Mapping from ONDM's Perspective

Abstract: Cloud computing revolves around storing and retrieving data in a portable manner. However, practical data portability across multiple Database-as-a-service (DBaaS) cloud data stores is challenging. This becomes even more complicated when data needs to be migrated between different types of data storage, such as SQL and NoSQL databases. NoSQL databases have gained significant popularity among developers due to their ability to provide high availability, fault tolerance, and scalability, making them suitable for managing big data in large-scale infrastructures. However, the varied data models in NoSQL databases make it difficult to migrate or port data among data repositories. Object to NoSQL database mappers (ONDMs) solves this problem. However, only a few ONDMs are available for C#.NET development, and the ONDM market used in Java development could be more stable. To address this issue, we propose building a middleware solution using the .NET framework to support cloud data portability, leveraging the capabilities of ONDMs. In this study, we evaluate several frameworks and compare them to our suggested middleware solution through empirical research. Our middleware solution can perform open network data management (ONDM) and object-relational mapping (ORM).

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PDF

Paper 87: Analysis and Application of Antibacterial Drug Resistance Based on Deep Learning

Abstract: The continuous improvement of deep learning technology has led to its deeper application in related fields, especially in the detection of antimicrobial resistance in the medical field. In drug resistance detection, the CNN-ATT-TChan model based on the fusion of CNN algorithm and attention mechanism can classify and organize a large amount of antimicrobial resistance data, achieving standardized processing. Based on mature chemical analysis and testing methods, drug resistance test data was obtained, and the training duration and classification accuracy F of the model were discussed in combination with the test data. At the same time, based on relevant research literature, the changes in ROC curves and AUC values between different models were compared. The results showed that the CNN algorithm using fusion attention mechanism can improve the training time of the model and also improve the classification accuracy of the model. Therefore, the application of CNN-ATT-TChan model combined with attention mechanism in the detection of antimicrobial resistance provides more support for the development of antimicrobial resistance testing.

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PDF

Paper 88: Multi-Scale Deep Learning-based Recurrent Neural Network for Improved Medical Image Restoration and Enhancement

Abstract: Improving medical image quality is essential for accurate diagnosis, treatment planning, and ongoing condition monitoring. A crucial step in many medical applications, the restoration of damaged input images tries to retrieve lost high-quality data. Despite significant advancements in image restoration, two major problems still exist. First, it's important to preserve spatial features, although doing so frequently results in the loss related data. Second, while producing linguistically sound outputs is important, location accuracy can sometimes suffer. To overcome these issues and improve medical imaging, the Multi-Scale Deep Learning-based Recurrent Neural Network (MSDL-RNN) is offered in this paper. The model makes use of various scales during building, in contrast to standard RNN-based techniques, which generally use both full-resolution and gradually reduced-resolution approximations. This multi-scale approach uses deep learning to address problems including noise reduction, defect elimination, and increase of overall image quality. Artificial Bee Colony Optimization is employed for efficient segmentation. By combining local and

global data, the MSDL-RNN technique effectively improves and recovers a variety of medical imaging modalities. It generalizes the optimization strategy for model capacity assurance by incorporating crucial pre-processing methods targeted to various medical image types. The suggested approach was implemented in Python software and has an amazing accuracy of 99.23%, which is 4.33% higher than other existing methods like DesNet, AGNet, and NetB0. This study sets the way for important developments in improving the quality of medical images and their uses in healthcare.

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PDF

Paper 89: Cold Chain Logistics Path Planning and Design Method based on Multi-source Visual Information Fusion Technology

Abstract: Complete cold chain logistics is needed to control the whole temperature of refrigerated and frozen food, including the closed environment, storage and transportation when loading and unloading goods. Studying how to optimize vehicle scheduling and reduce transportation time and transportation costs is very important. The research object of this paper is the path planning of urban cold chain logistics. This paper will consider the cold chain distribution of multi-vehicle coexistence, build an integer programming model, design a targeted ACO (Ant Colony Optimization) solution model, and verify it with an example. Based on multi-source visual information fusion technology, these independent heterogeneous data sources are accessed through cloud computing resource integration technology to establish a unified data integration middleware. The pheromone update model selected in this paper is the ant week model, which uses global information to record the optimal path of ants. The results show that the satisfaction of delivery time is far behind, and even the average satisfaction of key customers with high value is only 55.1%, which is 18.3% higher than that of the planning without considering value. This method can provide a real-time optimized path in an effective time range and improve the efficiency of distribution services, which has certain theoretical significance and practical value.

Author 1: Ke XUE   Author 2: Bing Han

PDF

Paper 90: CDCA: Transparent Cache Architecture to Improve Content Delivery by Internet Service Providers

Abstract: The popularity of on-demand multimedia such as video streaming services has been rapidly increasing the overall Internet traffic volume in the world. As of the beginning of 2023, almost 82% of this global Internet traffic came from video transmission through on-demand online services, trending towards changing the Internet paradigm from location-based to content-based, culminating in a new paradigm of Information-Centric Networking (ICN). ICN focuses on content distribution based on name rather than location, allowing Internet Service Providers (ISP) to implement local content caching systems for faster delivery and reduced transmission delays and unnoticeable jitter or distortions. ICN can be implemented over a Software-Defined Networking (SDN) infrastructure. SDN enables flexible programming and implementation of forwarding packet rules within a network domain seamlessly. This paper proposes a hybrid architecture that combines ICN and SDN to create a transparent in-network caching system for content distribution over the traditional IP network. The architecture aims to improve the performance of Video-on-Demand (VoD) services for customers while efficiently utilizing network provider resources. A prototype called CDCA was developed and evaluated in a Mininet emulation environment. The results of the evaluation demonstrate that the CDCA hybrid architecture to create a caching system for content distribution enhances VoD service performance and optimizes network resource utilization.

Author 1: Alwi M Bamhdi

PDF

Paper 91: An Improved Hybrid A*Algorithm of Path Planning for Hotel Service Robot*

Abstract: Due to the increasing demand for unmanned in the hotel industry in recent years, how to efficiently use hotel service robots to further improve the efficiency of the hotel industry has become a hot research issue. To solve the problems of lengthy path-finding time and poor route security in conventional service robots in complex environments, the current study provides an improved A* path-finding algorithm for application in the hotel environment. Firstly, the conventional A* algorithm is combined with bidirectional search and Jump Point Search (JSP) algorithm, which makes the search more effective. Secondly, the traditional A* algorithm is combined with the security weight square matrix to make the path trajectory safer. A cubic spline interpolation is chosen to smoothen the transitions at the corners planned by the improved A* algorithm. Simulation experiments were done on grid maps with 10*10, 20*20 and 50*50 sizes. Compared with the conventional A* algorithm, the search time were decreased by 67%, 77% and 95% respectively. The number of search nodes was decreased by 80%, 76% and 95%, respectively. Meanwhile the distance between the robot and the obstacles was increased. The results indicate that the improved A* algorithm suggested in the present research can ensure the path trajectory safer while keeping the path search efficiency higher.

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PDF

Paper 92: Innovative Practice of Virtual Reality Technology in Animation Production

Abstract: In order to make the users who watch animation look better, the innovative practice research of virtual reality technology in animation production is proposed. According to the object structure information, the method uses 3ds Max software to complete the production of 3D animated character models. It completes the character prototype texture feature extraction through the character prototype boundary contour extraction, image hat height transformation, and discrete grid projection. The OpenGL texture mapping is used to complete the mapping of 3D animated character models. After the boundary optimization of texture seams, the best 3D animated character modeling effect is obtained. Geometric modeling technology and DOF nodes are used to build static and dynamic scene entity models to complete the construction of a 3D animation scene. The interactive visualization platform based on space is introduced to complete the visualization processing of the interactive animation scene, and the animation scene is regarded as the image base. The points with equal arc length are selected according to the curve points, and the camera is switched in combination with the roaming speed to realize the real-time roaming of 3D animation scenes and complete the innovative, practical application of virtual reality technology in animation production. Experimental results show that this method improves the smoothness, integrity, and authenticity of animation, improves the smoothness of motion, and ensures the real-time roaming effect.

Author 1: He Huixuan   Author 2: Xiang Yuan

PDF

Paper 93: A Machine Learning Approach for Emotion Classification in Bengali Speech

Abstract: In this research work, we have presented a machine learning strategy for Bengali speech emotion categorization with a focus on Mel-frequency cepstral coefficients (MFCC) as features. The commonly utilized method of MFCC in speech processing has proved effective in obtaining crucial phoneme-specific data. This paper analyzes the efficacy of four machine learning algorithms: Random Forest, XGBoost, CatBoost, and Gradient Boosting, and tackles the paucity of research on emotion categorization in non-English languages, particularly Bengali. With CatBoost obtaining the greatest accuracy of 82.85%, Gradient Boosting coming in second with 81.19%, XGBoost coming in third with 80.03%, and Random Forest coming in fourth with 80.01%, experimental evaluation shows encouraging outcomes. MFCC features improve classification precision and offer insightful information on the distinctive qualities of emotions expressed in Bengali speech. By demonstrating how well MFCC characteristics can identify emotions in Bengali speech, this study advances the field of emotion classification. Future research can investigate more sophisticated feature

extraction methods, look into how temporal dynamics are incorporated into emotion classification models, and investigate practical uses for emotion detection systems in Bengali speech. This study advances our knowledge of emotion classification and paves the way for more effective emotion identification systems in Bengali speech by utilizing MFCC and machine learning techniques. Our work addresses the need for thorough and efficient techniques to recognize and classify emotions in speech signals in the context of emotion categorization. Understanding emotions is essential for many applications, as they are a basic component of human communication. By investigating cutting-edge strategies that show promise for enhancing the precision and effectiveness of emotion recognition, this study advances the field of emotion classification.

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PDF

Paper 94: Hybrid Integrated Aquila Optimizer for Efficient Service Composition with Quality of Service Guarantees in Cloud Computing

Abstract: The prompt evolution of cloud computing technology has given rise to the emergence of countless cloud-based services. However, guaranteeing Quality of Service (QoS) awareness in service composition poses a substantial difficulty in cloud computing. A solitary service cannot effectively handle the complicated requests and varied demands of real-world situations. In some instances, one service alone may not be enough to fulfill users' particular requirements, prompting the integration of several services to satisfy these needs. As an NP-hard problem, service composition has been addressed using many metaheuristic algorithms. In this context, the proposed methodology presents a new blended technique, referred to as Integrated Aquila Optimizer (IAO), which amalgamates conventional Aquila Optimizer (AO) and Particle Swarm Optimization (PSO) algorithm. The central objective of this hybridization is to tackle the shortcomings confronted by both AO and PSO algorithms. Specifically, these algorithms are known to get stuck in local search areas and show limited solution variety. To address these challenges, the proposed method introduces a novel transition mechanism that facilitates suitable adjustments between the search operators, ensuring continual improvements in the solutions. The transition mechanism allows the algorithm to switch between AO and PSO when any of them gets stuck or when the diversity of solutions decreases. This adaptability enhances the overall performance and effectiveness of the hybrid approach. The proposed IAO method is exhaustively tested through experiments conducted using the Cloudsim simulation platform. The numerical findings confirm the effectiveness of the suggested approach regarding dependability, accessibility, and expenses, which are essential factors of cloud computing.

