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Education is the most powerful weapon to bring empowerment.

- Achyuta Samanta



KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY
Deemed to be University U/S - 3 of the UGC Act, 1956
SCHOOL OF COMPUTER ENGINEERING

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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Publications

Adverse impacts of metaverse-induced cognitive biases on the immersive shopping experience: a conceptual model developed from a qualitative approach

Immersive shopping (IS) is the usage of simulation-based technology like metaverse to create interactive and highly personalised shopping experiences for customers wherein they spend quality time selecting the products, which increases their familiarity with the brand. When compared to a standard shopping experience, the IS experience (ISE) offers brick-and-mortar retailers a positive brand image. However, the metaverse can induce cognitive biases (CBs) in customers that can negatively influence their reasoning and decision-making. Therefore, this study explores the adverse impacts of metaverse-induced CBs on ISE for brick-and-mortar retail customers. Using simple random sampling, data were collected from 20 customers, and a qualitative approach was used for data analysis. The finding produces three adverse impacts for ISE. First, metaverse-induced CBs create a digital divide between customer communities, and the integration of retail services with the metaverse further aggravates the risk of this divide. Second, metaverse-induced CBs create financial malfeasance, which makes the metaverse susceptible to financial biases. Third, metaverse-induced CBs increase business reputation risk by adversely impacting decision-making, strategy formulations, and outcomes.

***Soumili Ghosh
Rajat Kumar Behera
Pradip Kumar Bala
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***Technology in
Society
Elsevier***

An adaptive explainable AI framework for securing consumer electronics-based IoT applications in fog-cloud infrastructure

A prominent use case of consumer electronics-based Internet of Things (IoT) applications, focused on smart cities, is connected devices that enable cities to optimize their operations via access to high volumes of sensitive data. Yet, these devices commonly utilize public channels for data access and sharing, requiring consistent communication protocols and an Intrusion Detection System (IDS) with the aid of AI. However, most of them involve high computation and communication costs. They are not fully reliable, either. Also, AI-based IDS solutions are viewed as black boxes because they cannot justify their decisions. To resolve these issues, we have proposed a framework based on explainable artificial intelligence (XAI) for securing consumer IoT applications in smart cities. At the beginning of the protocol execution, the participants exchange authenticated data through the blockchain-based AKA procedure. Meanwhile, we adopt the Python-based Shapley Additive Explanation (SHAP) framework to explain and interpret the core features guiding decision-making. The working model of this framework depicts its validation with recent benchmark methods.

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***IEEE Transactions
on Consumer
Electronics***

Protecting IoT-enabled healthcare data at the edge: Integrating blockchain, AES, and off-chain decentralized storage

In this article, we propose a blockchain-based data-protection scheme deployed at edge nodes. The proposed scheme uses the interplanetary file system (IPFS) model to address storage and data-protection issues in an IoT-edge-enabled smart healthcare system. First, the security issues in smart healthcare systems are identified, and the impact of these issues on patient privacy and hospital infrastructure is considered. A technique based on the 128-bit Advanced Encryption Standard is proposed to encrypt patient information and store it in an IPFS-based decentralized network. Edge-computing techniques are used to perform computations at the edge level within a decentralized architecture, thereby addressing the computational challenges associated with cloud computing. The encryption keys are stored using blockchain technology to address the issue of restricted computational power on low-end devices through off-chain and on-chain business processes. The experimental results demonstrate that the proposed scheme achieves a key management time of 0.2 ms, file retrieval time of 0.57 s, throughput of 0.11 Mb/s, encryption time of 1.96 ms, and decryption time of 1.91 ms.

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***IEEE Internet of
Things Journal***

A comprehensive survey on data distillation: Techniques, frameworks, and future directions

The increased adoption of machine learning techniques has led to exponential growth in data generation and utilization. Data distillation has emerged as a promising solution that reduces dataset size while preserving the essential information and optimizing computational resources. This survey provides a comprehensive analysis of data reduction techniques, covering methodologies, such as knowledge distillation (KD), core-set selection, hyperparameter optimization (HPO), and generative modeling. We further explore various data distillation learning frameworks, including performance, gradient, parameter, and distribution matching (DM), 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.

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***IEEE Internet of
Things Journal***

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

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.

