FOREWORD

Special Section on Deep Learning Technologies: Architecture, Optimization, Techniques, and Applications

Deep learning techniques, including neural network (NN), convolutional neural network (CNN), graph neural network (GNN), graph convolutional network (GCN), recurrent neural network (RNN), long short-term memory (LSTM) network, gated recurrent unit (GRU) network, have been popularly applied to data analyses and management. For instance, the CNN and auto-encoder can be used to analyze the pattern recognition and extract the features of data in various applications such as regression, classification, image recognition, etc. Furthermore, the RNN, LSTM network, and GRU network can be used to perform the time-series inference for chronology-oriented data (e.g. speech data, weather data, transportation data, stock market data, etc.). Regarding the applications in transportation, the advanced driver assistance systems and autonomous cars have been extensively developed based on the deep learning techniques, which enable the forward collision warning, blind spot monitoring, lane departure warning, traffic sign recognition, traffic safety, infrastructure management and congestion, and so on. However, how to enhance the performance and efficiency of these deep learning techniques is one of the biggest challenges of implementing these real-time applications.

Several optimization techniques, e.g. stochastic gradient descent (SGD), adaptive moment estimation (Adam), Nesterov-accelerated adaptive moment estimation (Nadam) algorithms have been proposed to support the deep learning algorithms for efficient solution-searching. For instance, the gradient descent method is a popular optimization technique to quickly seek the optimized weight sets and filters of the CNN for image recognition. Moreover, the hybrid approaches typical of mathematics in engineering and computer science such as the deep learning and optimization techniques can be investigated and developed to support a variety of data analyses and management.

Topics covered in this issue are categorized into eight themes: (1) core methods, (2) smart industry, (3) smart healthcare, (4) smart agriculture, (5) intelligent transportation systems, (6) positioning and navigation, (7) object recognition and tracking, and (8) person image generation. This special issue receives a total of 89 submissions, only 28 articles of which are accepted. An acceptance rate of 31.46% stems from the rigid review process for ensuring that only quality research work with significant results are collected. Relevant statistics of the special issue are shown as follows:

- 89 submissions;
- 28 publications: 6 letters and 22 papers;
- 61 rejections/withdrawals.

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Abel C. H. Chen *(Member)* received his Ph.D. degree in information management from National Chiao Tung University in 2013. He is a senior research fellow for Telecommunication Laboratories, Chunghwa Telecom Co., Ltd. He served as a professor for National Tsing Hua University, National Chiao Tung University, and Fuzhou University. He has published over 300 journal articles, conference articles, and patents. His contributions were published in IEEE Transactions on Intelligent Transportation Systems, ACM Transactions on Sensor Networks, IEEE Internet of Things Journal, IEICE Transactions on Information and Systems, and so on. Some of his publications have been recognised as highly cited papers and hot papers on Web of Science using data from Essential Science Indicators. He serves as an editor for several international journals (e.g., Scientific Data (Nature), Journal of Database Management, Journal of Applied Statistics, IEICE Transactions on Information and Systems, ISPRS International Journal of Geo-Information, and so on). He also serves as a chair for several international conferences (e.g., WWW'23 Workshop, WWW'22 Workshop, AAAI 2022 Workshop, WWW'21 Workshop, IEEE ICC 2020, and so on). His research interests include the Internet of things, network security and machine learning.