Author 1: Xiaofei Liu

Paper 95: QoS and Energy-aware Resource Allocation in Cloud Computing Data Centers using Particle Swarm Optimization Algorithm and Fuzzy Logic System

Abstract: Cloud computing has become a viable option for many organizations due to its flexibility and scalability in providing virtualized resources via the Internet. It offers the possibility of hosting pervasive applications in the consumer, scientific, and business domains utilizing a pay-as-you-go model. This makes cloud computing a cost-effective solution for businesses as it eliminates the need for large investments in hardware and software infrastructure. Furthermore, cloud computing enables organizations to quickly and easily scale their services to meet the demands of their customers. Resource allocation is a major challenge in cloud computing. It is known as the NP-hard problem and can be solved using meth-heuristic algorithms. This study optimizes resource allocation using the Particle Swarm Optimization (PSO) algorithm and fuzzy logic system developed under the proposed time and cost models in the cloud computing environment. Receiving, processing, and waiting time are included in the time model. The cost model incorporates processing and receiving costs. Two experiments demonstrate the performance of the proposed algorithm. The simulation results demonstrate the potential of our mechanism, demonstrating improved performance over previous approaches in aspects such as providers' total income, users' total revenue, resource utilization, and energy consumption.

Author 1: Yu Wang   Author 2: Lin Zhu

Paper 96: Efficient Cloud Workflow Scheduling with Inverted Ant Colony Optimization Algorithm

Abstract: Cloud computing has risen as a prominent paradigm, offering users on-demand access to computing resources and services via the Internet. In cloud environments, workflow scheduling plays a vital role in optimizing resource utilization, reducing execution time, and minimizing overall costs. As workflows comprise interdependent tasks that need to be assigned to Virtual Machines (VMs), the complexity of the scheduling problem increases in proportion to workflow size and VM availability. Due to its NP-hard nature, finding an optimal scheduling solution for workflows remains a challenging task. To address this problem, researchers have turned to metaheuristic approaches, which have shown promise in finding near-optimal solutions for complex combinatorial optimization problems. This paper proposes a novel metaheuristic algorithm called Inverted Ant Colony Optimization (IACO) for workflow scheduling in cloud environments. IACO is a variation of the traditional ACO algorithm, where the updated pheromone has an inverted influence on the path chosen by the ants. By leveraging the complementary nature of these two algorithms, our proposed algorithm aims to achieve superior workflow scheduling performance regarding total execution time and cost, surpassing existing approaches.

Author 1: Hongwei DING   Author 2: Ying ZHANG

PDF

Paper 97: Measuring Surroundings Awareness using Different Visual Parameters in Virtual Reality

Abstract: Due to the popularity of digital games, there is a growing interest in using games as therapeutic interventions. The ability of games to capture attention can be beneficial to distract patients from pain. In this paper, we investigate the impact of visual parameters (color, shapes, and animation) on users' awareness of their surroundings in virtual reality. We conducted a user study in which experiments included a visual search task using a virtual reality game. Through the game, the participants were asked to find a target among distraction objects. The results showed that the different visual representations of the target among distraction objects could affect the users' awareness of their surroundings. The least awareness of the surroundings occurred when the target and distractors shared similar features. Further, the conjunction of low similarity between distractors-distractors and high similarity between target-distractors provided less awareness of the surroundings. Additionally, results revealed that there is a strong positive correlation between search time and awareness of the surroundings. Less awareness of the surroundings while playing a game implies that users are positively engaged in that game. These results offered a set of criteria that can be applied to future virtual reality interventions for medical pain distraction.

Author 1: Fatma E. Ibrahim   Author 2: Neven A. M. Elsayed

Author 3: Hala H. Zayed

PDF

Paper 98: A Comparative Study of Deep Learning Algorithms for Forecasting Indian Stock Market Trends

Abstract: This research underscores the vital significance of providing investors with timely and dependable information within the dynamic landscape of today's stock market. It delves into the expanding utilization of data science and machine learning methods for anticipating stock market movements. The study conducts a comprehensive analysis of past research to pinpoint effective predictive models, with a specific focus on widely acknowledged algorithms. By employing an extensive dataset spanning 27 years of NIFTY 50 index data from the National Stock Exchange (NSE), the research facilitates a thorough comparative investigation. The primary goal is to support both investors and researchers in navigating the intricate domain of stock market prediction. Stock price prediction is challenging due to numerous influencing factors, and identifying the optimal deep learning model and parameters is a complex task. This objective is accomplished by harnessing the capabilities of deep learning, thereby contributing to well-informed decision-making and the efficient utilization of predictive tools. The paper scrupulously examines prior contributions from fellow researchers in stock prediction and implements

established deep learning algorithms on the NIFTY 50 dataset to assess their predictive accuracy. The study extensively analyzes NIFTY 50 data to anticipate market trends. It employs three distinct deep learning models—RNN, SLSTM, and BiLSTM. The results underscore SLSTM as the most effective model for predicting the NIFTY 50 index, achieving an impressive accuracy of 99.10%. It's worth noting that the accuracy of BiLSTM falls short when compared to RNN and SLSTM.

Author 1: Mrinal Kanti Paul   Author 2: Purnendu Das

PDF

Paper 99: Detection of Dyslexia Through Images of Handwriting using Hybrid AI Approach

Abstract: Dyslexia is a neurodevelopmental disorder characterized by difficulties with acquiring reading skills, despite the presence of appropriate learning opportunities, sufficient education, and a suitable sociocultural context. Dyslexia negatively affects children's educational development and their acquisition of language, as well as their writing. Therefore, early detection of dyslexia is of great importance. The prediction of dyslexia through handwriting is an active research field of almost five years' standing. In this paper, we propose hybrid models (CNN-SVM) and (CNN-RF) to reveal dyslexia through images of handwriting. The paper aimed to develop a CNN model to extract features from images of handwriting where CNN is highly reliable in extracting features from images, and to use SVM as a classifier due to its generalization abilities as well as using random forest (RF) as a classifier in (CNN-RF). The study aimed to combine a deep learning (DL) model and a machine learning (ML) model to improve model performance. Data sets that consisted of 176,673 images of handwriting were used in this study. The hyperparameter of the model was adjusted and examined in order to classify the three categories of handwriting. The CNN model that was built demonstrated an outstanding accuracy rate of 98.71% in effectively categorizing three distinct types of handwriting—99.33% with SVM, and 98.44% in the CNN-RF model. The aim of recognizing dyslexic handwriting through CNN-SVM was successfully attained, and our model outperformed all previous models.

Author 1: Norah Dhafer Alqahtani   Author 2: Bander Alzahrani

Author 3: Muhammad Sher Ramzan

PDF

Paper 100: A Hybrid metaheuristic Algorithm for Edge Site Deployment with User Coverage Maximization and Cost Minimization

Abstract: Recent years, edge computing has been getting increased attention due to its ultra-low delay service deliveries. Plenty of works have focused on

the performance improvement of edge computing by e.g., edge server deployment, edge caching, and task offloading. While, there is a lack of work on improving the investment cost for building or upgrading the edge site deployment by making a decision on which places edge sites are deployed. In this paper, we focus on the edge site deployment problem (ESDP) to maximize user coverage with fewest edge sites. We first formulate ESDP into a binary nonlinear programming with two optimization objectives of user coverage maximization and edge site minimization, and prove that ESDP is NP-complete. Then, we propose a hybrid metaheuristic algorithm to solve ESDP with polynomial time complexity, which combining the crossover and mutation operators of genetic algorithm with self-and social-cognition of particle swarm optimization. At last, we conduct extensive simulated experiment based on a real data set to evaluate the performance of our proposed algorithm. The results show that our algorithm achieves 100% user coverage with much fewer edge sites than other seven metaheuristic algorithms, and has a good scalability.

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Keywords: Edge computing; edge deployment; GA; PSO; metaheuristic

PDF

Paper 101: A Comprehensive System for Managing Blood Resources Leveraging Blockchain, Smart Contracts, and Non-Fungible Tokens

Abstract: The escalating demand for blood and its derivatives in the medical field underpins its indispensable nature for disease diagnosis and therapy. Such essential life-giving components are irreplaceable, necessitating a continuous reliance on voluntary blood donors. Existing methodologies primarily address the challenges of blood storage and its logistical distribution among healthcare centers. These conventional strategies lean towards centralized systems, often compromising data transparency and accessibility. Notably, there remains a significant gap in incentivizing and raising awareness among potential and existing donors regarding the life-saving act of blood donation. Recognizing these challenges, we introduce a robust and innovative framework that harnesses the potential of Blockchain technology, coupled with the power of smart contracts. Furthermore, to foster a sustainable blood donation ecosystem, we advocate the shift from traditional paper-based recognition to digitized donor acknowledgment using Non-Fungible Tokens (NFTs). Our novel approach encapsulates four key areas: (a) Introduction of a supply chain oversight mechanism for blood and its derivatives through Blockchain and smart contracts; (b) Development of a digital certification system for blood donors utilizing NFTs; (c) Execution of our suggested framework via smart contracts, offering a tangible proof-of-concept; and (d) Assessment and implementation of the proof-of-concept across four prominent platforms: ERC721 (ETH's NFT), and the Ethereum Virtual Machine (EVM) employing the Solidity language – this encompasses the BNB Smart Chain, Fantom, Polygon, and Celo, aiming to discern the optimal platform compatible with our innovative framework.

