KALANA

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SCHOOL OF COMPUTER ENGINEERING
Established : 1997

Education is the most powerful weapon to bring empowerment.
- Achyuta Samanta

Editorial Board

We are thankful to Respected Founder Dr. Achyuta Samanta for providing such a conducive environment. We are obliged to honourable vice chancellor Dr. Saranjit Singh, Dr. Samaresh Mishra, Director-General (Student Affairs) for his continued support and Prof. Bhabani Shankar Prasad Mishra, Dean (Academics) ,School of Computer Engineering, for their continued support .
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Prof. Santwana Sagnika
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Student

Publications

A Decisive Metaheuristic Attribute Selector Enabled Combined Unsupervised-Supervised Model for Chronic Disease Risk Assessment

In this study, a novel buffer-enabled heuristic, a memory-based metaheuristic attribute selection (MMAS) model, is proposed, which performs a local neighborhood search for optimizing chronic disorders data. It is further filtered with unsupervised K-means clustering to remove outliers. The resultant data are input to the Naive Bayes classifier to determine chronic disease risks' presence. Heart disease, breast cancer, diabetes, and hepatitis are the datasets used in the research. Upon implementation of the model, a mean accuracy of 94.5% using MMAS was recorded and it dropped to 93.5% if clustering was not used. The average precision, recall, and F-score metric computed were 96.05%, 94.07%, and 95.06%, respectively. The model also has a least latency of 0.8 sec. Thus, it is demonstrated that chronic disease diagnosis can be significantly improved by heuristic-based attribute selection coupled with clustering followed by classification. It can be used to develop a decision support system to assist medical experts in the effective analysis of chronic diseases in a cost-effective manner.

Sushruta Mishra
Hiren Kumar Thakkar
Priyanka Singh
Gajendra Sharma

Computational Intelligence and Neuroscience
Wiley

Brain tumor classification using dense efficient-net

Brain tumors are most common in children and the elderly. It is a serious form of cancer caused by uncontrollable brain cell growth inside the skull. Tumor cells are notoriously difficult to classify due to their heterogeneity. Convolutional neural networks (CNNs) are the most widely used machine learning algorithm for visual learning and brain tumor recognition. This study proposed a CNN-based dense EfficientNet using min-max normalization to classify 3260 T1-weighted contrast-enhanced brain magnetic resonance images into four categories (glioma, meningioma, pituitary, and no tumor). The developed network is a variant of EfficientNet with dense and drop-out layers added. Similarly, the authors combined data augmentation with min-max normalization to increase the contrast of tumor cells. The benefit of the dense CNN model is that it can accurately categorize a limited database of pictures. As a result, the proposed approach provides exceptional overall performance. The experimental results indicate that the proposed model was 99.97% accurate during training and 98.78% accurate during testing. With high accuracy and a favorable F1 score, the newly designed EfficientNet CNN architecture can be a useful decision-making tool in the study of brain tumor diagnostic tests.

Dillip Ranjan Nayak
Neelamadhab Padhy
Pradeep Kumar Mallick
Mikhail Zymbler
Sachin Kumar

Axioms
MDPI

A Novel Method for Predicting Time of Alcohol Use Based on Personality Traits and Demographic Information

In this work, novel approaches have been proposed to predict the time of use of alcohol consumption by individuals. It predicts that the alcohol is consumed on just the previous day or previous week or previous month, or a previous year or not at all consumed. Ultimately, the risk of becoming an alcohol addict has been identified. The input features used in this study are demographic features and personality traits. SMOTE with Tomek link has been used to make the samples balanced in all the classes. Machine learning algorithms, such as K-nearest neighbour (k-NN), random forest and gradient boosting, have been used to predict the time of use based on input features. The highest accuracy of 77% is obtained in the random forest algorithm using the feature set comprising of demographic features and personality traits. The obtained sensitivity, specificity, precision and F-score are 76.198%, 94.19%, 75.53% and 75.86%, respectively. The novelty of the work is that it can predict the time of use of alcohol without a clinical test with acceptable accuracy.

