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EDITORIAL

Special issue on "Green and Human Information Technology 2019"

Seong Oun Hwang[1] · Sansanee Auephanwiriyakul[2] · Muhammad Usman Akram[3] · Bok-Min Goi[4] · Chee Seng Chan[5]

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The latest technologies of artificial intelligence (AI) are already pervading our daily life regardless of our recognition. They present big challenges as well as great potentials at the same time. Particularly, advanced technologies of AI including deep learning are actively applied to secure such emerging fields as cloud, Internet of Things (IoT) and so on. Especially in a distributed system environment, block chain is used to address such issues as scalability, efficiency, flexibility as well as security. Recently, there has been considerable advancement in these areas.

In this special issue, we have selected five publications that represent the state-of-the-art research ranging from theory to practice.

In the first paper, entitled "Hard exudate detection in retinal fundus images using supervised learning", the authors propose a new method for automatic detection of hard exudate in fundus images. The method is the combination of image processing techniques and one of the 4 supervised learning approaches including the MLP network, SVM, hierarchical ANFIS, and CNN. From the cross-validation, the MLP network yields the best performance, SVM is the next best one, then the hierarchical ANFIS and the CNN, respectively. The contributions of this work cover both technical and application aspects. From the technical point of view, a new efficient supervised learning method for classification of ill-defined objects, like hard exudates, is proposed. The results suggest that the CNN may not be the best choice when the objects of interest do not have well-defined edges, well-defined shape, and well-defined color. In such cases, a proper set of features and classifiers would still be a good solution. From the application point of view, a new approach is proposed to solve hard exudate detection which will in turn solve the abnormality detection in diabetic retinopathy. The finding that the CNN is not the best choice will result in computational resource reduction which in turn enables possible stand-alone systems that apply the MLP or SVM like in mobile phones, tablets, or low-complexity embedded systems.

In the paper, entitled "Performance optimization of QoS-supported dense WLANs using machine-learning-enabled enhanced distributed channel access (MEDCA) mechanism", authors have proposed a Q-learning algorithm-based method to adjust back-off contention window (CW) size for wireless local area networks (WLANs). As an essential medium access control (MAC) function in IEEE 802.11-based WLANs, QoS-supported enhanced distributed channel access (EDCA) has successfully fulfilled the requirements of real-time multimedia applications. However, one of the challenges of QoS-supported WLANs is addressing the issue of how to reduce the number of collisions in WLANs owing to their distributed contention-based nature. As a solution, EDCA uses a binary backoff (BEB) mechanism, which blindly increases and decreases the CW after collisions and successful transmissions, respectively. However, in dense network

✉ Seong Oun Hwang
sohwang@gachon.ac.kr

Sansanee Auephanwiriyakul
sansanee@eng.cmu.ac.th

Muhammad Usman Akram
usman.akram@ceme.nust.edu.pk

Bok-Min Goi
goibm@utar.edu.my

Chee Seng Chan
cs.chan@um.edu.my

1 Department of Computer Engineering, Gachon University, Seongnam, Republic of Korea

2 Computer Engineering Department, Chiang Mai University, Mueang Chiang Mai, Thailand

3 Department of Computer and Software Engineering, National University of Sciences and Technology, Islamabad, Pakistan

4 Lee Kong Chian Faculty of Engineering and Science, Universiti Tunku Abdul Rahman, Sungai Long, Malaysia

5 Faculty of Computer Science and Information Technology, University of Malaya, Kuala Lumpur, Malaysia

environment, BEB cannot estimate actual congestion in the networks. Even it is worse when the channel fluctuation is severe. In this study, a machine-learning-enabled EDCA (MEDCA) mechanism is proposed for QoS-supported MAC layer channel access in dense WLANs. MEDCA overcomes the limitations of EDCA by implementing a channel observation-based collision probability for the scaling of back-off parameters. Furthermore, one of the deep reinforcement learning models, QL, is used to optimize the performance of multiple types of service applications in the network. QL is one of the prevailing models of machine learning to infer the network density and adjust its back-off CW[AC] accordingly. Simulation results show that the proposed MEDCA mechanism outperforms the traditional EDCA mechanism.

In the paper entitled, “Camera model identification using a deep network and a reduced edge dataset”, authors have proposed a method of digital image authentication using a relatively simple deep-network structure. Digital images are increasingly being used as evidence to prove crimes and to help make judgments in court. A digital image is a type of data like a document, a file, or physical evidence. Such data must be authenticated in order to be used for forensic purposes. One of the important aspects of data authentication is that the data have actually come from their alleged sources. Accordingly, source identification techniques have also been studied in recent years because of the social need to identify the copyright holders of photographic artwork and because of the increasing need to control photographs taken by hidden cameras. Recently, deep networks have become very successful at visual pattern recognition. With this motivation, several investigators have explored the possibility of using convolutional neural networks (CNNs) for camera source identification. In this paper, we use selective preprocessing, instead of a indiscriminate one, in order not to hinder the CNN’s strong ability to learn useful features for this kind of forensic task. To generate a consistent and balanced dataset, we limit the maximum number of original images to 200 per camera model, and we discard vertically taken images. The proposed method achieved a better prediction accuracy—95.27%—than GoogleNet and other existing methods. Also, challenging camera models such as the Sony DSC H50 and W170 can be classified with the quite high prediction accuracies of 85.3% and 87.2%, respectively.

In the paper, entitled “High-performance IoT streaming data prediction system using Spark: a case study of air pollution”, authors have proposed a high-performance IoT streaming data prediction system to improve the learning speed and predict in real time. Internet-of-Things (IoT) devices are becoming prevalent, and many of them generate continuous time-series data, i.e., streaming data. Deep learning is emerging as a solution to IoT streaming data analytics, but the slow training time has been a persistent problem. Therefore, they aimed to study a proper deep learning model for streaming data and proposed the modified LSTM auto encoder model than a generic LSTM model with a case study of air pollution. Through this study, they also have noticed that achieving the best performance requires optimizing many parameters, including learning rate, epoch, memory cell size, input time step size, and the number of features/predictors. In that regard, they show that high-performance data learning/prediction frameworks (e.g., Spark, Dist-Keras, and Hadoop) are required to rapidly fine-tune a model for training and testing before real deployment of the model as data accumulate.

In the last paper entitled “Adaptive path finding algorithm in dynamic environment for warehouse robot”, authors have proposed a path finding algorithm that can be used in warehouse robot. Warehouse robots have been widely used in e-commerce to automate good delivery process. These warehouse robots are required to navigate autonomously to reach the destination. Nevertheless, there are challenges in developing path finding algorithm due to uncertainty in warehouse caused by moving objects or humans. The proposed AD* algorithm can detect dynamic and static obstacle while operating in the warehouse environment. The algorithm includes offline and online path planning that predicts the movement of dynamic objects around the area. Extensive experimentations conducted by the authors showed that a robot can avoid hitting both static and dynamic obstacle due to the prediction capability of future location of moving object.

We thank all the authors, reviewers, and the editorial staff members of this journal for making this special issue a success. We are most pleased to have been part of this effort and to have been able to ensure the timely publication of these high-quality technical articles.