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PDF

Paper 102: An Enhanced CoD System Leveraging Blockchain, Smart Contracts, and NFTs: A New Approach for Trustless Transactions

Abstract: The global transportation of goods has evolved in response to varied economic demands. The rapid progression of modern scientific and technological innovations offers a shift from traditional shipping paradigms. Current systems, whether domestic like Cash-on-Delivery (CoD) or international such as Letter-of-Credit, necessitate trust-building through an intermediary—be it a carrier or a financial institution. While these conventional systems provide certain benefits, they inherently present several challenges and potential vulnerabilities, affecting both sellers and buyers. The introduction of blockchain technology and smart contracts has been explored as a viable alternative to bypass these intermediaries. However, simply removing the shipping intermediary presents its own set of issues, particularly when disputes arise. Notably, the shipper remains unaffected in situations of contention. Consequently, some models are now incorporating the shipper's role, either as a singular entity or in collaboration with others. Yet, a considerable number of these models still depend on an external trusted party for conflict resolution. Our study introduces a unique framework, blending the robustness of blockchain, the enforceability of smart contracts, and the authenticity assurance of NFTs. This system creates a streamlined CoD operation encompassing the seller, shipper, and buyer, using NFTs to produce digital receipts, guaranteeing both proof-of-purchase and a security deposit. Furthermore, our system provides an inherent mechanism for dispute resolution. Key contributions of our work including i) The design of a novel CoD system anchored on blockchain and smart contract capabilities; ii) The incorporation of Ethereum-based NFT (specifically, ERC721) for securely logging package information; iii) The development of smart contracts that facilitate NFT generation and transfer between transactional entities; and iv) Performance evaluation and deployment of these contracts across multiple EVM-compatible platforms such as BNB Smartchain, Fantom, Celo, and Polygon, establishing the optimal environment for our innovative system.

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PDF

Paper 103: Recognition of Human Interactions in Still Images using AdaptiveDRNet with Multi-level Attention

Abstract: Human-Human Interaction Recognition (H2HIR) is a multidisciplinary field that combines computer vision, deep learning, and psychology. Its primary objective is to decode and understand the intricacies of human-human interactions. H2HIR holds significant importance across various domains as it enables machines to perceive, comprehend, and respond to human social behaviors, gestures, and communication patterns. This study aims to identify human-human interactions from just one frame, i.e. from an image. Diverging from the realm of video-based inter-action recognition, a well-established research domain that relies on the utilization of spatio-temporal information, the complexity of the task escalates significantly when dealing with still images due to the absence of these intrinsic spatio-temporal features. This research introduces a novel deep learning model called AdaptiveDRNet with Multi-level Attention to recognize Human-Human (H2H) interactions. Our proposed method demonstrates outstanding performance on the Human-Human Interaction Image dataset (H2HID), encompassing 4049 meticulously curated images representing fifteen distinct human interactions and on the publicly accessible HII and HIIv2 related benchmark datasets. Notably, our proposed model excels with a validation accuracy of 97.20% in the classification of human-human interaction images, surpassing the performance of EfficientNet, InceptionResNetV2, NASNet Mobile, ConvXNet, ResNet50, and VGG-16 models. H2H interaction recognition's significance lies in its capacity to enhance communication, improve decision-making, and ultimately contribute to the well-being and efficiency of individuals and society as a whole.

Author 1: Arnab Dey   Author 2: Samit Biswas

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PDF

Paper 104: Keyphrase Distance Analysis Technique from News Articles as a Feature for Keyphrase Extraction: An Unsupervised Approach

Abstract: Due to the rapid expansion of information and online sources, automatic keyphrase extraction remains an important and challenging problem in the field of current study. The use of keyphrases is extremely beneficial for many tasks, including information retrieval (IR) systems and natural language processing (NLP). It is essential to extract the features of those keyphrases for extracting the most significant keyphrases as well as summarizing the texts to the highest standard. In order to analyze the distance between keyphrases in news articles as a feature of keyphrases, this research proposed a region-

based unsupervised keyphrase distance analysis (KDA) technique. The proposed method is broken down into eight steps: gathering data, data preprocessing, data processing, searching keyphrases, distance calculation, averaging distance, curve plotting, and lastly, the curve fitting technique. The proposed approach begins by gathering two distinct datasets containing the news items, which are then used in the data preprocessing step, which makes use of a few preprocessing techniques. This preprocessed data is then employed in the data processing phase, where it is routed to the keyphrase searching, distance computation, and distance averaging phases. Finally, the curve fitting method is used after applying a curve plotting analysis. These two benchmark datasets are then used to evaluate and test the performance of the proposed approach. The proposed approach is then contrasted with different approaches to show how effective, advantageous, and significant it is. The results of the evaluation also proved that the proposed technique considerably improved the efficiency of keyphrase extraction techniques. It produces an F1-score value of 96.91% whereas its present keyphrases are 94.55%.

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PDF

Paper 105: Gamification in Physical Activity: State-of-the-Art

Abstract: Physical activity is decreasing globally, and more people are becoming sedentary, which is associated with numerous adverse health outcomes. To counter this trend, gamification emerges as a promising strategy for enhancing participation in physical activity interventions. The review investigates the influence of gamified systems on the promotion of physical activity and examines associated behavioral and psychological outcomes. The analysis incorporates empirical studies focused on adult participants, published in peer-reviewed English-language journals over the last five years. Several critical aspects are considered in the analysis, including specific types of physical activity targeted, employed gamification systems, involved motivational features, and behavioral and psychological outcomes, thus offering a state-of-the-art overview of gamification and physical activity. Findings confirm that gamification serves as an effective mechanism for promoting physical activity. To address gaps in existing research, recommendations for future work include broadening the range of metrics used for measuring physical activity and investigating the psychological benefits of gamification in physical activity interventions. Moreover, future research could benefit from leveraging addictive game design elements and utilizing artificial intelligence and computer vision models to monitor user progress and suggest appropriate challenges. In conclusion, the review outlines the considerable potential of gamification to positively affect participation in physical activity, highlighting the need for additional research to fully realize this potential.

Author 1: Majed Hariri   Author 2: Richard Stone

Paper 106: Investigate the Impact of Stemming on Mauritanian Dialect Classification using Machine Learning Techniques

Abstract: Despite the plethora and diversity of research on Natural Language Processing (NLP). As a technique allowing computers to understand, generate, and manipulate human language; It still remains insufficient, especially with regard to the processing of Arabic texts and their dialects which are widely used. The proposed approach focuses on the application of machine learning techniques taking into account evaluation criteria such as training to comments expressed in Mauritanian dialect, published on social media notably Facebook, and compares results generated by three algorithms which we applied such as the Random Forest (RF), Na¨ıve Bayes Multinominal (NBM), and Logistic Regression (LR) algorithm. Additionally, We then study the effect of machine learning techniques when different stemmers are combined with other features such as the tokenizers used to process the dataset. Although major challenges exist such as the morphology of Arabic is completely different from Latin letter languages, and there is no pre-existing dataset or dictionary to train the algorithms, the result we obtained after the experiments carried out on Weka shows that the RF and NBM algorithms are more efficient when applied with ArbicStemmerKhoja giving results respectively 96.37% and 71.40%; However, Logistic gets better performance results with Null Stemme is 81.65%. Results obtained by the three techniques applied with a light Arabic stemmer were more than 70%. This article presents a contribution to NLP based on Machine learning, descript also an important study that can determine the best Arabic classifier.

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Paper 107: Quantum Steganography: Hiding Secret Messages in Images using Quantum Circuits and SIFT

Abstract: In today's era of escalating digital threats and the growing need for safeguarding sensitive information, this research strives to advance the field of information concealment by introducing a pioneering steganography methodology. Our approach goes beyond the conventional boundaries of image security by seamlessly integrating classical image processing

techniques with the cutting-edge realm of quantum encoding. The foundation of our technique lies in the meticulous identification of distinctive features within the cover image, a crucial step achieved through the utilization of SIFT (Scale-Invariant Feature Transform). These identified key points are further organized into coherent clusters employing the K-means clustering algorithm, forming a structured basis for our covert communication process. The core innovation of this research resides in the transformation of the concealed message into a NEQR (Novel Enhanced Quantum Representation) code, a quantum encoding framework that leverages the power of quantum circuits. This transformative step ensures not only the secrecy but also the integrity of the hidden information, making it highly resistant to even the most sophisticated decryption attempts. The strategic placement of the quantum circuit representing the concealed message at the centroids of the clusters generated by the K-means algorithm conceals it within the cover image seamlessly. This fusion of classical image processing and quantum encoding results in an unprecedented level of security for the embedded information, rendering it virtually impervious to unauthorized access. Empirical findings from extensive experimentation affirm the robustness and efficacy of our proposed strategy.

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Keywords: Clustering; keypoints; k-means; cover image; quantum steganography

PDF

Paper 108: Development of Interactive Data Visualization System in Three-Dimensional Immersive Space

Abstract: Today's data-driven environments require innovative tools and methods to analyze and present data. The growth of data across many domains and remarkable technological advances have necessitated a shift from 2D data representations. The rapid growth in dataset scale, variety, and speed has revealed the limitations of conventional charts and graphs. Significant progress has been made in the domain of interactive, three-dimensional data visualizations as a means to address this challenge. The integration of Virtual Reality (VR) and Augmented Reality (AR) technologies enables users to achieve a heightened level of immersion in a simulated environment, where data is transformed into physical and interactive creatures. Recent research in the domain of immersive analytics has provided evidence that virtual reality (VR) and augmented reality (AR) technologies possess the capacity to provide succinct multiple layouts, facilitate collaborative data exploration, enable immersive multiview maps, establish spatial environments, enhance spatial memory, and enable interactions in three dimensions. The primary aim of this research is to design and implement a sophisticated data visualization system that integrates the development of a data pipeline within the Unity 3D framework, with the specific goal of aggregating data. The resulting system will enable the presentation of data from CSV files within a three-dimensional immersive environment. The prospective ramifications of this development have the capacity to yield good effects in diverse domains, including E-commerce analysis, financial services, engineering technology, medical services, data analysis, and interactive data display, among others. The proposed system presents a methodical framework for the development of a 3D data visualization system that integrates virtual reality (VR) technologies,

Unity, and Python, with the aim of redefining the process of data exploration within a VR environment. This paper examines the integration of continuous testing methodologies within the context of Python API and virtual reality (VR) environments. It also allows for the creation of an interesting and immersive experience that meets user needs.

