

## **EAI CloudCom 2024 Programme**

**9 September 2024**

**9:00 Registration**

**9:30 Welcome Message by Prof A. Church**

**10:00 Keynote Presentation:** *On Blockchain: Design Principle, Building Blocks, Core Innovations, and Misconceptions*

Prof W. Zhao, Cleveland State University, USA

**10:50 Morning Tea break**

**11:20 Presentation Session 1**

Chair - Prof Yang

**11:20 Admission Control and Scheduling of Offloaded Tasks over Mobile Edge**

Abstract:

Mobile Edge Computing (MEC) brings resourceful mobile edge servers to a network's edge. The latest wireless communication technologies provide high bandwidth. The combination of state-of-the-art communication technologies and MEC enables a multitude of real-time communication and computing use cases, such as connected cars, augmented reality, etc. Offloaded tasks most often belong to real-time applications, hence a mobile edge server needs to complete execution of such tasks within defined latency requirements. To satisfy these latency requirements, admission control and scheduling algorithms are presented here. The admission control algorithm ascertains that only those tasks' offloading requests are admitted for execution on a mobile server whose latency requirements can be satisfied, and that the admission of a new task does not result in missing execution latency deadlines of already offloaded tasks. The admission control algorithm also allocates a time-slice (per unit-time) for offloaded tasks corresponding to each core on which tasks execute. Afterwards, our scheduling algorithm schedules offloaded tasks on cores selected by the admission control algorithm, and it ascertains that each task's execution latency requirements are satisfied. We show how the proposed admission control and scheduling algorithms outperform existing algorithms.

Authors:

Muhammad Omer Farooq      Munster Technological University

Thomas      Kunz      Carleton University

**11:50** *An LLM-based Agent Framework for Dynamic and Semantic Data Fusion, Integration and Engineering for Data Analysis*

Abstract:

Large Language Models (LLMs) have revolutionized numerous domains but face challenges in effectively harnessing enterprise data while safeguarding privacy. This study presents a novel framework combining LangChain technology with OpenAI's GPT-3.5 model, bridging the gap between enterprise data and LLM capabilities. By ensuring robust privacy safeguards through Explainable AI, LangChain facilitates secure data utilization without compromising sensitive information. The proposed framework accommodates major data source types and offers scalability to incorporate additional data types and sources. It features an LLM-powered data ingestion system, enabling automation and enhancing business intelligence applications. Leveraging advanced NLP capabilities, the system excels in language-driven data ingestion, showcasing the potential of LLMs. The efficacy of framework is evaluated against existing data ingestion methods, highlighting its dynamic nature empowered by a Python framework. Through a comprehensive analysis encompassing accuracy, response quality, usability, and profitability, LangChain demonstrates its superiority. The major advantage of this framework is the transparency, which is prioritized through a human-readable insights approach, providing users visibility in-to AI-generated content. Rigorous testing methodology, employing a diverse set of questions, showcases framework's satisfactory accuracy rate, with 12 out of 15 responses meeting expectations.

Authors:

Hong Qing Yu, University of Derby

Kasun C. Siriwardhana, University of Derby

**12:12** *Understanding Human Behavior through Smart Home IoT Data Analysis: Patterns and Insights*

Abstract:

This paper outlines the preprocessing methods and utilisation of clustering algorithms on a dataset capturing individual tasks within a household (via energy consumption and reactive sensors). The analysis spans seven months that includes multi-sensor readings from a single household. In an effort to identify patterns through Human Activity Recognition (HAR), various clustering algorithms were applied to refined data to compare their respective outcomes. Hence, the paper examines multiple clustering algorithms suitable for the dataset exceeding 800,000 instances after preprocessing. It delves into the real-world applications of smart home data and conducts initial experiments where feasible, comparing results to uncover patterns indicative of user habits and changes therein. The study emphasises the potential for early intervention, particularly in identifying deviations to assist individuals such as those with dementia.

