Through the Youth Eyes: Training Depression Detection Algorithms with Eye Tracking Data

Submitted by: Yadhu Gopakumar

Depression is a major mental health disorder that affects millions of people worldwide, making early detection crucial for effective intervention. Traditional diagnostic methods, such as clinical interviews and self-reported questionnaires, are often subjective and time-consuming. In this study, eye-tracking technology combined with machine learning was explored as a non-invasive approach to detecting depression. Eye-tracking captures how a person's eyes move when viewing emotional images, revealing behavioural patterns that may indicate depressive symptoms. Research suggests that individuals with depression exhibit longer fixation durations on negative stimuli, reduced attention to positive stimuli, slower saccadic movements, and variations in pupil dilation. To investigate this, 139 young participants were shown a set of positive and negative images while their eye movements were recorded. The collected data included key eye-tracking metrics, such as fixation duration, saccade velocity, blink rate, and pupil size changes. The dataset was then processed and divided into training and testing sets using stratified sampling, ensuring balanced representation between depressed and non-depressed individuals. Several machine learning models were applied, including Support Vector Machine (SVM), Random Forest (RF), Multi-Layer Perceptron (MLP), and Gradient Boosting (GB), with each model undergoing hyperparameter tuning to optimize its performance. The models were evaluated based on accuracy, recall, F1-score, precision-recall AUC, and Matthews Correlation Coefficient (MCC). Among these, the Random Forest (RF) model achieved the highest accuracy (84%), demonstrating its effectiveness in classifying depression based on eye-tracking data. The results indicate that machine learning combined with eye-tracking technology can serve as a promising tool for depression detection, providing an objective, automated, and non-invasive method to assess mental health. These findings highlight the potential of AI-driven solutions in clinical and non-clinical settings, offering new ways to improve mental health assessments through behavioural data analysis.

Integrated Technological Approaches toAcademic Success: Mobile Learning, Social Media, and AI in Visual Art Education

Submitted by: Yadhu Gopakumar

This study examines the impact of mobile learning, social media engagement, and artificial intelligence on academic performance in higher education, based on a theoretical model that includes ubiquitous access, interactivity, information sharing, collaborative learning, motivation, personalized learning,student support, and automation. Employing quantitative methodology, a total of three hundred eightyone students participated in a survey at King Saud University, both online and in-person. Structural Equation Modeling (SEM) analysis, provided by the SmartPLS tool, was utilized to examine the relationship between these variables. Study findings show that ubiquitous access and interactivity significantly enhance mobile learning. Whereas information sharing and motivation positively influence social media engagement, collaborative learning does not significantly impact it. However, personalized learning and student support were found to positively affect artificial intelligence technology, with Automation further improving its effectiveness. The study also reveals that mobile learning positively affects both social media engagement and academic performance, and artificial intelligence enhances academic performance through personalized support. However, the interaction between Artificial Intelligence and Mobile Learning does not significantly amplify academic benefits. The study highlights the need for a multi-dimensional approach to integrating mobile learning, AI, and social media in education, promoting personalized and adaptive learning environments. Practically, it encourages educators to adopt these technologies for enhanced academic performance and urges policymakers to invest in infrastructure and training for effective implementation.

CAXF-LCCDE: An Enhanced Feature Extraction and Ensemble Learning Model for XSS Detection

Submitted by: Yadhu Gopakumar

Threats to businesses, organizations, and individuals have become more complicated and varied due to the constant evolution of cyberattack strategies brought about by the quick development of Internet technologies. Cross-Site Scripting (XSS) remains one of the most pervasive and dangerous threats among the many that target online application security. This emphasizes the importance of strong detection mechanisms to protect user information and preserve system integrity. Combining machine learning with intrusion detection systems successfully addresses this problem and enhances XSS detection capabilities. This work provides a new feature extraction technique designed specifically for XSS, called Comprehensive Analysis of XSS Features (CAXF). We combine it with Leader Class and Confidence Decision Ensemble (LCCDE), an ensemble machine learning approach. This combination efficiently identifies various XSS attack types, such as reflected, stored, and DOM-based variations. Extensive trials were carried out on well-annotated datasets with typical samples of these XSS categories. The findings demonstrate that the suggested CAXF-LCCDE framework significantly outperforms conventional resilience and detection accuracy models. Furthermore, the results highlight how crucial tailored feature engineering and algorithm selection are for cybersecurity applications. This work provides important information for creating stronger and more dependable XSS attack defenses.

An Iterative Systematic Analytical Review of Machine Learning Techniques for Blockchain Optimization

Submitted by: Yadhu Gopakumar

The exponential growth of blockchain and machine learning (ML) technologies has catalyzed innovations across domains; however, the lack of comprehensive reviews addressing their integration limits our understanding of their synergistic potential. Existing reviews focus on specific applications and neglect scalability, security, and performance metrics that are critical for deploying ML-blockchain frameworks in complex environments. To bridge these gaps, this study conducts a comprehensive review of the most recent state-of-the-art research that evaluates methodologies, performance metrics, and their applicability. The reviewed methods include random forests, federated learning (FL), explainable AI (XAI), reinforcement learning (RL), and federated/hybrid models such as federated reinforcement learning and learning chains. These methods have emerged with the potential to support the balance among accuracy, privacy, and scalability across a variety of domains, such as the Internet of Things (IoT), healthcare, smart grids, and decentralized finance scenarios. This review identifies optimal methods for blockchain optimization and scalability enhancement, while providing a roadmap for integrating advanced ML techniques with blockchains. The findings will assist in significantly advancing domain knowledge in blockchain and guide future research and real-world implementation operations.