Author 1: Shah Murtaza Rashid Al Masud

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Author 4: Aloke Kumar Saha   Author 5: Rashik Rahman

PDF

Paper 109: Fine-Grained Differences-Similarities Enhancement Network for Multimodal Fake News Detection

Abstract: The use of social media has proliferated dramatically in recent years due to its increasing reach and ease of use. Along with this enlarged influence of social media platforms and the relative anonymity afforded to content contributors, an increasingly significant proportion of social media is composed of untruthful or "fake" news. Hence for various reasons of personal and national security, it is essential to be able to identify and eliminate fake news sources. The automated detection of fake news is complicated by the fact that most news posts on social media takes very diverse forms, including text, images, and videos. Most existing multimodal fake news detection models are structurally complex and not interpretable; the main reason for this is the difficulty of identifying essential features which characterize fake social media posts, leading to different models focusing on multiple different aspects of the news detection task. In this paper, we show that contrasting the different and similar (DS) features of social media posts serves as an important identifying marker for their authenticity, with the consequence that we only need to direct our attention to this aspect when designing a multimodal fake news detector. To address this challenge, we propose the Fine-Grained Differences-Similarities Enhancement Network (FG-DSEN), which improves detection with a simple and interpretable structure to enhance the DS aspect between images and text. Our proposed method was evaluated on two different language social media datasets, Weibo in Chinese and Twitter in English. It achieved accuracies 3% and 3.8% higher than other state-of-the-art methods, respectively.

Author 1: Xiaoyu Wu   Author 2: Shi Li

Author 3: Zhongyuan Lai   Author 4: Haifeng Song

Author 5: Chunfang Hu

PDF

Paper 110: Detecting and Unmasking AI-Generated Texts through Explainable Artificial Intelligence using Stylistic

Features

Abstract: In recent years, Artificial Intelligence (AI) has sig-nificantly transformed various aspects of human activities, including text composition. The advancements in AI technology have enabled computers to generate text that closely mimics human writing which is raising concerns about misinformation, identity theft, and security vulnerabilities. To address these challenges, understanding the underlying patterns of AI-generated text is essential. This research focuses on uncovering these patterns to establish ethical guidelines for distinguishing between AI-generated and human-generated text. This research contributes to the ongoing discourse on AI-generated content by elucidating methodologies for distinguishing between human and machine-generated text. The research delves into parameters such as syllable count, word length, sentence structure, functional word usage, and punctuation ratios to detect AI-generated text. Furthermore, the research integrates Explainable AI (xAI) techniques—LIME and SHAP—to enhance the interpretability of machine learning model predictions. The model demonstrated excellent efficacy, showing an accuracy of 93%.Leveraging xAI techniques, further uncovering that pivotal attributes such as Herdan's C, MaaS, and Simpson's Index played a dominant role in the classification process.

Author 1: Aditya Shah

Author 2: Prateek Ranka

Author 3: Urmi Dedhia

Author 4: Shruti Prasad

Author 5: Siddhi Muni

Author 6: Kiran Bhowmick

PDF

Paper 111: A Small Dummy Disrupting Database Reconstruction in a Cache Side-Channel Attack

Abstract: This paper demonstrates the feasibility of a database reconstruction attack on open-source database engines and presents a defense method against it. We launch a Flush+Reload attack on SQLite, which returns approximate, noisy volumes returned by range queries for a private database. Given the volumes, our database reconstruction uses two al-gorithms, a Modified Clique-Finding algorithm and Match-Extension algorithm, to recover the database. Experiments show that an attacker can reconstruct the victim's database with a size of 10,000 and a range of 12 with an error rate of up to 0.07% at most. To mitigate the attack, a small dummy data is added to the result volumes of range queries, which makes the approximation more confused. Experimental results show that by adding about 1% of dummy data, an attack success rate (in terms of the number of reconstructed volumes in the database) is reduced to 60% from 100% and an error rate increases to 15% from 0.07%. It is also observed that by adding about 2%of dummy data, the reconstruction is completely failed.

Author 1: Hyeonwoo Han

Author 2: Eun-Kyu Lee

Author 3: Junghee Jo

Paper 112: An Approach for Classification of Diseases on Leaves

Abstract: In recent years, significant advancements have been made in the realm of plant disease classification, with a particular focus on leveraging the capabilities of deep learning techniques. This study delves into the utilization of renowned Convolutional Neural Network (CNN) models, including EfficientNetB5, Mo-bileNet, ResNet50, InceptionV3, and VGG16, for the purpose of plant disease classification. The core methodology involves employing transfer learning, wherein these established CNN models are employed as a foundation and subsequently fine-tuned using a publicly accessible plant disease dataset. The study also compared the results with some deep learning models and with state-of-the-art. Among the tested CNNs, EfficientNetB5 has shown the best performance. EfficientNetB5 has outperformed another model and obtained 99.2% classification accuracy.

Author 1: Quy Thanh Lu

Paper 113: Transformer-based End-to-End Object Detection in Aerial Images

Abstract: Transformer models have achieved significant mile-stones in the field of Artificial Intelligence in recent years, primarily focusing on text processing and natural language processing. However, the application of these models in the domain of image processing, particularly on aerial images data, is actively research. This study concentrates on the experimental evaluation of Transformer-based models such as DETR, DAB-DETR, and DINO on the challenging Visdrone dataset, which is also essential for aerial image data processing. The experimental results indicate that Transformer-based models exhibit substantial potential, especially in object detection on aerial image data. Nevertheless, their application is not without challenges, including low resolution, dense object occurrences, and environmental noise. This work provides an initial glimpse into both the capabilities and limitations of Transformer-based approaches within this domain, with the aim of stimulating further development and optimization for practical applications, including traffic monitoring, environmental protection, and various other domains.

Author 1: Nguyen D. Vo   Author 2: Nguyen Le

Author 3: Giang Ngo   Author 4: Du Doan

Author 5: Do Le   Author 6: Khang Nguyen

Paper 114: The Impact of Text Generation Techniques on Neural Image Captioning: An Empirical Study

Abstract: Image captioning is an advanced NLP task that has various practical applications. To meet the requirement of visual information understanding and textual information generation, the encoder-decoder framework has been widely adopted by image captioning models. In this context, the encoder is responsible for transforming an image into vector representation, and the decoder acts as a text generator for yielding an image caption. It is obvious and intuitive that the decoder is crucial for the entire image captioning model. However, there is a lack of comprehensive studies in which the impact of various aspects of the decoder on the image captioning is investigated. To advance the understanding of the impacts of text generation techniques employed by the decoder, we conduct an extensive empirical analysis of three types of language models, two types of decoding strategies and two types of training methods, based on four state-of-the-art image captioning models. Our experimental results demonstrate that the language model affects the performance of image captioning models, while different language models may benefit different image captioning models. In addition, it is also revealed that among the decoding and training strategies under investigation, the beam search, AOA mechanism and the reinforcement learning based training method can generally improve the performance of image captioning models. Moreover, the results also show that the combinational usage of these strategies always outperforms the use of single strategy for the task of image captioning.

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Author 3: Liming Nie   Author 4: Zuzhang Qing

Author 5: Zuohua Ding

Paper 115: Optimizing the Production of Valuable Metabolites using a Hybrid of Constraint-based Model and Machine Learning Algorithms: A Review

Abstract: The advances in genome sequencing and metabolic engineering have allowed the reengineering of the cellular function of an organism. Furthermore, given the abundance of omics data, data collection has increased considerably, thus shifting the perspective of molecular biology. Therefore, researchers have recently used artificial intelligence and machine learning tools to simulate and improve the reconstruction and analysis by identifying meaningful features from the large multiomics dataset. This review paper summarizes research on the hybrid of constraint-based models and machine learning algorithms in optimizing valuable metabolites. The research articles published between 2020 and 2023 on machine learning and constraint-based modeling have been collected, synthesized, and analyzed. The articles are obtained from the Web of Science and Scopus databases using the keywords: "Machine learning", "flux balance analysis", and "metabolic engineering". At the end of the search, this review contained 13 records. This review paper aims to provide current trends and approaches in in silico

metabolic engineering while providing research directions by highlighting the research gaps. In addition, we have discussed the methodology for integrating machine learning and constraint-based modeling approaches.

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Author 3: Suhaila Zainudin   Author 4: Chan Weng Howe

PDF

Paper 116: Wrapper-based Modified Binary Particle Swarm Optimization for Dimensionality Reduction in Big Gene Expression Data Analytics

Abstract: Gene expression data has emerged as a crucial aspect of big data in genomics. The advent of high-throughput technologies such as microarrays and next-generation sequencing has enabled the generation of extensive gene expression data. These datasets are characterized by their complexity, fast data generation, diversity, and high dimensionality. Analyzing high dimensional gene expression data offers both challenges and opportunities. Computational intelligence and deep learning techniques have been employed to extract meaningful information from these enormous datasets. However, the challenges related to preprocessing, reducing dimensionality, and normalization continue to exist. This study explored the effectiveness of the Wrapper-based Modified Particle Swarm Optimization (WMBPSO) algorithm in reducing dimensionality of big gene expression data for Alzheimer's disease (AD) prediction, using the GSE33000 dataset. The reduced dataset was then used as input to a CNN-LSTM model for prediction. The WMBPSO method identified 4303 genes out of a total of 39280 genes as being relevant for AD. These genes were selected based on their discriminatory power and potential contribution to the classification task, achieving an accuracy score of 0.98. The performance of the CNN-LSTM model is evaluated using these selected genes, and the results were highly promising. The results of our analysis are 0.968 for mean cross-validation accuracy, 0.995 for AUC, and 0.967 for recall, precision, and F1 score. Importantly, our approach outperforms conventional feature selection methods and alternative machine and deep learning algorithms. By addressing the critical challenge of dimensionality reduction in gene expression data, our study contributes to advancing the field of AD prediction and under-scores the potential for improved diagnosis and patient care.

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PDF

Paper 117: Development of YOLO-based Model for Fall Detection in IoT Smart Home Applications

Abstract: In smart home applications, effective fall detection is a critical concern to minimize the occurrence of falls leading to injuries, especially for the assistance of elderly individuals. Various methods have been proposed, including both vision-based and non-vision-based approaches. Among these, vision-based approaches have garnered significant attention from researchers due to their practicality and applicability. However, existing vision-based methods face challenges such as low accuracy rates and high computational costs, which still need further exploration to enhance fall detection effectiveness. This study aims to develop a vision-based fall detection system tailored for smart home care applications. The objective of this study is to develop an accurate and lightweight fall detection method that is applicable in IoT platforms. A You Only Look Once (YOLO) based network is trained and tested to identify human falls accurately. The experimental results demonstrate that the developed YOLO-based technique shows promising outcomes for human fall detection and holds potential for integration in the Internet of Things (IoT) enabled smart home applications.

