SCHOLARLY PUBLICATIONS
School of Computer Engineering
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Journal Name: IEEE Internet of Things Journal **IF: 8.9**

Title: A Comprehensive Survey on Data Distillation: Techniques, Frameworks, and Future Directions

Author: Razi, Q.; Singh, S.; Priyadarshini, R.; Hassija, V.; Chalapathi, G.S.S.

Details: December 2025

Abstract: The increased adoption of machine learning techniques has led to exponential growth in data generation and utilization. This growth has necessitated efficient storage, processing, and utilization of this data, which presents critical challenges, particularly in resource-constrained environments such as the Internet of Things (IoT) and edge devices. Data distillation has emerged as a promising solution that reduces dataset size while preserving essential information and optimizing computational resources. This survey provides a comprehensive analysis of data reduction techniques, covering methodologies such as knowledge distillation, coreset selection, hyperparameter optimization, and generative modeling. We further explore various data distillation learning frameworks, including performance, gradient, parameter, and distribution matching, highlighting their effectiveness in different data modalities such as images, graphs, and text. Furthermore, we examine the implications of data distillation in key areas such as continual and federated learning, privacy preservation, security, healthcare, IoT applications, and edge computing. By enabling lightweight models with minimal computational overhead, data distillation facilitates real-time inference and decision-making on edge devices, making it highly relevant for low-power, bandwidth-limited environments. Data distillation offers numerous advantages in improving model efficiency, reducing training costs, and enhancing privacy. However, data distillation faces numerous challenges related to scalability, computational complexity, and information retention. This survey identifies these challenges and outlines potential future research directions, providing insights for researchers seeking to leverage data distillation for scalable and efficient machine-learning applications.

URL: https://ieeexplore.ieee.org/document/11250975

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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Journal Name: Expert Systems with Applications **IF: 7.5**

Title: Integration of EEG-based BCI technology in IoT enabled smart home environment: An in-depth comparative analysis on human-computer interaction techniques

Author: Kumar Gouda S.; Choudhry A.; Satpathy S.P.; Shukla K.M.; Dash A.K.; Pasayat A.K.

Details: Volume 294, December 2025

Abstract: The advent of smart home technology has revolutionized the way individuals communicate with their living spaces, offering efficiency, convenience, and comfort. The integration of brain-computer interface (BCI) technology within smart home environments presents a promising avenue for transforming human-computer interaction (HCI) paradigms. This review paper synthesizes current research findings on optimizing smart home user interfaces through HCI utilizing electroencephalography (EEG)-based BCI technology. EEG-based BCIs offer a novel approach to interface design by directly interpreting users neural signals, thereby enabling seamless interaction with smart home devices. By using EEG signals to figure out what people are thinking and feeling, BCI creates a direct way for people and machines to communicate naturally, without using traditional input methods. The paper examines a few explicit key components such as signal acquisition, feature extraction, feature selection, classification algorithms, and system integration. Furthermore, the review evaluates the effectiveness, challenges, and future prospects of EEG-based BCIs in optimizing HCI within smart home ecosystems. Insights from this review contribute to the understanding of how it can revolutionize user interaction paradigms, leading to more intuitive, efficient, and personalized smart home environments. This work presents a comprehensive study on the proposed topic by consolidating useful information from various sources and exhibiting it in a single paper to provide quality data to the novice researchers to help them in this field of research.

URL: https://www.sciencedirect.com/science/article/pii/S0957417425023486?via%3Dihub

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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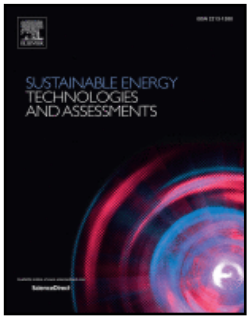
Journal Name: Sustainable Energy Technologies and Assessments **IF: 7.0**

Title: Enhancing wind energy forecasting in India: A site-specific comparative analysis of machine learning models and Weibull statistics using long-term data

Author: Yadav, H.K.; Chakraborty, S.; Gupta, M.N.; Bhattacharjee, A.; Yadav, S.; Sanyal, A.P.; Sarkar, J.; Sarkar, A.

Details: Volume 84**,** December 2025

Abstract: The global pursuit of clean and sustainable energy has elevated wind power as a vital renewable resource. Yet, its inherent variability poses significant challenges for integration into smart grids, where precise forecasting is crucial for grid stability and efficient energy management. Traditional statistical methods often fail to capture the nonlinear dynamics of wind, especially across diverse geographies. This study explores the application of advanced machine learning (ML) techniques to improve hourly wind speed prediction across six Indian locations, using long-term historical data (1969–2006) from the Indian Meteorological Department. Four ML models, Gradient Boosting Machine (GBM), Long Short-Term Memory (LSTM), Convolutional Neural Network (CNN), and Random Forest (RF), are employed to forecast wind power density (WPD), with performance assessed via Root Mean Square Error (RMSE) and Mean Absolute Error (MAE). A novel aspect of this work is the combined use of Weibull statistical modeling and ML forecasting to enhance wind resource assessments at varying hub heights. Results show that ML models, particularly GBM, outperform traditional approaches, yielding higher R^2 values, while CNN consistently underperforms. Among the studied sites, Tuticorin records the highest WPD (1090.06 W/m^2 in July), and Jaipur the lowest (14.03 W/m^2 in December), underscoring regional variability in wind energy potential. This research highlights the importance of selecting appropriate, location-specific models for reliable wind forecasting and offers critical insights for optimizing wind energy planning and integration into smart grid systems.