Author:

Md Israfil Biswas, University of Bedfordshire

**12:50** *Empowering HEIs through LLMs and Cloud Computing: Strategies for Seamless Integration and Sustainable Transformation*

Abstract:

Building upon my previous paper's exploration of the transformative potential of Large Language Models (LLMs) in higher education, this paper reaches into the critical role of cloud computing in enabling the smooth integration and sustainable transformation of Higher Education Institutions (HEIs) through LLMs. By examining the mutually beneficial relationship between LLMs and cloud technologies, this paper highlights how the cloud empowers HEIs to utilize the full potential of LLMs, overcoming challenges related to scalability, accessibility, and cost-effectiveness. The paper presents a comprehensive framework for the strategic integration of LLMs and cloud computing within HEIs, addressing key considerations such as data privacy, security, interoperability, and ethical governance. Through a systematic review of case studies and best practices, the paper offers actionable insights and recommendations for HEIs to navigate the complexities of LLM deployment in the cloud era. The findings emphasize the importance of a holistic, collaborative approach that engages diverse stakeholders, prioritizes data management, and aligns with the core values of higher education. By incorporating the merging of LLMs and cloud computing, HEIs can unlock new limits in personalized learning, research innovation, and societal impact, ultimately redefining the future of higher education in the digital age.

Authors:

Mohamed Idris, University of Bedfordshire

X. Feng, University of Bedfordshire

Vladimir Dyo, Royal Holloway, University of London

**13:20 Lunch**

**14:20 Presentation Session 2**

Chair - Dr Yu

**14:20** *Network Intrusion Detection by Adaptive Deep Metric Learning*

Abstract:

In the realm of network security, advancements like 5G, IoT, and cloud computing have expanded network environments and real-time traffic complexity, accompanied by a rise in diverse and sophisticated cyber-attacks. This paper introduces a self-adaptive discriminative autoencoder (SADAE) method which is developed

through deep metric learning aiming to effectively detect various network intrusions. SADAE integrates  $K$  local autoencoders and one global autoencoder: the former captures diverse data distributions, whilst the latter governs network traffic representation scale. Through effective self-adaptive metric learning, the proposed SADAE is able to identify and extract discriminative features to automatically detect various network traffic classes, enhancing data separability and improving detection accuracy. For validation and evaluation, the proposed approach was applied to the binary NSL-KDD datasets and multi-class CSE-CIC-IDS2018 datasets. The experimental results demonstrate SADAE's effectiveness in detecting and categorising network intrusion anomalies in reference to other popular deep learning and metric learning approaches.

Authors:

Qi Zhang, Dalian Maritime University

Mingxiao Zheng, Dalian Maritime University

Yanpeng Qu, Dalian Maritime University

Prof Longzhi Yang, Professor of Northumbria University

#### **14:50 *Enhancing Biometric Security: Advancements in EnvironmentIndependent Channel State Information Analysis***

Abstract:

This research paper explores the field of Channel State Information (CSI) biometrics, focusing on its applications, methodologies, and potential advancements. Through a thorough literature review, key trends and challenges in CSI biometrics are identified. A novel data collection methodology utilizing ESP32 is designed and demonstrated, enabling real-world CSI data capture. An analysis plan incorporating signal processing and machine learning techniques is outlined for extracting insights from the collected data. Additionally, a significant knowledge gap in environment-independent authentication within CSI biometrics is highlighted. This paper contributes to the field by providing practical insights into CSI biometrics implementation and analysis, while also identifying avenues for future research to address existing challenges and advance the field.

Author:

Lukasz Migacz, University Of Bedfordshire

#### **15:20 Afternoon Tea**

#### **15:50 *Identifying the 'gaps' where Cloud Computing***

Abstract:

This paper tries to identify cloud computing as an aid to the existing computer law on cyber stalking and cyber bullying in India. The computer laws are there in the country for over two decades, but they still fail to truly identify the tort and its remedial measure. A secondary study is therefore being conducted, as evidential support, to the applicability of cloud computing in computer laws on cyberstalking and cyberbullying. The findings support the claim that the cloud's interconnectedness, inoperability, and ubiquity can create various opportunities to nab Cyberstalkers and remove the ambiguity of the law.

Authors:

Ameema Miftha, University Of Bedfordshire

Marc Of Conrad, University Of Bedfordshire

Marcia Gibson, University Of Bedfordshire

### **16:20 *AI and Digital Forensics with Cloud – Edge Computing and Law Education Impact***

Abstract:

The Impact of Artificial Intelligence innovation on the cloud-edging computing had a significant influence on forensics science education. An investigation had been carried out this year, a forum on the impact of recent AI innovation to cloud computing and edge computing, digital forensics between collaborations were demonstrated here. A research has been carried out about ICT, Information data and related subject area to present. It would be useful to demonstrate the impact and challenge the educators facing with the current AI innovation, which could be useful for many forensics science teachers, students, engineers or ICT professionals in the article. Cloud - edging forensics should be belong to one of the future forensics science that served for the cloud – edging computing data management and governance of ICT technology. In/by the cloud - edge computing requirement, the cloud - edge computing aiming to decrease the usage of ICT resources in facilities, to avoid possible cyber risks. To support massive information data analytics, system bandwidth and computational power. Inside this article, our aim and objectives are to analysis the impact of recent Artificial Intelligence technology affect to Computer Law on Cloud - edge computing, forensics science, in particular, the impact on digital forensics education in universities, technical colleges, schools and professional training agencies in education).