Author 1: Pengcheng Gao

Keywords: Smart home; IoT; elderly care; computer vision; deep learning; YOLO

PDF

Paper 118: Identification of the False Data Injection Cyberattacks on the Internet of Things by using Deep Learning

Abstract: With the expanding utilization of cyber-physical structures and communication networks, cyberattacks have become a serious threat in various networks, including the Internet of Things (IoT) sensors. The state estimation algorithms play an important role in defining the present operational scenario of the IoT sensors. The attack of the false data injection (FDI) is the earnest menace for these estimation strategies (adopted by the operators of the IoT sensor) with the injection of the wicked data into the earned mensuration. The real-time recognition of this group of attacks increases the network resilience while it ensures secure network operation. This paper presents a new method for real-time FDI attack detection that uses a state prediction method basis on deep learning along with a new officiousness identification approach with the use of the matrix of the error covariance. The architecture of the presented method, along with its optimal group of meta-parameters, shows a real-time, scalable, effective state prediction method along with a minimal error border. The earned results display that the proposed method performs better than some recent literature about the prediction of the remaining useful life (RUL) with the use of the C-MAPSS dataset. In the following, two types of attacks of the false data injection are modeled, and then, their effectiveness is evaluated by using the proposed method. The earned results show that the attacks of the FDI, even on the low number of the sensors of the IoT, can severely disrupt the prediction of the RUL in all instances. In addition, our proposed model outperforms the FDI attack in terms of accuracy and flexibility.

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Author 3: Xin Liu

Keywords: Cyberattacks; false data injection (FDI) attacks; internet of things (IoT); deep learning

Paper 119: Automated Fruit Grading in Precise Agriculture using You Only Look Once Algorithm

Abstract: In the realm of precision agriculture, the automated grading of fruits stands as a critical endeavor, serving to maintain consistent quality assessment and streamline the sorting process. Traditional methods based on computer vision and deep learning techniques have both been explored extensively in the context of fruit grading, with the latter gaining prominence due to its superior performance. However, the existing research landscape in the domain of deep learning-based fruit grading confronts a compelling challenge: striking a balance between accuracy and computational cost. This challenge has been consistently noted through an extensive analysis of prior studies. In response, this study introduces an innovative approach built upon the YOLOv5 algorithm. This methodology encompasses the creation of a bespoke dataset and the division of data into training, validation, and testing sets, facilitating the training of a robust and computationally efficient model. The findings of the experiments and the subsequent performance evaluation underscore the effectiveness of the proposed method. This approach yields significant improvements in both accuracy and computational efficiency, thus addressing the ongoing challenge in deep learning-based fruit grading. Therefore, this study contributes valuable insights into the field of automated fruit grading, offering a promising solution to the trade-off between accuracy and computational cost while demonstrating the practical viability of the YOLOv5-based approach.

Author 1: Weiwei Zhang

Keywords: Precise agriculture; automated fruit grading; deep learning; computer vision; Yolov5

Paper 120: Image Stitching Method and Implementation for Immersive 3D Ink Element Animation Production

Abstract: As the growth of immersive 3D animation, its application in ink element animation is constantly updating and advancing. However, the current immersive 3D ink element animation production also has the problem of lack of innovation and repeated development, so the research innovatively designs and develops the image stitching method for immersive 3D ink element animation production. The method is designed through stereo matching algorithm and scale-invariant feature transform algorithm, and the stereo matching algorithm is optimized with the weighted median filtering method based on the guide map. In addition, the study also designs the specific implementation of this method from different functional modules. The experimental results show that on four different datasets, the error percentages of the optimized stereo matching algorithm in non-occluded areas are 0.3885%, 0.4743%, 1.6848%, and 1.34%, respectively. The error percentages of all areas are 0.8316%, 0.8253%, 4.3235%, and 4.1760%, respectively. The research and design of image stitching methods can be applied in other fields and has good practical significance.

Author 1: Chen Yang   Author 2: Siti SalmiJamali

Author 3: Adzira Husain   Author 4: Nianyou Zhu

Author 5: Jian Wen

PDF

Paper 121: AI Animation Character Behavior Modeling and Action Recognition in Virtual Studio

Abstract: With the advancement of virtual broadcasting technology, the use of artificial intelligence animated characters in virtual scenes is becoming increasingly widespread. However, there are still a series of challenges and limitations to make the behavior of animated characters more natural, intelligent, and diverse. Therefore, this study proposes a behavior tree based animation character behavior modeling and a short-term memory action recognition method combining human geometric features. The research results indicate that when the behavior modeling model faces different obstacles, the successful avoidance rate is over 80%, and the avoidance reaction time is 0.41s-0.65s. The accuracy and loss function values of the action recognition method gradually converge to 1 and 0 with the quantity of iterations grows. For the recognition of seven types of actions, the accuracy of raising the left hand, raising the right hand, waving the left hand, and waving the right hand reaches 100%, and the recall rate of raising the right hand is 100%. The majority of action types have F-value scores above 0.9. Relative to the recurrent neural network model, the accuracy of the double-layer long-term and short-term memory model is 95.8%, which is significantly better than the former's 86.3%, showing better recognition performance. In summary, modeling and identifying the behavior of artificial intelligence animated characters can make the characters in virtual broadcasting more intelligent, natural, and realistic, thereby improving the viewing experience of virtual broadcasting, which has important practical value and research significance. This has significant practical and research value, providing insightful references for related fields.

Author 1: Yaoyao Xu

PDF

Paper 122: An Integrated, Bidirectional Pronunciation, Morphology, and Diacritics Finite-State System

Abstract: A bidirectional phonetizer, morphologizer, and diacritizer pipeline (FSPMD) for modern standard Arabic (MSA) that integrated pronunciation, concatenative and templatic morphology, and diacritization were developed. Grammar and segmental phonology rules were applied in the forward direction to ensure the order of the proper rules, which were supplemented with special backward direction rules. The FSPMD comprises bidirectional finite-state transducers (FSTs) consisting of an ordered composition of FSTs, unordered parallel FSTs, unioned FSTs, and for validity, finite-state acceptors. The FSPMD has unique, innovative features and can be used as an integrated pipeline or standalone phonetizer (FSAP), morphologizer (FSAM), or diacritizer

(FSAD). As the system is bidirectional, it can be used in forward (generation, synthesis) and backward (analysis, decomposition) directions and can be integrated into systems such as automatic speech recognition (ASR) and language learning tools. The FSPMD is rule-based and avoids stem listings for morphology or pronunciation dictionaries, which makes it scalable and generalizable to similar languages. The FSPMD models authentic rules, including fine granularity and nuances, such as rewrite and morphophonemic rules, subcategory identification and utilization, such as irregular verbs. FSAP performance regarding text from the Tashkeela corpus and Wikipedia demonstrated that the pronunciation system can accurately pronounce all text and words, with the only errors related to foreign words and misspellings, which were out of the system's scope. FSAM and FSAD coverage and accuracy were evaluated using the Tashkeela corpus and a gold standard derived from its intersection with the UD_PADT treebank. The coverage of extraction of root and properties from words is 82%. Accuracy results are roots computed from a word (92%), words generated from a root (100%), non-root properties (97%), and diacritization (84%). FSAM non-root results matched and/or surpassed those from MADAMIRA; however, root result comparisons were not conducted because of the concatenative nature of publicly available morphologizers.

Author 1: Maha Alkhairy   Author 2: Afshan Jafri

Author 3: Adam Cooper

Keywords: Computational linguistics; phonology; morphology; modern standard Arabic; diacritization; text-to-speech; language learning tools

PDF

Paper 123: Applications of Artificial Intelligence for Information Diffusion Prediction: Regression-based Key Features Models

Abstract: Information diffusion prediction is essential in marketing, advertising, and public health. Public health officials may avoid disease outbreaks, and businesses can optimize marketing campaigns and target audiences. Information diffusion prediction helps identify influential nodes in social networks, enabling targeted interventions to spread positive messages or counter misinformation. Organizations can make informed decisions and improve society by analyzing information propagation patterns. This research study investigates the prediction of information diffusion on social media platforms using a diverse set of features and advanced machine learning and deep learning models. We explore the impact of network structure, early retweet dynamics, and tweet content on social media, provided by the publicly available dataset Weibo, a social network like Twitter. By applying the training of the models on set of features separately, we observed different performances. The Random Forest model using all features achieved an R-squared of 76.690%. The Random Forest (RF) model focusing on the following network structure achieved an R-squared of 90.773%. The RF model analyzing the retweeting network structure achieved an R-squared of 98.161%.

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Text Simplification using Hybrid Semantic Compression and Support Vector Machine for Troll Threat Sentences

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Abstract—Text Simplification (TS) is an emerging field in Natural Language Processing (NLP) that aims to make complex text more accessible. However, there is limited research on TS in the Malay language, known as Bahasa Malaysia, which is widely spoken in Southeast Asia. The challenges in this domain revolve around data availability, feature engineering, and the suitability of methods for text simplification. Previous studies predominantly employed single methods such as semantic compression, or machine learning with the Support Vector Machine (SVM) classifier consistently achieving an accuracy of approximately 70% in identifying troll sentences—statements containing threats from online trolls notorious for their disruptive online behavior. This study combines semantic compression and machine learning methods across lexical, syntactic, and semantic levels, utilizing frequency dictionaries as semantic features. Support Vector Machine and Decision Tree classifiers are applied and tested on 6,836 datasets, divided into training and testing sets. When comparing SVM and Decision Tree with and without semantic features, SVM with semantics achieves an average accuracy of 92.37%, while Decision Tree with semantics reaches 91.21%. The proposed TS method is evaluated on troll sentences, which are often associated with cyberbullying. Furthermore, it is worth noting that cyberbullying has been reported to be a significant issue, with Malaysia ranking as the second worst out of the 28 countries surveyed in Asia. Therefore, the outcomes of the study could potentially offer means, such as machine translation and relation extraction, to help prevent cyberbullying in Malaysia.

Keywords—Text simplification; semantic compression; machine learning; natural language processing; cyber bullying

I. INTRODUCTION

Natural Language Processing (NLP) represents a branch of artificial intelligence dedicated to enabling both machines and humans to comprehend, interpret, and deduce significance from human languages [1]. In the contemporary landscape, NLP encounters its most noteworthy challenges in the complexity of human communication. The process of deciphering and manipulating language is highly intricate, hence the common practice of employing diverse techniques to address a multitude of challenges.

This area of research encompasses numerous expanding and valuable applications. Natural Language Processing (NLP) encompasses a wide spectrum of tasks, ranging from straightforward ones like spell checking, keyword search, synonym identification, data extraction, classification, summarization, and text simplification, to more complex tasks like machine translation. In the future, NLP holds the potential to revolutionize task assistance. In this chapter, we will delve into past research related to a specific NLP task—text simplification.