URL: https://www.sciencedirect.com/science/article/abs/pii/S2213138825005661?via%3Dihub

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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Journal Name: IEEE Transactions on Services Computing **IF: 5.8**

Title: QuanFraud: Quantum State Verification Scheme for Fraud Detection in IoT-Assisted Quantum-Blockchain Networks

Author: Majumder, S.; Ray, S.; Dasgupta, M.; Bhattacharya, P.; Gadekallu, T.R.; Srivastava, G.

Details: December 2025

Abstract: Fraud detection in Internet-of-Things (IoT) applications remains a pressing challenge. Adversaries exploit injection, eavesdropping, and man-in-the-middle attacks that often evade conventional detection pipelines. Existing blockchain and Machine Learning (ML) based solutions improve accuracy but lack verifiability, auditability, and resilience against quantum-era threats. We propose QuanFraud, a protocol that integrates Greenberger–Horne–Zeilinger (GHZ)–θ quantum state verification, Decentralized Identifiers (DID), and a Quantum Support Vector Classifier (QSVC) within an auditable blockchain framework. The scheme ensures that fraud detection outcomes are not only data-driven but also cryptographically verifiable and resistant to identity-correlation and replay attacks. We evaluate QuanFraud on a financial dataset of 20,000 records (117 features), using Principal Component Analysis (PCA) and the Synthetic Minority Oversampling Technique (SMOTE) under 10- fold cross-validation. Results show that classical baselines such as Random Forest and XGBoost achieve balanced accuracy above 77%, while QSVC alone yields 42.1 ± 2.8%. This gap indicates that the contribution of QuanFraud is not accuracy leadership but a verifiable, auditable fraud-detection protocol under Noisy Intermediate-Scale Quantum (NISQ) constraints, where QSVC provides kernel-level privacy, quantum state verification, and on-chain checks that classical models do not offer. We further discuss complexity and scalability, highlighting the scheme's suitability for deployment in resource-constrained IoT environments.

URL: https://ieeexplore.ieee.org/document/11264016

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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Journal Name: Computers & Electrical Engineering **IF: 4.9**

Title: Secure and anonymous model training using pixel-level encryption for privacy-preserving AI with obfuscation-based representation learning

Author: Razi, Q; Chougule, A; Chalapathi, GSS; Hassija, V

Details: Volume 128, Part B, December 2025

Abstract: We present a novel framework for privacy-preserving model training that embeds pixel-level AES-ECB encryption directly into the deep learning pipeline, enabling computation on encrypted medical images without exposing raw data. To address the challenge of learning from visually obfuscated inputs, we introduce an obfuscation-based representation learning mechanism that extracts task-relevant features while preserving utility. Extensive experiments on COVID-19, Malaria, and Pneumonia classification tasks demonstrate that our method achieves competitive performance, with only (1.7%) accuracy degradation compared to training on unencrypted data. Comprehensive quantitative evaluations, including Structural Similarity Index (SSIM), Peak Signal-to-Noise Ratio (PSNR), Entropy, Histogram Chi-Square Distance, and Number of Pixel Change Rates (NPCR), confirm strong visual obfuscation, ensuring data confidentiality. Our framework integrates seamlessly with existing medical imaging workflows, supporting deployment in hospitals, telemedicine systems, and cross-institutional collaborations, making it a practical solution for privacy-preserving AI in regulated healthcare environments.

URL: https://www.sciencedirect.com/science/article/pii/S0045790625007001

Journal Name: Biomedical Signal Processing and Control **IF: 4.9**

Title: A modified Gray Wolf Optimization algorithm for early detection of Parkinson's Disease

Author: Santhosh K.; Dev P.P.; A. B.J.; Lynton Z.; Das P.; Ghaderpour E.

