Editorial

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Biographical notes: Ruey-Shun Chen is a Professor of Information Management at National Chiao-Tung University, Taiwan. His current research interests include artificial intelligent, bio-inspired computing, soft computing, deep learning, context-awareness, and data mining. His research has been published or is forthcoming in over 100 SCI/SSCI journal papers and a number of national and international conference proceedings, such as *IEEE Transactions on Systems, Man, and Cybernetics* (Part B), *IEEE Systems*, *IEEE eXplore*, *IEEE Access*, *Applied Soft Computing*, *Information Sciences, Computers and Electrical Engineering*, *European Journal of Operational Research*, *Information & Management*, *Knowledge-Based System*, *Fuzzy sets*, *Pattern Recognition Letters*, *Neurocomputing*, and *Engineering Applications of Artificial Intelligence*.

L. Mary Gladence is an Associate Professor in the School of Computing, Sathyabama Institute of Science and Technology, Chennai, India. She has 16 years of experience. Her research interests include deep learning, artificial intelligence, data mining, sequential pattern mining, machine learning, bio computing, and data analytics, with more than 70 publications in these areas. She has been a guest editor and reviewer in refereed international journals such as *IEEE Access*, *Library Hi-Tech*, *Journal of Super Computing*, *Journal of Medical and Biological Engineering*, *Computer communications*, etc. She has completed a project titled 'Cattle farm management using RFID tags', funded by Unnat Bharat Abhiyan (UBA), MHRD, Govt. of India, and is currently working on the project titled 'Inventorization of waste management: the global scenario', Technology Business Incubator, NSTEDB-DST, Govt. of India.

1 Introduction

The Internet of Things (IoT) has emerged as an important new technological paradigm to facilitate the development of new innovations and to improve quality of life. Edge computing approaches provide an attractive solution for processing the data used in IoT applications, and researchers are urgently seeking ways to further reduce edge computing energy consumption, improving response times, and increasing resource capacity. These efforts not only improve the performance of smart devices within the network perimeter but also cloud server operations. The resulting services benefit from network contextual-awareness, low response times, and network traffic offloading. Owing to the heterogeneity and variability of edge computing, performance should be evaluated using formal modelling, verification, and testing methods to ensure their dependability, correctness, and security.

However, such an approach to evaluating the functional and non-functional aspects of edge computing raises particular challenges, and considerable research and development efforts are currently devoted to formal modelling, verification, and testing approaches.

2 Papers in the current issue

The first theme of this special issue focuses on 'Theories, models, and algorithms for edge computing technologies'. Zhang applied the ADMM (Alternating Direction Multipliers Method) to the cloud computing framework, thereby improving the speed of big data acquisition for parallel battery back states and minimising the data fitting issue. Zhao developed a new facial recognition algorithm based on edge computing, achieving recognition accuracy rates as high as 98%, with an average matching time of only

1.79 s. Zhang integrated the Bidirectional RNN network model with an edge computing architecture to construct a intelligent grammar error correction system using deep learning approaches that outperforms other natural language processing models. Qin and Yu used data mining techniques to construct a basketball scoring database, applying association rules to identify factors affecting the scoring recognition rate in a 6G IoT environment. Zhou and Zheng used the immune algorithm (IA), particle swarm optimisation (PSO) algorithm, and immune PSO (IPSO) algorithm to develop path planning for football robots. Their approach integrates edge computing techniques including a wireless communication subsystem and robot vision. Wei and Xu used CNN (Convolutional Neural Networks) for large-scale image recognition and processing to identify pavement cracks with accuracy and loss rates that improve on the AlexNet model. Gao and Yu proposed a modified fuzzy support vector machine (FSVM) method for human behaviour recognition based on the dynamic and static characteristics under an edge computing framework. Zhong proposed an intrusion recognition model based on K-DNN (K-nearest neighbour classification Deep Neural Networks) and an edge computing framework to identify and prevent various types of network intrusion. Xia developed a new music recommendation system using hybrid DLANN (Deep Learning Artificial Neural Network) and MEC (Mobile Edge Computing) technologies. Their empirical results show the proposed system can increase deep learning computation efficiency and storage capacity. Wang and Cai designed a multi-touch system based on backpropagation neural network (BPNN) techniques and compared the resulting performance against the Hidden Markov model (HMM) method. Their empirical results provide a useful reference for intelligent IoT technologies in the field of interactive art. Su developed an intelligent classroom model based on a multi-layer backpropagation (BP) neural network integrated with a genetic algorithm (GA) to generate personalised learning recommendations for students. Their work also applied the YOLOV3 (you only look once) approach to detect and evaluate learner engagement.

The second theme of this issue focuses on 'New edge computing frameworks for intelligent services and smart living'. Huang and Shao applied edge computing techniques to urban sculpture space design and planning to predict and monitor actual energy consumption demand. Sun developed a real-time assessment approach of permanent deformation and fatigue life of mixed asphalt layers based on BIM (Building Information Modelling) in an edge computing environment. Leou et al. investigated the application of IoT technologies in urban sports events to improve participant involvement and satisfaction in marathons. Wang developed human resource analysis and management system based on mobile edge computing (MEC) technology. The proposed system achieves efficient real-time administration of human resources and detailed monitoring of business operations. Cao et al. applied edge computing to wind farm data acquisition and management. Zhou and Weng used the analytic hierarchy process (AHP) and fuzzy comprehensive evaluation (FCE) to assess the data security of financial information sharing platforms, and their proposed model effectively reduces costs and improves enterprise financial management efficiency. Deng constructed a shared financial service centre in a cloud computing environment, effectively increasing financial work processing efficiency while reducing costs. Yu developed the tourism scene monitoring system by using the mobile edge computing with the business-driven action learning approach. This research can be a reference for the tourism industry.

3 Conclusion

This special issue highlights the latest research focusing on edge computing-based formal modelling, verification, and testing, seeking to address practical and immediate challenges to further advances. The issue features a broad range of original and timely work that point towards new directions and developments.

We would like to thank all the contributors to this special issue for their outstanding participation and contributions. Particular thanks are due to the Editor in Chief, Professor Fatos Xhafa, for his tremendous efforts and support. We are confident that readers of *IJGUC* and scholars researching edge computing will find this special issue to be of great interest and benefit.