Text simplification involves the transformation of a sentence into one or more straightforward sentences, making it more understandable for both machines and humans while preserving the original context and content. Additionally, text simplification serves as a valuable application that can improve various Natural Language Processing (NLP) tasks. Study by [2] highlights that text simplification tasks encompass several operations, including theoretical simplification to streamline content and structure, elaborate modification to clarify key points, and text summarization to remove peripheral or irrelevant information. The primary goal of text simplification is to enhance the accessibility of information for individuals with disabilities [3-4], those with low literacy levels [5-6], and non-native speakers [7].

In the Malay language, the exploration of text simplification is a relatively new area of study. Recent years have witnessed extensive research in Malay language studies, particularly in the domains of text summarization and sentence compression [8-11]. Researchers have been keen on enhancing the quality and cohesiveness of generated summaries. Sentence compression, a technique that involves eliminating non-essential details while preserving sentence grammar patterns, has garnered significant attention. This process identifies and removes frequently occurring sequences of adjacent words across a collection of documents, resulting in heuristic knowledge for sentence compression with an 85% confidence value [8].

Study by [8] primarily focuses on the Frequent Pattern growth tree, which stores compressed and critical information related to frequent patterns in large databases. However, it's worth noting that this study of text summarization does not encompass semantic compression, potentially leading to issues of ambiguity. Existing literature suggests that Malay language studies primarily concentrate on text summarization, specifically sentence compression, without delving into semantic comprehension. Fig. 1 illustrates the distinction between text simplification and text summarization.

Example sentence:
Google began in January 1996, as a research project by Larry Page, who was soon joined by Sergey Brin, when were both PhD students at Stanford University in California.
text simplification:
Google **was started** in January 1996, as a research project by Larry Page, who was soon joined by **and** Sergey Brin, when were both **two** PhD students at Stanford University in California, **USA**.
text summarization:
Google began in January 1996, as a research project by Larry Page, who was soon joined by Sergey Brin, when were both PhD students at Stanford University in California.

Fig. 1.   Text simplification versus text summarization [31].

In Text Simplification (TS), information extraction stands as a pivotal phase. The primary output of the information extraction process is the Syntax Tree, which illustrates the sentence's structure [12]. However, the syntax tree can become ambiguous when a sentence adheres to multiple grammar rules. To address this issue, machine learning techniques are commonly employed. These methods encompass Support Vector Machine (SVM) (e.g., [13-14]), Maximum Entropy (e.g., [15]), Decision Tree (DT) (e.g., [16]), and Conditional Random Field (e.g., [17]).

Among these techniques, the Support Vector Machine (SVM) has been recognized as the most effective classifier for text simplification, achieving an accuracy of approximately 70% [18]. It is important to note that studies employing SVM for text simplification have predominantly concentrated on the English language. In contrast, there is a lack of research on text simplification in the Malay language.

Furthermore, within the domain of Text Simplification, the primary objective is to condense a given sentence. This task necessitates a process of comprehending the inherent meaning of the sentence, commonly referred to as semantic compression.

In many text simplification approaches, a singular method is typically employed, whether it's a machine learning method or semantic compression. Studies solely focused on machine learning methods tend to overlook the significance of sentence structure properties crucial for semantic interpretation. Conversely, research exclusively centered on semantic compression may encounter challenges in predicting syntax trees, leading to potential ambiguity problems. Therefore, there is a growing recognition of the necessity to combine machine learning methods and semantic compression. In this hybrid approach, machine learning is applied to identify ambiguous sentence structures, while semantic compression is employed to simplify sentences based on relevant semantic content.

Troll is a prime example necessitating text simplification, as it often comprises sentences laden with concealed meanings. Originally, trolling involved the use of deceptive posts as bait to elicit responses from other online community members, often luring them into engaging with a fabricated story. Trolling encompasses various forms, and the term "trolling" has been broadly applied to describe various malicious or harassing activities on the internet. These activities may include instigating contentious discussions, targeting individuals or groups with harassment, sharing offensive content, vandalizing community-contributed pages, defacing memorial pages, and even being used interchangeably with cyberbullying. As a result, this study focuses on trolls associated with cyberbullying as the domain for testing a proposed text simplification method.

The motivation by engaging in TS research in a minority language offers the opportunity to develop language-specific techniques and tools, enriching the broader NLP field while deepening insights into the unique linguistic features and challenges of that language. This paper introduces a hybrid approach for text simplification in the Malay language. The model effectively distinguishes between complex and non-complex words, offering a potential solution to combat cyberbullying in Malaysia through means like machine translation and relation extraction. The key steps involve developing text simplification features that emphasize semantic aspects. Additionally, lexical features, including stemmed words, are incorporated into the study. Subsequently, hand-crafted features encompassing lexical, syntactic, and semantic attributes are organized and classified using machine learning techniques to attain the highest accuracy results.

II.   RELATED WORKS

The NLP components employed in TS encompass five levels: lexical, syntactic, semantic, discourse, and pragmatic. According to [19], the TS process primarily involves the lexical and syntactic levels. However, it's worth noting that semantic considerations play a crucial role in both the lexical and syntactic approaches to ensure the preservation of word and sentence meanings.

The lexical level, referred to as lexical simplification (LS), concentrates on replacing complex words with simpler synonyms. For instance, it involves substituting "facile" with "easy." Previous research in psycholinguistics has shown that such substitutions of complex terms within a sentence, as done by comprehensive lexical simplification, have significant potential to enhance sentence readability [20]. LS involves altering the intricate or unusual phrasing within a sentence by replacing it with a synonymous word that is more straightforward and comprehensible [21].

In the realm of syntactic simplification, it encompasses distinct elements like idiomatic phrases, apposition, coordination, subordination, and voice. Study by [22] employ the typed dependency representations provided by the Stanford Parser. They argue that these formatted dependencies offer a high level of precision, facilitating the creation of straightforward standards and the automation of corporate acquisition processes.

Recent research demonstrates that the semantic approach has been applied in text simplification tasks, as evidenced by studies such as [22-27]. Study by [28] also highlights that

semantic compression can serve as a valuable technique for intelligently generalizing terms while minimizing information loss. To address structural mismatches, study by [29] suggests employing semantic parsing to rephrase sentences.

There are various approaches employed for text simplification (TS) tasks. Recent research has shown a growing interest in hybrid approaches that integrate multiple techniques for simplification such as deep semantic and monolingual machine translation have been combined in the hybrid approach, as demonstrated by [30], structural semantics and neural methods are another focus in recent studies, exemplified by [27], hybrid approaches may involve a combination of hand-crafted transformation rules, machine learning (ML) techniques, and semantic parsers, as explored by [31], these hybrid approaches often merge natural language processing (NLP) components with machine learning techniques. The research conducted by [20] advocate for the use of Machine Learning (ML) techniques as a means to achieve more reliable solutions in text simplification. These hybrid methods represent a multifaceted approach to text simplification, leveraging various techniques to enhance the quality and effectiveness of simplification processes.

As a relatively new language within the field of text simplification, a more comprehensive investigation of each feature is essential to achieve higher accuracy. The study in [32] involved the utilization of all relevant features, with a subsequent comparison of results to identify the most effective features for future use. Thus, the primary objective of this study is to combine the strengths of semantic compression and machine learning methods through hybridization. This approach aims to leverage the benefits of both techniques to enhance the practice of text simplification.

III. METHODOLOGY

The research methodology of the study can be segmented into five distinct phases: a literature review phase, a phase dedicated to defining data sets and specifications, a phase focused on designing text simplification features for the TS model, a phase involving the construction of the TS model based on SVM classifier and selected features, and finally, a phase dedicated to performance evaluation.

A. Datasets

In this study, the primary data sources include news articles, online resources, and existing datasets for the Malay language. Additionally, a corpus from previous studies, including [33-36], covering Parts of Speech (POS) and Noun Phrases, was used to create the Malay Text Simplification Dataset (Malay TS Dataset) with 6,836 instances categorized as complex or non-complex.

The work begins by utilizing the state-of-the-art corpus developed by [34], known as the Malay corpus. This corpus comprises 18,387 tokens, each of which is accompanied by word category information and is written using the Rumi script. It includes 21 word categories for part-of-speech (POS) tagging, following the standard provided by the Dewan Bahasa dan Pustaka (DBP). You can find the Malay part-of-speech tagset within the corpus in Table I.

TABLE I. PART-OF-SPEECH DBP TAGSET IN MALAY CORPUS [34]

Tag Set	Description	Example in Malay language with English gloss	Number of tokens
KN	Noun	chair (*kerusi*)	6108
KK	Verb	eat (*makan*)	2539
ADJ	Adjective	black, beautiful, deep (*hitam, cantik, dalam*)	1623
KSN	Preposition	at, to, from, to (*di,ke, dari, kepada*)	1409
KB	Auxiliary verb	will, not yet, can (*akan, belum, boleh*)	390
KG	Pronoun	me, you (*saya, awak*)	496
KH	Conjunction	which, and, or (*yang, dan, atau*)	1608
ADV	Adverb	perhaps (*bahasawanya, barangkali*)	817
KT	Question	what, how much (*apa, berapa*)	49
KBIL	Cardinal	one, two (*satu, dua*)	258
KPM	Narrator	is (*adalah, ialah*)	100
KP	Command	don't, please (*jangan, sila*)	5
KAR	Direction	in, up, down (*dalam, atas, bawah*)	48
PW	Discourse mark	even, then (*hatta, maka*)	9
KEP	Short form	*UNCR, PBB*	179
#E	Clitic *lah*	try it (*cubalah*)	31
KN@	Clitic *nya*	His/her book (*Bukunya*)	235
KNF	Deny	No, it's not (*tidak, bukan*)	171
KNK	Proper noun	*Allah, Muhammad*	236
SEN	List number	*(i), (ii), (iii), etc*	3
SYM	Any symbol or punctuations	*. , " - + etc*	2073

The study in [37] established a process for identifying complex words in three languages. This study follows the same process developed by Yimam, known as Complex Word Identification (CWI). In this process, a survey was conducted using 10 TS control samples and 10 TS non-control samples from the Malay corpus. For instance, the study focuses on TS users, who are non-native speakers. Therefore, 10 non-native speakers of the language were selected as a control sample, along with 10 native speakers. Native speakers are individuals who learned their first language in childhood, often referred to as their mother tongue [38]. Non-natives are individuals who learned a different language as their first language in childhood. Respondents were provided with texts from the Malay corpus and asked to annotate each word based on its complexity.

The results of the answers provided by the 10 native speakers and the 10 non-native speakers will determine whether a word is classified as complex or not. The label assigned to the target word is based on the responses of these 10 native and 10 non-native speakers. If at least one annotator marks the word as complex, the label will be "COMPLEX" (1); otherwise, it will be "NOT COMPLEX" (0).