Details: Volume 109, November 2025, Article number 108061

Abstract: Parkinson's disease (PD) is one of the most common neurodegenerative diseases, causing significant morbidity and mortality worldwide. PD can be diagnosed at an early stage by analyzing patient datasets, such as speech and handwriting samples. In this paper, a modified version of the classical Gray Wolf Optimization (GWO) is proposed with an application to detect early-stage PD through processing such datasets. The new model (MGWO-eP) aims to enhance the algorithm's exploration capability (e) and overcome local optima issues by adjusting a key parameter (P) that controls the search agents' positions. The MGWO-eP is then applied as a feature selection technique to predict PD in its early stages, using samples of speech and writing. The effectiveness of MGWO-eP is validated by benchmark optimization functions for achieving the global optimum. Then six popular machine learning classifiers are applied to three benchmark PD prediction datasets that include hand-writing and speech samples from people with and without PD, namely HandPD Spiral, HandPD Meander, and SpeechPD. The proposed model achieves best overall accuracies of 96.30% (with voting), 94.45% (with random forest), and 98.31% (with voting), outperforming GWO and particle swarm optimization algorithms as they get stuck with local optimal solutions. The results show that the proposed model is robust and can be used for early detection of PD in patients through analyzing datasets, such as their handwriting and speech to help the patients access treatments early in the disease, prolonging time spent with adequate symptom control and delaying years of disability/morbidity.

URL: https://www.sciencedirect.com/science/article/pii/S1746809425005725?via%3Dihub

Journal Name: Computers and Electrical Engineering **IF: 4.9**

Title: Reconstruction resilient privacy-aware dataset distillation using feature distribution matching technique

Author: Razi, Q.; Chalapathi, G.S.S.; Hassija, V.

Details: Volume 129, January 2026

Abstract: Dataset distillation has emerged as a powerful technique for reducing the size of training data while preserving model performance. This offers significant advantages in various domains, particularly in medical imaging, where data annotation is expensive, storage is limited, and computational resources are constrained. In this paper, we propose a novel distillation technique that combines diffusion models with distribution matching to generate distilled data for three medical image datasets, i.e., Pneumonia, COVID-19, and Brain Tumor detection. The diffusion component enables the generation of high-quality and diverse synthetic samples, while distribution matching ensures alignment with the underlying data distribution, thereby preserving discriminative features. We further design an autoencoder-based reconstruction framework to analyze and compare the vulnerability of original, conventional distilled, and our proposed distilled datasets to reconstruction attacks. In addition, we incorporate privacy risk evaluations using membership inference attacks (MIA) and attribute inference attacks (AIA). Experimental results show that our method achieves better classification accuracy and stronger privacy preservation compared to existing distillation approaches. These findings suggest that dataset distillation, particularly with our proposed framework, not only improves computational efficiency but also acts as an effective privacy-enhancing mechanism, making it a promising approach for secure and scalable medical artificial intelligence (AI) applications.

URL: https://www.sciencedirect.com/science/article/pii/S0045790625007657?via%3Dihub

SCHOLARLY PUBLICATIONS
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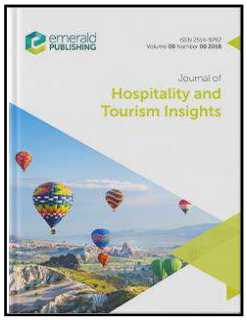
Journal Name: Journal of Hospitality and Tourism Insights **IF: 4.8**

Title: Unveiling factors of gamification platforms for tourism marketing: exploring its impact on tourist inspiration and sustainable tourist engagement

Author: Behera, R.K.; Zhang, L.

Details: December 2025

Abstract: Purpose – Using the concepts of game design principles such as badges, leaderboards, points and rewards, gamification platforms for tourism marketing make tourists have more fun, which inspires their behavioural changes towards sustainable engagement. Despite the growing interest in gamification in tourism marketing, literature lacks a theoretically grounded and empirically validated framework that unveils the factors of gamification platforms for tourism marketing to explore its impact on tourist inspiration (TI) and sustainable tourist engagement (STE). To address this gap, the study draws on the technology acceptance model (TAM) to conceptualise and validate a structural model to explain the relational dynamics between factors of gamification platforms and STE. Design/methodology/approach – Primary data were collected from 305 domestic and international tourists in India using a two-wave time-lagged survey. Quantitative methodology was employed to analyse the hypothesised relationships. Findings – Findings reveal that factors of gamification platforms for tourism marketing include their usefulness, ease of use, trust, security, effectiveness and enjoyment. Such factors positively influence TI, and subsequently, TI positively influences STE. Practical implications – The findings imply that gamification platforms for TI can offer tourism marketing managers the opportunity to increase motivation, enable behavioural change, enable analysis and enable learning. Originality/value – This study contributes to tourism technology literature by offering a novel theory-driven framework that explicates the mechanism through which key factors of gamification platforms for tourism marketing can promote STE.



URL: https://www.emerald.com/jhti/article/doi/10.1108/JHTI-07-2025-

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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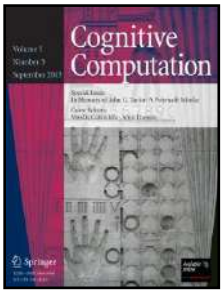
Journal Name: Cognitive Computation **IF: 4.3**

Title: Privacy-Preserving Skin Disease Detection Using One-Shot Federated Learning Approach

Author: Anas, T.; Razi, Q.; Bajoria, S.; Hassija, V.; Chalapathi, G.S.S.