Divya Kumari
Aleena Swetapadma

IETE Journal of Research

Smart COVID-shield: An IoT-driven reliable and automated prototype model for COVID-19 symptoms tracking

IoT technology is revolutionizing healthcare and is transforming it into more personalized healthcare. In the context of COVID-19 pandemic, IoT`s intervention can help to detect its spread. This research proposes an effective "Smart COVID-Shield" that is capable of automatically detecting prevalent symptoms like fever and coughing along with ensuring social distancing norms are properly followed. It comprises three modules which include Cough Detect Module (CDM) for dry cough detection, Temperature Detect module (TDM) for high-temperature monitoring, and Distance Compute Module (DCM) to track social distancing norm violator. The device comprises a combination of a lightweight fabric suspender worn around shoulders and a flexible belt wrapped around the waist. The model accurately reported when body temperature rises. It outperformed thermal gun as it accurately recorded a mean of only 4.65 candidates with higher body temperature as compared to 8.59% with the thermal gun. A significant reduction of 3.61% on social distance violators was observed. Besides this, the latency delay of 10.32 s was manageable with the participant count of over 800 which makes it scalable.

Hrudaya Kumar Tripathy
Sushruta Mishra
Shubham Suman
Anand Nayyar
Kshira Sagar Sahoo

Computing
Springer

Chaotic Neural Networks and Farfalle Construction Based Parallel Keyed Secure Hash Function

In this article, a keyed hash function based on farfalle construction and chaotic neural networks (CNNs) is proposed, which generates a hash value with arbitrary (defined by user) length (eg, 256 and 512 bits). The proposed hash function has parallelism merit because it is built over farfalle construction which avoids the dependency between the blocks of a given message. Moreover, the proposed hash function is chaos based. The security analysis shows that the proposed hash function is robust and satisfies the properties of hash algorithms, such as random-like (non-periodic) behavior, ideal sensitivity to original message and secret key, one-way property and optimal diffusion effect. The speed performance of the hash function is also analyzed and compared with a hash function which was built based on sponge construction and CNN, and compared with secure hash algorithm (SHA) variants like SHA-2 and SHA-3. The results have shown that the proposed hash function has lower time complexity and higher throughput especially with large size messages. Additionally, the proposed hash function has enough resistance to multiple attacks, such as collision attack, birthday attack, exhaustive key search attack, preimage and second preimage attacks, and meet-in-the-middle attack.

Mohamad Mulham Belal
Tanmoy Maitra
Debasis Giri
Ashok Kumar Das

Security and Privacy
Wiley

AI-Based Mobile Edge Computing for IoT: Applications, Challenges, and Future Scope

Mobile edge computing (MEC) faces several challenges, including security and privacy, deployment protocols, and offloading management. Although, various studies have been found tuning MEC to solve such challenges, the literature provide more ideas for smart developments toward applications particularly using FL and AI. Most researches miss combining interesting aspects of MEC, such as machine learning and deep learning approaches limiting works to only single aspect. Thus, a literature work is needed to focus on all the aspects of MEC together. This study aims to present a comprehensive survey on MEC by providing all necessary information, including network architecture, advantages, objectives, access technologies, deployment templates, characteristics, and many more. The work is not limited to only MEC background but also covers the AI and FL approaches used within MEC, allowing mobile phones to learn a shared predictive model collaboratively. This survey also provides information regarding security and privacy challenges as well as attacks on MEC and their solutions. The applications of MEC illustrate different sectors where MEC is applicable further highlighting open issues and challenges to be investigated.