Afterward, data cleaning is an integral part of this study, which involves removing punctuation and converting all letters to lowercase. This is done to address data sparsity within the dataset. The dataset comprises original sentences, target word indices, counts of annotations by native and non-native speakers for the sentences, counts of markings by native and non-native speakers for the target words, and binary and classification labels for the target words. Subsequently, a dataset consisting of 6,836 instances with labels indicating complexity or non-complexity is created. The detailed description of the Malay TS Dataset, including complexity information after data cleaning, is provided in Table II.

TABLE II.   PART-OF-SPEECH DBP TAGSET IN MALAY TS DATASET WITH THE COMPLEX INFORMATION

Tag Set	Description	Number of tokens	Complex word	Non-complex word
KN	Noun	2459	299	2160
KK	Verb	1103	88	1015
ADJ	Adjective	687	82	605
KSN	Preposition	591	3	588
KB	Auxiliary verb	136	1	135
KG	Pronoun	210	6	204
KH	Conjunction	735	14	721
ADV	Adverb	332	12	320
KT	Question	22	2	20
KBIL	Cardinal	112	2	110
KPM	Narrator	*None*	*None*	*None*
KP	Command	*None*	*None*	*None*
KAR	Direction	*None*	*None*	*None*
PW	Discourse mark	*None*	*None*	*None*
KEP	Short form	6	6	0
#E	Clitic *lah*	1	1	0
KN@	Clitic *nya*	10	10	0
KNF	Deny	*None*	*None*	*None*
KNK	Proper noun	3	3	0
SEN	List number	*None*	*None*	*None*
SYM	Any symbol or punctuations	*None*	*None*	*None*

B. Proposed Method

Generally, the method begins by importing the raw Malay text dataset. The proposed approach encompasses three stages before obtaining the output of text simplification. Initially, the raw Malay text Part-of-Speech (POS) dataset is converted into feature extractions. Two types of feature extractions are employed: semantic compression features and lexical features. Text compression is achieved by using a semantic network and information on term frequencies from a frequency

dictionary. Subsequently, lexical features are constructed based on Part-of-Speech (syntactic), vowels (lexical), characters (lexical), and syllables (lexical). Handcrafted features combine semantic compression and lexical features. Finally, machine learning classifiers, specifically Decision Tree (DT) and Support Vector Machines (SVM), are used to identify complexity patterns in the Malay language. This hybrid method is configured for these two machine learning classifiers using the frequency dictionary. Additionally, the study evaluates this method on previously unseen troll sentences. Fig. 2 illustrates the proposed method during this phase.
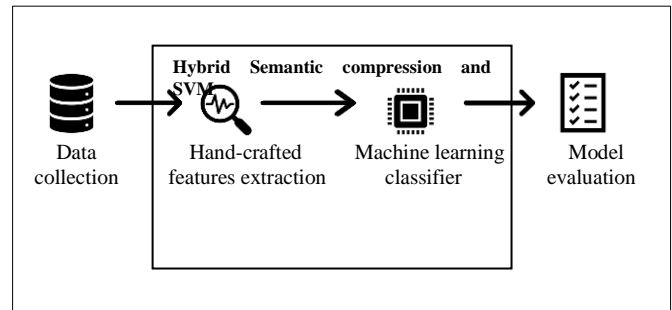
Fig. 2.   Proposed method.

This phase assessed the validity of the hypotheses derived from the literature review. It primarily involved the preparation and development of lexical, syntactic and semantic features based on the findings from the preceding step. The experimental aspect of this phase focused on extracting features related to factors like length, frequency, lexical, syntactic, and semantic characteristics. Additionally, base words in the Malay language were extracted and incorporated as features. The Part-of-Speech (POS) tags present in the Malay corpus were also employed as syntactic features. To align with semantic requirements, a frequency dictionary was generated. The lexical features, as presented in Table III, were ultimately adopted for this study. Subsequently, each feature in token form underwent a normalization process to facilitate the development of learning models based on Decision Trees (DT) and Support Vector Machine (SVM) classifiers.

TABLE III.   LEXICAL, SYNTACTIC AND SEMANTIC FEATURES IN MALAY TS DATASET

Type	Features	Abbreviation
Lexical	Number of syllables	SYL
	Length of word	CHAR
	Base word	STEM
	Frequency of word	FREQ
	Number of token (not stem)	VOW
	Number of token (after stem)	Vow
Syntactic	Part-of-speech Tagging	POS
Semantic	Frequency dictionary	DF

Algorithm 1 outlines the features for constructing the Malay TS method for the Malay language.

Algorithm 1: Malay TS method
1: Input: text T, word_feature W, gaps G, discard_empty D, flags F
2: read T sequence,
read word_feature W,
feature_type1: Syllable feature,
feature_type2: Character feature,
feature_type3: Stem feature,
feature_type4: Frequency feature,
feature_type5: Part-of-Speech tag feature,
feature_type6: Vowel feature,
feature_type7: Frequency distribution feature,
read gaps G, read discard_empty D, read flags F,
3: If feature_type3 exists in T sequence
4: Enhance with the modification rules and steps
5:   If not
6:      Continue to machine learning algorithms (SVM, DT)
7:   Fit to gaps G, discard_empty D, flags F

As a result of the above works, two classifiers were utilized, specifically the SVM and DT classifiers. The experiment is partitioned into two segments: one that takes semantic features into account and one that does not take semantic features. Data was divided using k-fold cross-validation (k=10), and subsequently, the average outcomes are computed. These results will be analyzed and discussed in the Experiment and Results section.

C. Performance Evaluation

In the domain of machine learning, particularly in the context of statistical classification, a confusion matrix, alternatively referred to as an error matrix, is a structured table format that provides a means to visually assess the effectiveness of an algorithm, often in the context of supervised learning. Fig. 3 illustrates the configuration of the confusion matrix. Its primary purpose is to evaluate the performance of a classification algorithm. In this study, four metrics were employed: accuracy, precision, recall, and F1-measures, to gauge the performance of the classification algorithm.

Fig. 3. Confusion matrix.

IV. EXPERIMENTS AND RESULTS

The hybrid method proposed in this study was employed on a dataset comprising 6,836 instances. This original dataset encompasses lexical details, syntactic information, sentences, base words, and semantic information, as illustrated in Table IV.

TABLE IV. FEATURE ENGINEERING FOR MALAY TS DATASET

POS	CHAR	VOL	SYL	Sentence	STEM	DF	Vow	Binary	Class
1	4	2	2	Asid Alfa Li	asid	4	2	1	Complex
1	4	2	2	Asid Alfa Li	alfa	3	2	1	Complex
1	6	3	3	Asid Alfa Li	lipoik	3	3	1	Complex
1	7	3	3	Asid Alfa Li	manfaat	3	3	1	Complex
2	5	2	2	Asid Alfa Li	untuk	73	2	0	Not complex
1	5	2	2	Asid Alfa Li	saraf	13	2	0	Complex
3	4	2	2	Saya menga	saya	9	2	1	Complex

Subsequently, a frequency dictionary and vowel characteristics dictionary are constructed for base words, contributing to the generation of semantic features. The frequency dictionary tallies the occurrences of base words within the corpus, while the vowel characteristics dictionary calculates the count of vowels in each base word. The POS features encompass a set of 31 labels, including nouns, prepositions, pronouns, verbs, denies, and more, as shown in Table V. The stem feature is then removed from the final dataset, leaving the DF (frequency dictionary) and Vow (vowel characteristics) features as representations of the stem word, as illustrated in Table VI.

TABLE V. PART OF SPEECH FEATURES WITH 31 LABELS

Tagset	Labeling	Numbering
Noun	kn	1
Preposition	ksn	2
Pronoun	kg	3
Verb	kk	4
Deny	knf	5
Conjunction	kh	6
Adjective	adj	7
Adverb	adv	8
Question word	kt	9
Verb with clitics -nya	kk@	10
Auxiliary verb	kb	11
Narrator	kpm	12
Short form	kep	13
Cardinal	kbil	14
Proper noun	knk	15
Noun with clitic -lah	kn#	16
Adjective with clitics -nya	adj@	17
Adverb with clitics -nya	adv@	18
Pronoun with clitics -lah	kg#	19
Noun with clitics -nya	kn@	20
Verb with clitics -lah	kk#	21

Tagset	Labeling	Numbering
Direction	kar	22
Command	kp	23
List number	sen	24
Adjective with clitics -lah	adj#	25
Auxiliary verb with clitics -lah	kb#	26
Adverb with clitics -lah	adv#	27
Pronoun with clitics -nya	kg@	28
Explanation word	kkt	29
Deny with clitics -lah	knf#	30
Deny with clitics -nya	knf@	31

TABLE VI. FEATURE ENGINEERING FOR MALAY TS DATASET WITH SEMANTIC FEATURE

POS	CHAR	VOW	SYL	DF	Vow	Class
1	4	2	2	4	2	Complex
1	4	2	2	3	2	Complex
1	6	3	3	3	3	Complex
1	7	3	3	3	3	Complex
2	5	2	2	73	2	Not complex
1	5	2	2	13	2	Complex
3	4	2	2	9	2	Complex

In the realm of machine learning, data normalization is employed to reduce the impact of feature scales on model training. The preparation of data for machine learning in this study involves the utilization of numerical data, ensuring that our model converges to optimal weights and, ultimately, resulting in a more precise model. To achieve this, min-max normalization has been implemented. Regarding class labels, they are assigned values of 0 (indicating simplicity or non-complexity) or 1 (indicating complexity), as illustrated in Table VII. Subsequently, the dataset has been divided into training and testing sets using a 10-fold cross-validation approach, denoted as Tr:Te dataset.

TABLE VII. DATA AFTER NORMALIZATION PROCESS

	0	1	2	3	4	5	6
0	0.000	0.1667	0.250	0.086957	0.010714	0.33333	1.0
1	0.000	0.1667	0.250	0.086957	0.007143	0.33333	1.0
2	0.000	0.2778	0.375	0.130435	0.007143	0.50000	1.0
3	0.000	0.3333	0.375	0.130435	0.007143	0.50000	1.0
4	0.033	0.2222	0.250	0.086957	0.257143	0.33333	0.0

The learning process is subsequently executed using DT and SVM classifiers. To ensure a robust evaluation, the dataset has been split into an 80% training set and a 20% testing set, denoted as 80Tra:20Test. For the SVM classifier, the RBF kernel and class weighting have been applied, particularly beneficial for handling imbalanced datasets. Following the completion of the experiment table containing

semantic features, the most effective classifier was determined. This optimal classifier is then saved as a "pickle" file, enabling it to be used for testing new data. In the context of this study, the aim is to classify troll data as either complex or non-complex.