Author:

X. Feng, University of Bedfordshire

**18:00 Best Paper Award announcement**

**18:20 Conference Meal**

**20:30 End of the 1st day of conference**

**10 September 2024**

**10:00 Presentation Session 3 - virtual presentations**

Chair - X Feng

**10:00 *Lightweight CSI Feedback with Global Context Attention***

Abstract:

In future wireless communication systems, reconfigurable intelligent surfaces (RIS) present a promising technology. However, in RIS-assisted communication systems, feedback of downlink channel state information (CSI) poses significant challenges, particularly with a large number of base station (BS) antennas and RIS unit cells. Traditional CSI feedback methods based on compressed sensing assume channel sparsity and require extensive computation and storage operations by both the user equipment (UE) and the BS, thereby increasing the burden on the UE. This paper proposes a lightweight CSI feedback mechanism based on global context attention network (GCANet). This method uses a lightweight autoencoder at the UE for CSI encoding, reducing the computational and storage burden on the UE, while deploying the decoder at the BS to leverage its powerful computational capabilities for complex decoding tasks. Simulation results demonstrate that this method significantly reduces feedback overhead and enhances system performance, with the UE's encoder model parameters and computational load being substantially reduced compared to baseline methods.

Authors:

Hao Feng, Peking University

Yuting Xu, Peking University

Yuping Zhao, Peking University

**10:30 *AI for Law and AI under Law in China***

Abstract:

This article briefly examines the impact of Artificial Intelligence (AI) on Chinese Legislation and the legal sector. It highlights the emerging issues that have come to the forefront due to the rapid advancement of AI. Furthermore, it will assess how the Chinese regulatory regime addresses these problems and how AI technology transforms the legal industry.

Authors:

Jian Wang, China Foreign Affairs University

Junke Xu, China Foreign Affairs University

**11:00 *Leveraging Artificial Intelligence Integration in Regional Sports Education to Foster Equitable and Sustainable Development***

Abstract:

Regional disparities in sports education are a pressing issue, marked by variations in resources, standards, and participation levels. This paper proposes leveraging artificial intelligence (AI) to address these disparities, supported by literature review, expert insights, and data analysis. Causes include economic, urban-rural, regional, and ethnic factors. Strategies involve raising awareness, enhancing teacher training, and establishing AI demonstration sites. However, AI integration poses risks such as data privacy, technological reliability, and ethical concerns. Recommendations include reinforcing data privacy, improving technological reliability, and establishing clear ethical guidelines. Diversification in developmental approaches is crucial, involving broad societal participation to ensure equitable access to quality sports education.

Author:

Shuyi Li, Dalian Maritime University

**11:20 Tea break**

**11:50 Presentation Session 4**

Chair - Dr Jon Hitchcock

**11:50 *Blockchain in Space-Air-Ground Integrated Networks: A Critical Look***

Abstract:

In this paper, we provide a concise review on the use of blockchain in space-air-ground integrated networks (SAGIN). Our study is guided by several research questions. First, we identify the objectives of the blockchain-based solutions for SAGIN. Second, we investigate how the blockchain technology is used to achieve the objectives. Third, we evaluate the maturity levels of the proposed blockchain-based solutions. Our findings show that blockchain has been used in the areas of dynamic spectrum management, crowd-sensing, traffic offloading, computation offloading, geofencing for unmanned air vehicles, data sharing, authentication of various SAGIN-connected entities, security of air traffic management, data security, and trustworthiness of the network. All studies proposed some forms of custom blockchain instead of using an existing public blockchain platforms to achieve their intended objectives. Furthermore, most studies chose to use some traditional distributed consensus algorithms and other non-mainstream algorithms for the proposed blockchain solutions. Except for a couple of studies, in which Hyperledger was used as the basis for customization, none of the studies validated the proposed solution experimentally. In addition to the research questions, we highlight pervasive misconceptions and misunderstandings regarding the blockchain technology and provide a guideline on how to properly develop blockchain-based solutions for SAGINs.

