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Editorial

In the fourth, and final, issue of *CIT. Journal of Computing and Information Technology* (Vol. 28, No. 4; December 2020), we bring four papers from the regular section, which address subjects in graph theory, computer vision, time series, and machine learning.

In the first paper of the present issue, Mehmet Karaata addresses a problem in graph theory which can find applications in simplifying the discovery of some network characteristics, eventually improving its overall performance. The paper *Algorithms for Finding Diameter Cycles of Biconnected Graphs* firstly introduces a new graph theoretic concept, which the author denotes as the diameter cycle of a graph, along with presenting two algorithms for finding a diameter cycle of a biconnected graph. The concept of graph/network diameter designates a network boundary which maximizes distances between nodes in the cycle. The algorithms for finding this cycle thus devised are an abstract intuitive algorithm utilizing a brute-force mechanism for expanding an initial cycle, and a concrete algorithm using fundamental cycles in the expansion process and possessing polynomial time and space complexity.

The second paper of this issue deals with the practical problem of providing correct reading of electricity meters. Namely, modern smart electricity meters rely on LCD technology to display the consumption. However, LCD displays are prone to defects which can cause incorrect meter reading. In order to obviate this problem, a number of methods have already been devised, which the authors propose to supersede by their improvement based on a two-stage procedure using deep learning. The paper *Automatic Detection of Display Defects for Smart Meters based on Deep Learning* by Ye Chen, Zhihu Hong, Yaohua Liao, Mengmeng Zhu, Tong Han, and Quan Shen thus describes this novel method, whose first stage is to localize the LCD screen by applying the YOLOv5 algorithm, while the second is to detect the LCD fault based on a deep convolutional neural network model constructed by residual mechanism ResNet34. In such a way the authors claim to be able to achieve a defect detection accuracy of 98.9% on the used dataset, hence accurately detecting the common defects of LCD screens.

In their paper *A Hybrid Approach for Clustering Uncertain Time Series*, Ruizhe Ma, Xiaoping Zhu and Li Yan study uncertain data processes and analysis, which are essential in data and knowledge engineering, by concentrating on uncertain time series data clustering in which the uncertain values at time points are represented by probability density function. The authors consequently propose a two-step hybrid clustering approach for uncertain time series – named *HybridCluster* method – consisting of a partition of uncertain time series data into a set of micro-clusters using the Euclidean distance. Following the idea of hierarchical clustering, these micro-clusters are subsequently merged by applying an improved Dynamic Time Warping (DTW) distance as the similarity measure. Experimental evaluation shows improved cluster stability and execution speed with respect to the state-of-the-art UKMeansDTW algorithm, which uses DTW with limited window width as the similarity measure.

The last paper of this issue – *An effective Data Sampling Procedure for Imbalanced Data Learning on Health Insurance Fraud Detection* – targets prevention of inappropriate activities to gain unlawful advantage from health insurance companies. Since detection of such fraud implies in-depth domain knowledge for processing typically huge amounts of data, it is nowadays performed using machine learning techniques. However, classification of health insurance datasets is prone to issues caused by inherent data volume and high dimensionality, as well as a considerable varia-

tion between the ratio of fraudulent cases to non-fraudulent cases (*i.e.*, skewed class distribution), which leads to increasing misclassification rates. The authors, Shamitha S. Kotekani and Ilango Velchamy, thus propose a novel three-step data sampling procedure named *Fused Resampling and Cleaning Ensemble* (FusedRCE), which uses *k*-means SMOTE (Synthetic Minority Oversampling TEchnique) to oversample the data, and filter noise through data cleaning using the Tomek Link algorithm. Evaluation results show a higher classification accuracy and faster training speed of the proposed method over existing approaches.

Vlado Glavinić
Editor-in-Chief