After completing the feature engineering process, the training datasets undergo several performance evaluations. Two algorithms are employed to predict text simplification, distinguishing between complex and non-complex words. To ensure the suitability of the chosen model, a score test model is utilized. The algorithms in use are Decision Tree classifiers and Support Vector Machine (SVM). The modeling is implemented in a Jupyter notebook using Python code, and both datasets, one with semantic features and one without, are tested. The Decision Tree classifier achieves its highest accuracy of 92.98% when using semantic feature information. On the other hand, the SVM achieves its highest accuracy of 93.20% with or without the semantic feature information. This suggests that semantic features may or may not be necessary for the SVM classifier, but there is a significant difference for the Decision Tree classifiers.

The average accuracy of both classifiers indicates that SVM outperforms the DT classifier by a margin of 0.6%. Table VIII provides a performance comparison between the two classifiers, revealing that the frequency dictionary does not significantly impact the results. Both cases, with and without a frequency dictionary, yield similar accuracy levels. The presence or absence of the frequency dictionary doesn't result in a noticeable difference in average accuracy in this experiment.

However, when examining each production of the classifier model individually, the significance of semantic features in the training dataset becomes evident. Table IX and Table X present precision, recall, and F1-score for the best models of SVM and DT, respectively, highlighting the importance of semantic features in improving these metrics.

TABLE VIII. PERFORMANCE OF TWO CLASSIFIERS WITH TWO DIFFERENCE FEATURES

Data Split / ML classifier	Frequency distribution			
	With frequency distribution		*Without frequency distribution*	
	DT (%)	SVM (%)	DT (%)	SVM (%)
90Tr:10Te	**92.98**	92.40	92.69	92.40
80Tr:20Te	92.62	**93.20**	92.91	**93.20**
70Tr:30Te	91.96	92.30	91.61	92.30
60Tr:40Te	91.15	92.07	91.55	92.07
50Tr:50Te	90.46	92.22	91.72	92.22
40Tr:60Te	90.59	92.52	91.83	92.52
30Tr:70Te	90.76	92.35	91.98	92.35
20Tr:80Te	89.78	92.10	91.17	92.10
10Tr:90Te	90.56	92.17	90.44	92.17
Average	91.21	**92.37**	91.77	**92.37**

TABLE IX. SVM LEARNING MODEL

	Precision (%)	Recall (%)	F1-score (%)	Support
0	94	100	97	1279
1	50	3	6	89
accuracy			93	1368
macro avg	72	52	51	1368
weighted avg	91	93	91	1368
0	94	100	97	1279

TABLE X. DT LEARNING MODEL

	Precision (%)	Recall (%)	F1-score (%)	Support
0	94	98	96	632
1	58	27	37	52
accuracy			93	684
macro avg	76	63	67	684
weighted avg	92	93	92	684
0	94	98	96	632

The top-performing model from the Malay TS Dataset, as determined by the research conducted by [40], is utilized to categorize unannotated troll threat sentences. The research materials comprise vlogs, which are video content sourced from the YouTube platform. The study scrutinizes 30 videos recorded by Mat Luthfi between 2011 and 2014. This investigation delves into the use of sarcastic language in YouTube videos, utilizing modern technology as the primary medium of contemporary society. Sarcasm is the examination of employing irony to ridicule or express disdain. On the other hand, "trolling" refers to a predominantly indirect form of communication. The term "trolling" is widely used to describe various malicious or harassing activities on the internet, such as initiating inflammatory discussions, among others, as noted by [39]. To the best of the researcher's knowledge, there is no publicly accessible Malay language troll dataset, so the work by [40], which examines sarcasm, serves as a suitable substitute for a troll dataset.

Before classifying unannotated troll threat sentences as either complex or non-complex words, these sentences (unseen data) must undergo a feature extraction process. This study investigates three different types of sarcasm: Irony Sarcasm, Sarcastic Sarcasm, and Sinise Sarcasm. There are 173 instances in 11 scripts for Irony Sarcasm, 101 instances in seven scripts for Sarcastic Sarcasm, and 303 instances in 10 scripts for Sinise Sarcasm, totaling 578 instances used for testing the Malay TS model.

The initial step involves data cleaning, which includes removing punctuation, converting words to lowercase, and applying the stemming process. Subsequently, a Malay Part-of-Speech tagging system, developed based on the ID3 algorithm by [41], is employed. Table XI provides an overview of the unseen dataset and its preparation process.

TABLE XI. UNSEEN DATASET

INPUT	POS	CHAR	VOW	SYL	STEM	DF	Vow
Test	4	4	1	1	*test*	1	1
Ke	2	2	1	1	*ke*	1	1
Facebook	1	8	4	2	*facebook*	1	4
Dalam	2	5	2	2	*dalam*	2	2
hidup	4	5	2	2	*hidup*	1	2
aku	3	3	2	2	*aku*	3	2
tak	5	3	1	1	*tidak*	13	2
da	4	2	1	1	*ada*	8	2
sapa-sapa	9	9	4	4	*siapa*	1	3

Table XII displays the proportions of complex and non-complex sentences in the troll threat dataset. Language experts have thoroughly evaluated the test results on these troll threat sentences. Table XIII presents the marks assigned by expert analysts to each test data sample generated by the Malay TS model.

TABLE XII. PROPORTION OF COMPLEX AND NON-COMPLEX TROLL SENTENCE

Sarcasm types	Non-complex	Complex
Irony	151	22
Sarcastic	88	13
Sinise	284	19

TABLE XIII. EXPERT RESULT FOR TROLL SENTENCE BASED ON SVM

Test sample	Irony	Sarcastic	Sinise
Total token	173	101	303
Token wrongly label	22	13	19
Token correctly label	151	88	284
Accuracy (%)	87.28	87.13	93.73
Average accuracy (%)	**89.38**		

As indicated in Table XIII, the SVM model effectively recognizes only non-complex words. It encountered difficulties in identifying complex words within this unseen dataset, resulting in a low success rate for complex words. When testing with unseen data using SVM, it shows that there are no instances of Type II errors, but Type I errors are present. The SVM model struggles to predict the complex class in three separate unseen datasets.

According to Table XIV, the Decision Tree (DT) model demonstrates success in identifying both non-complex and complex words. However, it occasionally misclassifies words, leading to a lower accuracy percentage compared to the SVM model. Testing on the unseen data reveals the presence of both Type I and Type II errors in the predictions made by the DT model. Notably, the DT model can predict complex classes in the Sarcastic and Sinise datasets, although the number of accurate predictions in these cases is relatively small.

TABLE XIV.   EXPERT RESULT FOR TROLL SENTENCE BASED ON DT

Test sample	Irony	Sarcastic	Sinise
Total token	173	101	303
Token wrongly label	41	11	26
Token correctly label	132	90	277
Accuracy (%)	76.30	89.11	91.42
Average accuracy (%)	**85.61**		

V.   DISCUSSIONS

In this project, a novel dataset called the Malay TS Dataset has been introduced. Additionally, a new Malay TS method has been developed by integrating three levels of NLP components with ML classifiers. The proposed method combines lexical, syntactic, and semantic features with an SVM classifier. To assess the classifier model, a comparison has been made between SVM and DT classifiers, and the findings of this comparative study are presented.

Based on the readings, the SVM classifier exhibits the highest accuracy in identifying troll sentences. The experiment involved utilizing K-fold cross-validation to split the data. To assess the method's effectiveness, the outcomes of the proposed approach were compared with another classifier, specifically DT. The proposed approach demonstrates promising results with a robust classifier model. The findings indicate that the SVM classifier, utilizing an 80-20 split of training and test data, performs as the best classifier model. However, when applied to troll data, the developed SVM model struggles to predict complex words. In contrast, the DT model, while encountering fewer complex words, exhibits better performance in predicting them.

In this research, an automated Malay TS model has been successfully developed. A novel approach, referred to as the Hybrid Semantic Compression-SVM method, has been introduced. This method aims to identify complex words within text. The research utilizes a dataset extracted from the Malay corpus by [33], containing a total of 6,836 instances. Previous studies have typically employed these two methods independently, while this study seeks to combine them for enhanced accuracy. The primary objective of this research is to hybridize semantic compression and Support Vector Machine to enhance text simplification performance. This overarching goal is complemented by three sub-objectives. Firstly, the creation of a Malay TS lexical dataset is undertaken. Secondly, the design of text simplification features for the TS model is carried out, drawing from prior work by [42]. Lastly, the results of the proposed method are evaluated against an existing Python-based classifier.

VI.   CONCLUSION

Text simplification is a subfield of NLP that has seen significant development in recent years. While research in English has been extensive, tackling simplified text in other languages presents challenges due to limited resources and associated data. This study focuses on analyzing lexical, syntactic, and semantic features to identify troll threat sentences in the Malay language, and the development of resources marks the beginning of this effort.

In summary, this study exclusively incorporates frequency dictionary features within the semantic compression method. Looking ahead, there are several avenues for enhancing this project. Malay, being a minority language, has limited potential for leveraging semantic information. Semantic compression is a component of semantic analysis and comprises two crucial stages: the frequency dictionary and the semantic network. In this research, to the best of our knowledge, only the frequency dictionary has been implemented, as the code is available for development alongside existing features (lexical and syntactic). However, due to the constraints in accessing tools freely for building syntactic information based on dependencies and constituent trees, the discussion of semantic networks is omitted in this study.

To enhance the application of this project, it can be extended with three additional stages in the development of Complex Word Identification (CWI). These stages encompass Substitution Generation, Substitution Selection, and Substitution Ranking, constituting the second, third, and fourth steps in CWI. The second step involves generating potential substitutions for the target words identified in the initial step. Subsequently, the system selects the most appropriate replacement, and the final step entails organizing the hierarchy of replacement options that can be applied to the previously identified target word.

Exploring higher-level Natural Language Processing (NLP) components, such as syntactic analysis, proves more suitable for analyzing social media data compared to mere word-level comprehension. Lexical feature analysis, on the other hand, aligns better with users facing language difficulties (e.g., dyslexia, aphasia) and non-native speakers. Investigating patterns in troll sentences as compared to standard Malay sentences could yield valuable insights if developed further.

Social network datasets necessitate a distinct approach from conventional language sentences. There are additional preprocessing steps required to analyze such data effectively. Handling text abbreviations, dialects, slang, and other variations is essential before arriving at the base words within the text. Techniques like lemmatization are more appropriate for word recognition than stemming. Furthermore, resources like WordNet Bahasa should be considered in this analysis. A comprehensive study integrating social network analysis and data analytics is essential for identifying troll threat sentences.

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