Authors:

Wenbing Zhao, University Cleveland, USA

Shunkun Yang, Beihan University, China

Xiong Luo, University of Science and Technology, Beijing, China

**12:20** *SecureCloud: A Cross-Platform Encrypted File Sharing Solution with Forensic Imaging Capability*

Abstract:

In this age of AI dominating the digital panorama, the way we deal with, and procedure records has grown to be a sensitive circumstance. As individuals' percentage sensitive non-public information and files over the net, a veil of uncertainty shrouds the adventure of those files, leaving us brooding about how inclined the device is to ability misused with the aid of malicious actors. This uncertainty extends to the protection of facts saved on our devices and how securely online provider companies manipulate our documents. Amid these issues, enterprise giants like Apple and Microsoft have taken proactive steps to deal with this issue. Notably, Apple, a brand recognised for its trustworthiness and successful products, has launched the latest marketing campaign squarely centred on improving privacy. Acknowledging the evolving panorama, they've committed to bolstering the security features of their gadgets. Yet, this begs the question of how different platforms are responding to privacy and security-demanding situations.

Authors:

Arunpaul Muthupandian, University of Bedfordshire

Mahmoud Artemi, University of Bedfordshire

X. Feng, University of Bedfordshire

Marc Conrad, University of Bedfordshire

**12:50** *Integration of AI and Cloud Computing: Advantages and Challenges*

Abstract:

Cloud technology has led to a major growth in business cooperation. Each of the procedures has been improved by the use of AI. An organisation can benefit from excellent data security and low maintenance costs with a cloud computing solution. The success of cloud services techniques is significantly influenced by the application of artificial intelligence in particular industries. As a result, the combined effect of these two developments increases the prosperity of certain firms. Public clouds function better when smart devices and computer vision models are used. It has also shown how businesses may gain from integrating AI into public cloud plans in several ways. This research provides insight into the advantages and challenges of combining artificial intelligence with cloud computing.



Author:

Sehrish Khan, University of Bedfordshire

**13:10 Lunch**

**14:10 Presentation Session 5**

Chair - X. Feng

**14:10 *Discriminative Features Learning-based Convolutional Neural Network***

Abstract:

Object detection algorithms aim to classify and detect object class instances in images or videos. The effectiveness of these object detectors is due to substantial improvement in the deep convolutions neural networks. However, very few attempts have been made to explore the positive and negative object regions and to differentiate between similar objects with a distracting background in challenging scenarios. To achieve optimum training and completely leverage the capacity of model architectures, it is important to mitigate inter-class and intra-class variations during the training of the classifier to improve accuracy. To improve the accuracy, we proposed a new framework, using InceptionResNet-V2 and Resnet101 models as a backbone with a triplet loss function. The proposed framework learns the mapping from images to compact Euclidean distance, where the distance directly corresponds to a measure of object similarity. This new framework backbone trained with triplet loss function can be plugged into any detector. In our case, we selected SSD and replaced the original backbone network VGG-16 of SSD. The triplet loss function improves the classification performance and improves accuracy which leads to efficient object detection. Moreover, extensive experiments on the PASCAL VOC 2007 and PASCAL VOC 2012 datasets show the efficacy and enhancement of the proposed method, by comparing it with other states of the art methods.

Authors:

Tanvir Ahmad, Xi'an University of Architecture and Technology, China

Asad Ullah, University of Bedfordshire, UK

Bian GenQing, Xi'an University of Architecture and Technology, China

Fan Zhang, Xi'an University of Architecture and Technology, China

Belal Ahmad, Huazhong University of Science and Technology, China

**14:40 *Monitoring Patient Apps Security Vulnerabilities***

Abstract:

The rapid growth of self-monitoring patient apps has revolutionized the healthcare industry, enabling individuals to track their health metrics and engage more actively

in their own care. However, this technological advancement has also introduced significant security and privacy concerns. This article examines the security vulnerabilities inherent in self-monitoring patient apps, highlighting the risks to patient data and the potential consequences of these vulnerabilities. It explores the common security flaws found in these apps, such as weak authentication mechanisms, inadequate data encryption, and the lack of secure data transmission protocols. The article also discusses the regulatory landscape and the need for comprehensive security standards to protect patient privacy and ensure the integrity of health data. Finally, it provides recommendations for app developers, healthcare providers, and policymakers to address these vulnerabilities and enhance the security of self-monitoring patient apps.

Author: Khalid Hussein, University of Bedfordshire

**15:30 Afternoon tea**

**15:40 Conference closing remarks**

**15:50 End of Conference**

