

## Guest Editorial: Machine Learning-based Decision Support Systems in IoT systems

Mu-Yen Chen<sup>1</sup>, Jose de Jesus Rubio<sup>2</sup>, and Mirjana Ivanović<sup>3</sup>

<sup>1</sup> National Cheng Kung University, Taiwan, mychen119@gs.ncku.edu.tw

<sup>2</sup> Instituto Politécnico Nacional, Mexico, rubio.josedejesus@gmail.com

<sup>3</sup> University of Novi Sad, Faculty of Sciences, Serbia, mira@dmi.uns.ac.rs

In contemporary research in Information and Communication Technologies, the Internet of Things (IoT) is getting to be one of the most popular technologies that facilitate new interactions among things and humans to enhance the quality of life and computing systems in a lot of domains. In IoT environments, enormous amounts of data is being generated by numerous interconnected smart and intelligent devices. Many different decision-making processes rely on quality and proper processing this data to trigger events or control actuator. With the rapid development of IoT systems, Intelligent Decision Support System (IDSS) paradigm is emerging as an attractive solution for processing and managing the information of IoT devices by providing optimal Quality of Service (QoS). IDSS for IoT systems investigates the massive quantity of complex data to help industry, academicians, medical systems, smart city and other smart applications. Decision support system (DSS) is an intelligent system, which offers excellent assistant in diverse levels of information technology. Besides, it is a dynamic information model as important data is added on a uniform basis. IoT, embedded devices, sensors, mobile applications, manual data entry and online sources are few complex data sources for IDSS. IDSS makes use of a specter of powerful Machine Learning techniques to enhance the process of complex making decisions and prediction. Other Artificial Intelligence techniques such as Metaheuristic, Fuzzy Logic, Case-based Reasoning, Artificial Neural Networks, and Intelligent Agents can be integrated into DSS for IoT systems to increase their reliability and performances. Despite the importance of decision making on IoT systems, this special issue invited researchers to publish selected original papers presenting intelligent trends to solve new challenges of IDSS problems.

This special issue received 43 submissions where the corresponding authors were majorly counted by the deadline for manuscript submission with an open call-for-paper. All these submissions were considered significant in the field, but however, one-half of them passed the pre-screening and quality check by guest editors. The qualified papers then went through double-blinded peer review based on a strict and rigorous review policy of ComSIS Journal. After a totally three-round review, 16 papers were accepted for publication. A quick overview to the papers in this issue can be revealed below, and we expect the content may draw attention from public readers, and furthermore, prompt the society development.

The first article entitled “Adaptive Multiscale Sparse Unmixing for Hyperspectral Remote Sensing Image”, by Li et al. present an adaptive multi-scale spatial sparse hyperspectral unmixing algorithm (AMUA) to deal with the unmixing hyperspectral images. The results show the robustness and accuracy of the AMUA algorithm.

The second article entitled “Evaluation of Smart City Construction and Optimization of City Brand Model under Neural Networks”, by Li et al. integrate the artificial neural

network (ANN) and grey relational analysis (GRA) to evaluate the smart city construction and city brand. Finally, the results show the proposed model has the better performance than the EWM, GRA and TOPSIS methods.

The third article entitled “Security Performance Analysis of Active Intelligent Reflective Surface Assisted Wireless Communication”, by Li et al. apply the Intelligent Reflecting Surface (IRS) to wireless security communication, and design passive/active IRS methods to improve and optimize the security capacity.

The fourth article entitled “Content-only attention Network for Social Recommendation”, by Wu et al. develop a content-only multi-relational attention network (CMAN) for social recommendation. The proposed model jointly estimates the score similarity and trust relationship on user similarity, and further achieves the high recommendation accuracy.

The fifth article entitled “Machine Learning-based Intelligent Weather Modification Forecast in Smart City Potential Area”, by Chao adopts the machine learning approach and decision tree algorithms to develop the weather prediction model. The experimental results illustrate the proposed model can outperform the existing mesoscale regional prediction methods for the bad weather variation.