Details: Volume 17, December 2025

Abstract: Skin diseases are among the most common health conditions, yet there is a shortage of specialists in this field. Although machine learning has shown significant potential to address this issue, concerns about patient data privacy remain, as training such models typically requires centralized data storage. This paper proposes a new framework that utilizes One-Shot Federated Learning (FL) with dataset distillation to solve the privacy and efficient model training problems of skin disease detection. In this paper, we have implemented FedD3, which combines the privacy benefits of federated learning with the communication efficiency of one-shot communication. This also avoids the iterative model updates across distributed devices, which creates a high bandwidth usage problem. Through our experiments on real skin disease data, this framework gives an accuracy of over 90% for six different types of skin diseases without breaching users' privacy. The proposed model will not only preserve patients' privacy but also greatly reduce bandwidth and computational overhead, making it deployable in resource-constrained environments. The study plays a part in the attempt to get closer to the future of privacy-preserving machine learning within medical science.



URL: https://link.springer.com/article/10.1007/s12559-025-10531-0

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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Journal Name: Scientific Reports **IF: 3.9**

Title: TL-PneuNet: a transfer learning-based pneumonia classification framework

Author: Tripathy, B.; Khan, S.; Bebortta, S.; Kamal, A.; Tripathy, S.S.; Fazil, M.; Albarrak, A.M.

Details: Volume 15, Issue 1, December, 2025

Abstract: Pneumonia is a severe respiratory ailment that may be caused by viruses, fungus, and bacteria. Pneumonia causes the accumulation of water, purulent material, or other fluids in the air sacs (alveoli) of the lungs. A delay in the identification of pneumonia may be life-threatening. Nevertheless, the limited radiation levels used for diagnosis result in unreliable detection, posing a significant obstacle in the field of pneumonia detection in healthcare. Transfer Learning (TL) may revolutionize healthcare by offering an effective method for differentiating between normal and pneumonia patients. Therefore, we have proposed a TL utilizing model for predicting pneumonia. Our experiment uses 5856 highly imbalanced chest X-ray images to fit different vision models such as Xception, VGG16, and ResNet152V2 using TL approach. After training, our model performs exceptionally well on the X-ray dataset, achieving an accuracy of 80.45, 80.77, and 83.17% respectively. However, the results show that the ResNet152V2 performs exceptionally well as compared to other models. Also, it achieves a precision and recall score of 79.87 and 97.69% respectively. The results exemplify the potential of our framework to help pulmonologists and physicians make rapid diagnoses of pneumonia patients by providing accurate and fast pneumonia classification.

URL: https://www.nature.com/articles/s41598-025-24180-8

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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Journal Name: Scientific Reports **IF: 3.9**

Title: 3D FusionNet for synthetic CT based lung cancer segmentation

Author: Parida, C.; Bilgaiyan, S.; Sagnika, S.; Roy, S.; Pandey, A.

Details: December 2025

Abstract: Interpretation of three-dimensional medical scans continues to be a demanding task in computer-assisted diagnostic systems. In this study we present a segmentation framework specifically designed for lung CT images. Since lung cancer is one of the most fatal cancers worldwide and the demand for better detection tools remains pressing. To address this issue our proposed work combined the Deep Convolutional Generative Adversarial Networks (DCGAN) with the 3D-TDUnet++ architecture. The use of DCGAN allowed us to generate additional CT samples. Which results in reducing the problem of insufficient annotated data and improving the robustness of the training set. In this experiment the Chest CT-Scan images Dataset is used which is publicly available in KAGGLE. Which is being further enriched with synthetic images created by DCGAN. While being trained on this augmented dataset the proposed 3D-FusionNet model achieved superior performance in cancer detection. Which shows higher accuracy, sensitivity and specificity than other conventional approaches. The integration of DCGAN with 3D-TDUnet++ together with Non-Local Feature Aggregation (NLFa) made the system promising for clinical environments where limited data often restricts the application of deep learning models. Quantitative evaluation reveals that the proposed 3D-FusionNet achieves a Dice coefficient of 88.94%, F1-score of 88.94% and an accuracy of 93.37%. Outperforming the benchmark models such as DenseNet, ResNet and MDDNet-ASPP. This hybrid design leverages the strengths of generative augmentation and non-local attention to improve both segmentation precision and clinical robustness. Thus the proposed 3D-FusionNet model demonstrates how deep generative modeling and volumetric segmentation can be integrated into a cohesive machine vision system. Which is capable of scalable and efficient deployment in real-world diagnostic pipelines.

URL: https://www.nature.com/articles/s41598-025-29703-x

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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Journal Name: Scientific Reports **IF: 3.8**

Title: An intelligent framework for skin cancer detection and classification using fusion of Squeeze-Excitation-DenseNet with Metaheuristic-driven ensemble deep learning models

Author: Dorathi Jayaseeli J.D.; Briskilal J.; Fancy C.; Vaitheeshwaran V.; Patibandla R.S.M.L.; Syed K.; Swain A.K.