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***Expert Systems
with Applications
Elsevier***

A novel speech signal feature extraction technique to detect speech impairment in children accurately

Speech signal processing and extracting useful information from speech signal is necessary for speech language impairment (SLI) detection in children. In this work, a study has been carried out to obtain optimal feature extraction technique for SLI detection. Inputs used for SLI detection here are the speech signals recorded from children. Features are first extracted from the recorded speech signals using various feature extraction techniques. The feature extraction techniques that has been implemented are relative spectral transform – perceptual linear prediction (RASTA), wavelet packet transform (WPT), linear predictive coding (LPC), perceptual linear prediction (PLP), Mel-Frequency cepstral coefficients (MFCC), complex quantization cepstral coefficient (CQCC), perceptual noise cepstral coefficients (PNCC). The features extracted are then given to deep learning models namely transformer, temporal convolutional networks (TCN) and TabNet for SLI detection. The result obtained has highest accuracy of 100.00 % using PNCC feature combined with TabNet method. The novelty of the method is that the PNCC features has not been suggested for SLI detection previously. The proposed method can be used for speech impairment detection and monitoring by therapist and doctors.

Manisa Manoswini
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Aleena Swetapadma

***Computers in
Biology and
Medicine
Elsevier***

A smart contract solution for transparent auctions on permissioned blockchain platform

The rapid and advanced development of the Internet and Technology in recent years has led to the increased popularity of online electronic auctioning (e-auction) systems like eBay. These e-auctions are becoming increasingly essential to the global economy and hold a promising future as they increase user participation and provide advantages such as time-saving, low cost, and ubiquity (not limited to geographic location). However, existing real-time e-auction systems are centralized and rely on intermediaries, leading to issues such as lack of transparency, corruption, security risks, interoperability, and low trust from bidders and auctioneers. To address these issues, we present a permissioned blockchain-based transparent auction system that allows participants to participate in the auction and bidder organization in a single decentralized platform. Auctioneer announces the auction then bidders submit an individual bid for the auction during the auction period. In this paper, we present the implementation of smart contracts over the Hyperledger Fabric platform, conduct testbeds using the caliper benchmark tool, and report the results.

***Sujata Swain
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***Computers and
Electrical
Engineering
Elsevier***

Distill to Delete: Unlearning in Graph Networks With Knowledge Distillation

Graph unlearning has emerged as a pivotal method to delete information from an already trained graph neural network (GNN). One may delete nodes, a class of nodes, edges, or a class of edges. An unlearning method enables the GNN model to comply with data protection regulations. Our work takes a novel approach to address these challenges in graph unlearning through knowledge distillation, as it distills to delete in GNN (D2DGN). It is an efficient model-agnostic distillation framework where the complete graph knowledge is divided and marked for retention and deletion. It performs distillation with response-based soft targets and feature-based node embedding while minimizing KL-divergence. The unlearned model effectively removes the influence of the deleted graph elements while preserving knowledge about the retained graph elements. D2DGN surpasses the performance of existing methods when evaluated on various real-world graph datasets by up to 43.1% (AUC) in edge and node unlearning tasks. Other notable advantages include better efficiency, better performance in removing target elements, preservation of performance for the retained elements, and zero overhead costs.

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***IEEE Transactions
on Neural
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PQKELP: Projected Quantum Kernel Embedding based Link Prediction in dynamic networks

Projected Quantum Kernels (PQK) presents an elegant solution to achieve quantum advantage by simple quantum projection using the kernel trick, followed by a projection back to the classical state with relabeled data. In this work, we propose Projected Quantum Kernel Embedding based Link Prediction (PQKELP), a projected quantum kernel (PQK) approach on random walk embedding-based features to solve the link prediction problem. Thereby achieving a two-fold improvement by combining embedding generation and quantum projection, resulting in quantum-enhanced embedded features that enhance link prediction performance. Extensive experiments and analyses were done with a set of well-known random walk methods, i.e., Node2Vec, DeepWalk, and Walklets, also with six classical machine learning techniques and on five well-known dynamic network datasets. The results including several performance metrics like accuracy, AUC, F1-score, and precision show that our proposed model is better than traditional link prediction methods, classical machine learning approaches, and even the most cutting-edge methods available currently.

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***Expert Systems
with Applications
Elsevier***

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

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 $42.1 \pm 2.8\%$. We further discuss complexity and scalability, highlighting the scheme's suitability for deployment in resource-constrained IoT environments.

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***IEEE Transactions
on Services
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