The sixth article entitled “Predicting Smart Cities’ Electricity Demands Using K-Means Clustering Algorithm in Smart Grid”, Wang et al. adopt the back propagation neural network (BPNN) and K-means clustering algorithm to build the electricity demands prediction model. The experimental results illustrate the proposed model can achieve high accuracy rate of 85.25% and provide a valuable reference for power industry.

The seventh article entitled “Using Machine Learning Approach to Construct the People Flow Tracking System for Smart Cities”, by Yao et al. propose a human target detection algorithm based on convolutional neural network (CNN) model and then construct a people flow tracking system to detect pedestrians effectively. This research is useful for the people flow statistics in public areas under smart city issues.

The eighth article entitled “Using neural network to automatic manufacture product label in enterprise under IoT environments”, by Zhang and Dong applies the KNN, SVM, decision tree, random forest, GBDT, XGBoost, and ANN methods into the manufacturing dataset. Finally, the artificial intelligence model can decrease the frequency of production line shutdown and increase the factory productivity.

The ninth article entitled “Using deep learning to automatic inspection system of printed circuit board in manufacturing industry under the internet of Things”, by Zhang adopts the deep learning approach to construct the automatic optical inspection (AOI) system for printed circuit board (PCB) defects in Industry 4.0. The results show the image recognition rate is 92% and the component recognition rate reaches 99%.

The tenth article entitled “Large-scale Image Classification with Multi-perspective Deep Transfer Learning”, by Wu et al. modify the channel attention module and spatial attention module to construct a multi-perspective convolutional neural network model. The results point out the proposed model outperform other machine learning and deep learning models on ImageNet-1K and Cifar-100 datasets.

In “Using artificial intelligence assistant technology to develop animation games on mobile devices”, Zhang develops an XNA animation game with AI technology including the finite state machine, fuzzy state machine and neural network to improve the learning ability of AI roles than traditional rule-base system. The results demonstrate the ad-

vantages of AI can bring important features such as scalability, reusability and design flexibility for the animation games development.

In “Pedestrian attribute recognition based on dual self-attention Mechanism”, by Fan and Guan use the spatial and semantic self-attention mechanism to construct a robust pedestrian attribute recognition framework based on convolutional neural network model. As the results, the proposed model can improve the recognition accuracy of attributes in both the PETA and RAP pedestrian attribute datasets.

In “Inverse Halftoning Based on Sparse Representation with Boosted Dictionary”, Yang et al. present an image inverse halftone algorithm for error diffusion halftone image by using the deconvolution and the denoising approaches. The experimental results illustrate the proposed algorithm achieves the better PSNR than other comparison algorithms.

In “Selective Ensemble Learning Algorithm for Imbalanced Dataset”, Du et al. develop a selective ensemble learning algorithm based on under-sampling approach for imbalanced dataset. In this study, the G-mean or F-mean will be used to calculate the classification performance of the ensemble stage. As the results, the proposed algorithm obtains the good generalization capability on imbalanced dataset for both of UCI dataset and KDDCUP dataset.

In “Personalization Exercise Recommendation Framework based on Knowledge Concept Graph”, Yan et al. integrate the knowledge structure diagram and constructivist learning theory to build a personalized exercise recommendation framework. The framework is implemented based on a graph neural network and the experimental results are better than other four methods (BKT, DKT, GKT and HGKT).

The last paper “The Duration Threshold of Video Content Observation: An Experimental Investigation of Visual Perception efficiency” by Song et al. design an investigation process into the efficiency of human visual perception on video clips considering exposure duration. The proposed method adopts several indicators to evaluate the performance of image processing, which is different from the traditional AI methods.

**Acknowledgments.** The guest editors are thankful for the hard work and enthusiasm of our authors and reviewers without whom the current issue and the publication of the journal itself would not have been possible. We also thank the Editorial Team members Vladimir Kurbalija, Jovana Vidaković and Davorka Radaković for technically guiding the whole process of preparation of this issue.