Details: Volume 15, Issue 1, December 2025

Abstract: Skin cancer is the most dominant and critical method of cancer, which arises all over the world. Its damaging effects can range from disfigurement to major medical expenditures and even death if not analyzed and preserved timely. Conventional models of skin cancer recognition require a complete physical examination by a specialist, which is time-wasting in a few cases. Computer-aided medicinal analytical methods have gained massive popularity due to their efficiency and effectiveness. This model can assist dermatologists in the initial recognition of skin cancer, which is significant for early diagnosis. An automatic classification model utilizing deep learning (DL) can help doctors perceive the kind of skin lesion and improve the patient's health. The classification of skin cancer is one of the hot topics in the research field, along with the development of DL structure. This manuscript designs and develops a Detection of Skin Cancer Using an Ensemble Deep Learning Model and Gray Wolf Optimization (DSC-EDLMGWO) method. The proposed DSC-EDLMGWO model relies on the recognition and classification of skin cancer in biomedical imaging. The presented DSC-EDLMGWO model initially involves the image preprocessing stage at two levels: contract enhancement using the CLAHE method and noise removal using the wiener filter (WF) model. Furthermore, the proposed DSC-EDLMGWO model utilizes the SE-DenseNet method, which is the fusion of the squeeze-and-excitation (SE) module and DenseNet to extract features. For the classification process, the ensemble of DL models, namely the long short-term memory (LSTM) technique, extreme learning machine (ELM) model, and stacked sparse denoising autoencoder (SSDA) method, is employed. Finally, the gray wolf optimization (GWO) method optimally adjusts the ensemble DL models' hyperparameter values, resulting in more excellent classification performance. The effectiveness of the DSC-EDLMGWO approach is evaluated using a benchmark image database, with outcomes measured across various performance metrics. The experimental validation of the DSC-EDLMGWO approach portrayed a superior accuracy value of 98.38% and 98.17% under HAM10000 and ISIC datasets across other techniques.

URL: https://www.nature.com/articles/s41598-025-92293-1

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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Journal Name: Scientific Reports **IF: 3.8**

Title: A hybrid fused-KNN based intelligent model to access melanoma disease risk using indoor positioning system

Author: Mishra S.; Das H.; Mohapatra S.K.; Khan S.B.; Alojail M.; Saraee M.

Details: Volume 15, Issue 1, December 2025

Abstract: The Indoor Positioning System (IPS) based technology involves the positioning system using sensors and actuators, where the Global Positioning System (GPS) lacks. The IPS system can be used in buildings, malls, parking lots and several other application domains. This system can also be useful in the healthcare centre as an assisting medium for medical professionals in the disease of the diagnosis task. This research work includes the development and implementation of an intelligent and automated IPS based model for melanoma disease detection using image sets. A new classification approach called Fused K-nearest neighbor (KNN) is applied in this study. The IPS based Fused-KNN is a fusion of three distinct folds in KNN (3-NN, 5-NN and 7-NN) where the model is developed using input samples from various sensory units while involving image optimization processes such as the image similarity index, image overlapping and image sampling which helps in refining raw melanoma images thereby extracting a combined image from the sensors. The IPS based Fused-KNN model used in the study obtained an accuracy of 97.8%, which is considerably more than the existing classifiers. The error rate is also least with this new model which is introduced. RMSE (Root Mean Square Error) and MAE (Mean Absolute Error) value generated with the proposed IPS base Fused-KNN the model for melanoma detection was as low as 0.2476 and 0.542 respectively. An average mean value computed for accuracy, precision, recall and f-score were found to be 94.45%, 95.2%, 94.4% and 94.9% respectively when validated with 12 different cancer-based datasets. Hence the presented IPS based model can prove to be an efficient and intelligent predictive model for melanoma disease diagnosis, but also other cancer-based diseases in a faster and more reliable manner than existing models.

URL: https://www.nature.com/articles/s41598-024-74847-x

SCHOLARLY PUBLICATIONS
School of Computer Engineering
KIIT Deemed to be University

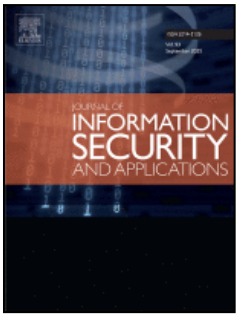
Journal Name: Journal of Information Security and Applications **IF: 3.7**

Title: Rhetorical Structure Theory-based machine intelligence-driven deceptive phishing attack detection scheme

Author: C., Patra, Chanchal; D.R., Giri, Debasis Ratna; B., Kundu, Bibekananda; T., Maitra, Tanmoy; M., Wazid, Mohammad