Ashish Singh
Suresh Chandra Satapathy
Arnab Roy
Adnan Gutub

Arabian Journal for Science and Engineering Springer

Prolificacy assessment of spermatozoan via state-of-the-art deep learning frameworks

Childlessness or infertility among couples has become a global health concern. Due to the rise in infertility, couples are looking for medical supports to attain reproduction. This paper deals with diagnosing infertility among men and the major factor in diagnosing infertility among men is the Sperm Morphology Analysis (SMA). In this manuscript, we explore establishing deep learning frameworks to automate the classification problem in the fertilization of sperm cells. We investigate the performance of multiple state-of-the-art deep neural networks on the MHSMA dataset. The experimental results demonstrate that the deep learning-based framework outperforms human experts on sperm classification in terms of accuracy, throughput and reliability. We further analyse the sperm cell data by visualizing the feature activations of the deep learning models, providing a new perspective to understand the data. Finally, a comprehensive analysis is also demonstrated on the experimental results obtained and attributing them to pertinent reasons.

Satish Chandra
Mahendra Kumar Gourisaria
Harshvardhan Gm
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IEEE Access

Prioritized and predictive intelligence of things enabled waste management model in smart and sustainable environment

Collaborative modelling of the Internet of Things (IoT) with Artificial Intelligence (AI) has merged into the Intelligence of Things concept. This recent trend enables sensors to track required parameters and store accumulated data in cloud storage, which can be further utilized by AI based predictive models for automatic decision making.In this research, an Intelligence of Things Enabled Smart Waste Management (IoT-SWM) model with predictive capabilities is developed. Here, local sinks (LS) are deployed in specified locations. At every instant, the current status of smart bins in each LS is notified to users to determine the priority level of LS to be emptied. Based on aggregated sensor values for the three smart bins, LS weight and poison gas value, the priority order of emptying LS is computed, and decision is made whether to notify the users with an alert message. It also helps in predicting the LS, which is likely to be filled up at a faster rate based on assigned timestamp. This model is implemented in real time and it was observed that bins, which were close to more crowded sites filled up faster compared to sparse populated areas. Random forest algorithm was used to predict whether an alert notification is to be sent or not. An average mean of 95.8% accuracy was noted.

Sushruta Mishra
Lambodar Jena
Hrudaya Kumar Tripathy
Tarek Gaber

Plos One

A Computer Vision-based Perceived Attention Monitoring Technique for Smart Teaching

Our proposed system periodically will monitor the learning behaviour of the whole class and track the attentiveness of each student. This deep learning-based real-time face monitoring system will allow lecturers to improvise/her delivery either through bringing diversity in the class contents or personal care to those non-attentive students. The concept of the deep learning technique in an ensemble configuration has been used to predict the likelihood of eyes' openness. Separately, a student's facial expressions are also recognized using our Convolutional Neural Network (CNN) model. Finally, the net learning behaviour of a student has been computed by a weighted average of these two features (that is, eyes' openness and facial expressions). The student learning behaviour is validated twice with Pearson correlation coefficient and Spearman correlation coefficient measures between the openness of eye and facial expressions. Again, the Cosine similarity has been used to further examine the periodical similarity of the student's learning patterns. The proposed pipeline has performed even better than the state-of-the-art models such as ResNet50, MobileNetV2, and EfficientNet-B0 in terms of accuracy and f1-score.

Rajdeep Chatterjee
Rohit Halder
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Multimedia tools and applications Springer

Perturbation-Based Fuzzified K-Mode Clustering Method for Privacy Preserving Recommender System

Recommender systems are extensively used today to ease out the problem of information overload and facilitate the product selection by users in e-commerce market. Both privacy and security are two major concerns of the user in these systems. For the protection of the user's rating, there are several existing works on the basis of encryption or randomization methodologies. This paper proposes a methodology that not only protects the privacy of ratings but also provides better accuracy. After applying fuzzification on the user ratings, random rotation and perturbation methods are used before being fed to the collaborative filtering system. In this process, similar users are grouped into clusters by which recommendation is made. By considering different cluster size on four different datasets, the proposed fuzzified k-Mode clustering method provides less MAE and RMSE value as compared to other k-Means and k-Mode clustering approach and also achieves the better privacy than randomized perturbation method by obtaining IVDM value i.e. 0.67, 0.61, 0.55 and 0.7.

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