Guest Editorial
Current State of the Art of AI Computing, IoT and Big Data Technologies

Ka Lok Man, Tomas Krilavičius, Sangoh Park

Recent progress in deep learning has unleashed some of the promise of artificial intelligence, moving it from the realm of toy applications to a powerful tool that can be leveraged across a wide number of industries. In this new era, analytics is becoming a competitive necessity and key for many applications, such as internet technology, mobile applications, web application of social media, Internet of Things (IoT), computing, and computer engineering. There are many challenges of applying/analyzing such technologies, with the most often discussed being growing data volumes, velocity of data, and variety of data which are placing increased demands on industry. Powered by the integration of new technologies/applications in internet technology, computing, IoT and computer engineering, deep learning and artificial intelligence technologies provide fundamentally new insights and opportunities for businesses, industries and academia. Therefore, research in computational technologies, platforms, and tools offers adaptive mechanisms that will provide more efficient and effective solutions to real industrial problems. It is expected that such research will help in the development of policies, strategies, and methodologies as well as the shaping of organizational behaviors towards the adoption of these new technologies.

This Special Issue will provide a systematic overview and state-of-the-art research in Internet Technology, Computing, IoT and Computer Engineering Technology, with a special focus on Deep Learning and Artificial Intelligence technologies, and will outline new developments in fundamental, approaches, methodologies, software systems, and applications in these areas. Also, the main goal of this special issue is to offer an opportunity for all practitioners to contribute with their original research and review papers. Outstanding papers have been selected from those accepted by and presented in the International Conference on Recent Advancements in Computing, Internet of Things (IoT) and Computer Engineering Technology (CICET 2018), October 29-31, 2018, Taipei, Taiwan. CICET 2018 is hosted and organized by The Tamkang University amid pleasant surroundings in Taipei, which is a delightful city for the conference and traveling around.

Each selected paper is substantially extended with at least 40% of difference from its conference version. This issue presents four high quality academic papers. Also, this mix provides a well-rounded snapshot of current research in the field and provides a springboard for driving future work and discussion. The four papers presented in this issue are summarized as follows:

1. *"Chinese Microblog Sentiment Analysis by Adding Emoticons to Attention-Based CNN"*: Yi-Jen Su, Chao-Ho Chen, Tsong-Yi Chen, Cheng-Chan Cheng reported that nowadays people are used to sharing their views and ideas on social media service (SMS) platforms and generating enormous amounts of data every day. Sentiment analysis was adopted in their research to discover embedded information in Chinese short texts, serving as an integral part of Social Media Monitoring and Analytics. They proposed a deep learning method: Attention-of-Emoticons Based Convolutional Neural Network (AEB-CNN), by integrating emoticons and attention-based mechanisms with CNN to enhance the accuracy of sentiment analysis without external knowledge. Implementation was performed by TensorFlow and the accuracy of sentiment polarity of Chinese microblogs reached as high as 85.8%.

2. *"Attention-based Recurrent Neural Network for Traffic Flow Prediction"*: Qi Chen, Wei Wang, Xin Huang, Hai-Ning Liang mentioned that traffic flow prediction is a fundamental problem in transportation modeling and management. Neural networks have been widely applied to traffic flow prediction in the past few years. However, existing studies only focus on predicting the traffic flow at next time step, while travelers may need a sequence of predictions to make better travel decisions. To address the above limitation, their paper introduces a long short-term memory encoder-decoder architecture for traffic flow prediction. Experiments demonstrate that the proposed method for traffic flow prediction has superior performance and can be further used for traffic anomaly detection.

3. *"Efficient Implementation of GMDA-based DOA Technique using Pre-training Phase Unwrapping for Source Localization"*: Sang-Ick Kang, Seongbin Kim, Sangmin Lee proposed a novel technique to improve the performance of generalized mixture decomposition algorithm (GDMA) based on a pre-training phase unwrapping. From an investigation of the GDMA

*Corresponding Author: Ka Lok Man; E-mail: kalok2006@gmail.com

scheme, it is discovered that the conventional GDMA method cannot take full consideration of phase unwrapping since the estimated inter-channel phase difference (IPD) slop is initialized by the random. To avoid this phenomenon, their proposed GDMA approach initializes IPD slope from the data of low-frequency bins. Experimental results show that compared to the conventional GMDA method, their proposed GMDA technique based on pre-training phase unwrapping obtains low estimation error and when integrated into a source localization system achieves improved results.

4. *"Roofline-based Data Migration Methodology for Hybrid Memories"*: Jongmin Lee, Kwangho Lee, Mucheol Kim, Geunchul Park, Chan Yeol Park outlined that High-performance computing (HPC) systems provide huge computational resources and large memories. The hybrid memory is a promising memory technology that contains different types of memory devices, which have different characteristics regarding access time, retention time, and capacity. However, the increasing performance and employing hybrid memories induce more complexity as well. In the paper, the authors proposed a data migration methodology called HyDM to effectively use hybrid memories targeting at Intel Knight Landing (KNL) processor. HyDM monitors status of applications running on a system and migrates pages of selected applications to the High Bandwidth Memory (HBM). To select appropriate applications on system runtime, they adopt the roofline performance model, a visually intuitive method. HyDM also employs a feedback mechanism to change the target application dynamically. Experimental results show that the authors' HyDM improves over the baseline execution the execution time by up to 22%.

We strongly believe that all papers included in this Special Issue will have a significant importance for future scientific research works, and also make the contributions to the studies conducted by other researchers, engineers, practitioners and people from industry and business, who work in advanced areas of AI Computing, IoT, Integrated Circuits and Systems and Computer Engineering Technology.

We would like to express our sincere appreciation of the valuable contributions made by all authors. Special thanks go to Professor Han-Chieh Chao, Editor-in-Chief of the Journal of Internet Technology (JIT) and the Honorary Chair of CICET 2018 for offering us to publish this Special Issue, and for his highly supports throughout the entire publication process.

Guest Editors

Ka Lok Man received the Dr. Eng. Degree in Electronic Engineering from Politecnico di Torino, Italy, in 1998, and the Ph.D. degree in Computer Science from Eindhoven University of Technology, The Netherlands, in 2006. He is currently a professor in Computer Science and Software Engineering in Xi'an Jiaotong-Liverpool University, Suzhou, China. His research interests include formal methods and process algebras, AI computing, IoT, embedded system design and testing, and photovoltaics.

Tomas Krilavičius received his Ph.D. from University of Twente, The Netherlands in 2006. He is currently chief scientist and Baltic Institute of Advanced Technology, Vilnius, Lithuania and professor at Applied Informatics department, Vytauto Didžiojo University, Kaunas, Lithuania. His research interests include application of AI, language technologies, and large scientific infrastructures.

Sangoh Park received B.S., M.S., and Ph.D. degrees from the School of Computer Science and Engineering, Chung-Ang University, Seoul, South Korea, in 2005, 2007, and 2010, respectively. He was a Senior Researcher at the Global Science Experimental Data Hub Center, Korea Institute of Science and Technology Information from 2012 to 2017. He is currently a Associate Professor at the School of Computer Science and Engineering, Chung-Ang University, Seoul, South Korea. His research interests include embedded systems, big data systems, cyber-physical systems, and Linux systems.