Details: Volume 94, November 2025

Abstract: The easiest way for users to interact with one other is via emails or messages. However, the growing incidence of cybercrime necessitates the astute use of emails or messages. These days, one of the biggest risks is phishing as well as smishing. Attackers aim to get sensitive user data by means of phishing emails. Credit card information, passwords, usernames, and other sensitive data are included. These might result in severe financial loss. The literature has a plethora of anti-phishing techniques for identifying phishing email or messages. However, fraudsters are always coming up with new techniques, making it difficult to develop anti-phishing techniques to stop phishing or smishing attack. This paper discusses a novel methodology leveraging Rhetorical Structure Theory (RST) to validate whether a given text of emails or messages are deceptive or not. A balanced dataset of deceptive and non-deceptive have been collected and annotated manually using different features like term Discourse Connectors, Rhetorical Relations, Deception likely tags and sentence type features. The work involved experiment with different machine learning classifiers trained using these features in order to achieve higher accuracy in deception phishing detection task. The proposed technique exhibits high accuracy on the dataset when RST based linguistic features are used. When ensemble classifiers are used instead of individual classifiers, the optimal classification performance is achieved, leading to an increase in accuracy. In comparison to the individual learners, the results of our experiment demonstrate that the proposed technique achieved the greatest accuracy, precision, recall, and F1-score values.



URL: https://www.sciencedirect.com/science/article/pii/S2214212625002212?via%3Dihub

SCHOLARLY PUBLICATIONS
School of Computer Engineering
KIIT Deemed to be University

Journal Name: IEEE Access **IF: 3.6**

Title: Privacy-Preserving On-Screen Activity Recognition via One-Shot Federated Learning

Author: Swami, P.; Priya, A.; Palanisamy, B.; Roy, D.; Hassija, V.; Chalapathi, G.S.S.

Details: Volume 13, December 2025

Abstract: Preserving user privacy while monitoring on-screen activity is a growing challenge in remote and decentralized work environments. In this paper, we propose a novel one-shot federated learning (FL) framework that enables secure, low-overhead, and privacy-preserving on-screen activity recognition. Conventional FL methods require multiple communication rounds between clients and a central server. In contrast, our one-shot FL approach performs model aggregation in a single round, significantly reducing communication costs and latency, making it ideal for bandwidth-constrained and resource-limited environments. Using a custom dataset of 2,300 screenshots from common applications (e.g., Coursera, YouTube, Amazon), we train Deep Convolutional Neural Network (DCNN) models such as VGG16, VGG19, and InceptionResNetV2 locally on client devices. Sensitive visual data is never shared, and the screenshots are processed and discarded post-inference, ensuring strict data confidentiality. We further enhance privacy by integrating differential privacy mechanisms. To further improve learning effectiveness under different data distributions, we evaluate two aggregation techniques, FedAvg for IID and FedProx for non-IID settings. Experimental evaluations show that our approach achieves up to 99.1% classification accuracy (MobileNet) while reducing communication overhead by over 80% compared to traditional FL. This work highlights the effectiveness and scalability of one-shot FL for secure, real-time activity tracking in privacy-sensitive applications.

URL: https://ieeexplore.ieee.org/document/11271466

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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Journal Name: IEEE Access **IF: 3.6**

Title: Quantum-Accelerated Feature Selection for Edge-Enabled Perception in Connected and Autonomous Vehicles

Author: Hassija, V.; Bhattacharjee, A.; Chakrabarti, A.; Razi, Q.; Adhitya, M.; Chalapathi, G.S.S.

Details: Volume 13**,** December 2025

Abstract: The growing complexity and volume of traffic and sensory data in Connected and Autonomous Vehicles (CAVs) make it crucial to develop more effective methods for selecting and extracting features from high-dimensional images and videos. This paper proposes a novel quantum-accelerated feature selection framework utilising the Variational Quantum Eigensolver (VQE) to enhance perception tasks in CAV environments. By decomposing high-dimensional traffic images into compact patches encoded as quantum Hamiltonians, the proposed design aims to support Intelligent Transportation Systems (ITS) tasks such as object detection, vehicle classification, and traffic monitoring in CAVs. The quantum hybrid method serves as a pipeline for extracting selective features that have been optimised using gradient-aware parameter pruning and conditional principal component analysis (PCA). The implementation of this quantum hybrid approach facilitates addressing computational challenges at the edge in embedded vehicular systems, reducing data dimensionality while preserving key discriminative spatial patterns necessary for object detection and traffic monitoring. Although the quantum method currently underperforms in certain clustering and separability metrics, it demonstrates potential as a viable alternative for advanced perception in CAVs. This work lays a foundation for integrating quantum computing into edge-based autonomous vehicle perception, highlighting both opportunities and challenges with near-term quantum hardware.

URL: https://ieeexplore.ieee.org/document/11259111

SCHOLARLY PUBLICATIONS
School of Computer Engineering
KIIT Deemed to be University

Journal Name: IEEE Access **IF: 3.6**

Title: MCRel: A Minimal Cut Set-Based Approach for Reliability Analysis of Sensor-Based IIoT

Author: Rani Sahu, D.; Ray, N.K.; Tripathy, P.

Details: Volume 13, November, 2025

Abstract: The rapid evolution of sensors has facilitated to its usage in the domain of Industrial IoT (IIoT). The component of IIoT includes sensors, devices, actuators, applications and cloud servers. Sensors are the important element of IIoT which are heavily prone to errors, interference and link issues etc. At this juncture, the efficiency and credibility of sensor networks has been a challenging problem for the design of IIoT system that can tolerate the network failure without any network disconnectedness, thereby improving the sustainability of the IIoT system for prolonged time period. Network reliability is a pivotal factor for finding the effectiveness of IIoT networks. This work proposes accurate and efficient minimal cut set based reliability estimation (MCRel) technique that analyzes the reliability of sensor networks and helps in well organized way of designing the IIoT system. This approach aims to estimate the reliability of the system using the self-generated minimal cut set based approach (MCRel). The algorithm is implemented on varied IIoT applications wavering from smaller to larger systems with complex communication links. This article presents an illustration of the generation of cut arcs and minimal cut sets, along with the framing of an unreliability expression with the computation of the reliability value. To evaluate the reliability of the IIoT system, a comprehensive analysis comparing MCRel with other contemporary algorithms has been conducted. The simulated findings demonstrate that, with an improvement of more than 15%, the MCRel outperforms competing algorithms, especially during the period of peak network traffic.

URL: https://ieeexplore.ieee.org/document/11230528

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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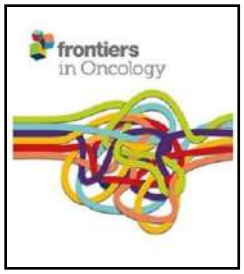
Journal Name: Frontiers in Oncology **IF: 3.3**

Title: Cervical cancer classification using a novel hybrid approach

Author: Mondal, J.; Chatterjee, R.; Kumar Gourisaria, M.; Sahni, M.; Leon-Castro, E.

Details: Volume 15, December 2025

Abstract: Cervical cancer is among the most frequently diagnosed malignancies in women. It is the fourth most prevalent malignancy in women worldwide. Pap smear tests, a popular and effective medical procedure, enable the early detection and screening of cervical cancer. Expert physicians perform the smear analysis, which is a laborious, time consuming and prone to mistakes. The main objective of our work is to distinguish or classify the healthy and malignant cervical cells using our proposed CASPNet model. Methods: This study proposes a novel technique by combining the concept of feature extraction by multi-head self-attention blocks, cross-stage partial network and feature fusion integration by spatial pyramid pooling fast layer components to identify healthy and cancerous cervical cells. Based on the comprehensive ablation study results, our proposed CASPNet architecture shows optimal performance having superior test accuracy with comparable computational efficiency. Results: The experimental study of our proposed model CASPNet (Contextual Attention and Spatial Pooling Network) has achieved an accuracy of 97.07% in the widely used benchmark SIPAKMED dataset. Conclusion: When compared to CNN models, self-attention blocks of vision transformer models are more accurate in classification tests and are generally better at capturing global contextual information inside an input image. The architecture's CSP blocks are ideal for classification tasks with constrained resources where efficiency and speed are balanced; as a result, they are suitable for local feature extraction. Again, in cervical cells, objects are of varying sizes. Therefore, SPPF records contextual information at different receptive fields and performs multi-scale feature extraction. Hence, we can understand the images more precisely and reliably by incorporating all these benefits in our suggested CASPNet model.



URL: https://www.frontiersin.org/journals/oncology/articles/10.3389/fonc.2025.1703772/full

SCHOLARLY PUBLICATIONS
School of Computer Engineering
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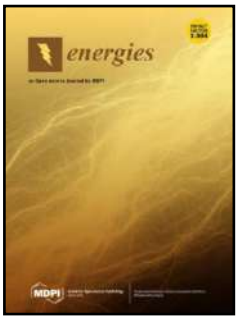
Journal Name: Energies **IF: 3.2**

Title: A Pragmatic Investigation of Energy Consumption and Utilization Models in the Urban Sector Using Predictive Intelligence Approaches

Author: Mohapatra, SK; Mishra, S; Tripathy, HK; Bhoi, AK; Barsocchi, P

Details: Volume 18, Issue 13, December 2025

Abstract: Energy consumption is a crucial domain in energy system management. Recently, it was observed that there has been a rapid rise in the consumption of energy throughout the world. Thus, almost every nation devises its strategies and models to limit energy usage in various areas, ranging from large buildings to industrial firms and vehicles. With technological advancements, computational intelligence models have been successfully contributing to the prediction of the consumption of energy. Machine learning and deep learning-based models enhance the precision and robustness compared to traditional approaches, making it more reliable. This article performs a review analysis of the various computational intelligence approaches currently being utilized to predict energy consumption. An extensive survey procedure is conducted and presented in this study, and relevant works are discussed. Different criteria are considered during the aggregation of the relevant studies relating to the work. The author's perspective, future trends and various novel approaches are also presented as a part of the discussion. This article thereby lays a foundation stone for further research works to be undertaken for energy prediction.



URL: https://www.mdpi.com/1996-1073/18/13/3351

SCHOLARLY PUBLICATIONS
School of Computer Engineering
KIIT Deemed to be University

Journal Name: Journal of Visual Communication and Image Representation **IF: 3.1**

Title: CA-VAD: Caption Aware Video Anomaly Detection in surveillance videos

Author: Senapati D.P.; Pani S.K.; Baliarsingh S.K.; Dev P.P.; Tripathy H.K.

Details: Volume 294, December 2025

Abstract: n video anomaly detection, identifying abnormal events using weakly supervised video-level labels is often tackled with multiple instance learning (MIL). However, traditional methods struggle to capture temporal relationships between segments and extract discriminative features for distinguishing normal from anomalous events. To address these challenges, we propose Caption Aware Video Anomaly Detection (CA-VAD), a framework that integrates visual and textual features for enhanced semantic understanding of scenes. Unlike conventional approaches relying solely on visual data, CA-VAD uses a pre-trained video captioning model to generate textual descriptions, transforming them into semantic embeddings that enrich visual features. These textual cues improve the differentiation between normal and abnormal events. CA-VAD incorporates an Attention-based Multi-Scale Temporal Network (A-MTN) to process visual and textual inputs, capturing temporal dynamics effectively. Experiments on CUHK Avenue, ShanghaiTech, UCSD Ped2, and XD-Violence datasets show that CA-VAD outperforms state-of-the-art methods, achieving superior accuracy and robustness.

URL: https://www.sciencedirect.com/science/article/pii/S104732032500135X?via%3Dihub

SCHOLARLY PUBLICATIONS
School of Computer Engineering
KIIT Deemed to be University

Journal Name: International Review of Retail, Distribution and Consumer Research **IF: 3.0**

Title: Evolution of sustainable retailing and how it influences consumer behavior: a bibliometric review

Author: Singh A.P.; Behera R.K.; Bala P.K.

Details: Volume 294, December 2025

Abstract: Over the years, sustainability has garnered much attention owing to evidence of climate change, United Nations (UN) sustainable development goals, pandemics, and the changing behavior of millennials. Retailers are one of the largest consumers of global natural and human resources. They have joined the sustainability bandwagon by pledging resources and communicating the same to their target customers for better business positioning. This study aims to analyze the conceptual structure of sustainability in the context of retail enterprises and its role in shaping consumer behavior. Therefore, it leverages bibliometric techniques to elaborate on the productivity and impact of the existing body of knowledge in this area through performance analysis and discover the knowledge clusters through science mapping. The data used for this study were sourced by querying the Scopus database for the intersection of terms related to 'sustainability,' 'retail,' and 'consumer behavior.' Subsequently, they were processed and illustrated using RStudio and the bibliometrix package for R to drive insights in bibliometric summaries, including tables, maps, and networks. In addition to highlighting temporal and spatial trends and dominant themes, the study suggests future research avenues in sustainable retailing.

URL: https://www.tandfonline.com/doi/full/10.1080/09593969.2024.2381066

SCHOLARLY PUBLICATIONS
School of Computer Engineering
KIIT Deemed to be University

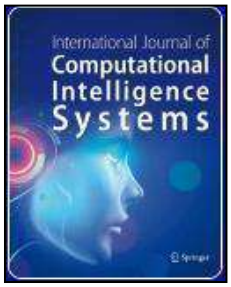
Journal Name: International Journal of Computational Intelligence Systems **IF: 3.0**

Title: Optimized DenseNet Architectures for Precise Classification of Edible and Poisonous Mushrooms

Author: Singh J.P.; Ghosh D.; Singh J.; Bhattacharjee A.; Gourisaria M.K.

Details: Volume 18, Issue 1, December 2025, Article number 143

Abstract: Background: The subtle differences between edible and toxic mushroom species make classification difficult. Traditional methods often result in errors which led to misclassifications and conventional machine learning models often struggle in feature extraction due to subtle differences in mushroom species. Deep learning models, such as DenseNet architectures, offer potential solutions, but due to model complexity, deep architecture and large number of parameters these models suffer from overfitting and computational costs. These can be handled by optimizing the model. This study's primary goal is to enhance the precision and reliability of mushroom classification through deep learning by enhancing the DenseNet-121 structure. Methods: The study analyzes the basic DenseNet-121 model as well as a modified DenseNet-121 with frozen upper layers which preserve important lower level features. Automated hyperparameter tuning is done with KerasTuner, while dropout and weight decay regularization methods are used to control overfitting. Evaluation metrics include accuracy, precision, recall, F1-score, confusion matrices, and other graphical methods. Conclusion: The study demonstrates the effectiveness of architectural modifications and regularization strategies in improving model performance. Despite problems such as possible over-reliance on pre-trained features and computational complexity, the modified DenseNet-121 is useful for accurate mushroom classification. Future study could look into improving freezing procedures and lowering computational demands to extend applicability.



URL: https://link.springer.com/article/10.1007/s44196-025-00871-y