

Editorial

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This first ComSIS issue of Volume 19 for 2022 contains 14 regular articles and 7 articles in the special section “Applications of Intelligent Systems.” Published papers cover a wide range of attractive contemporary topics, and we believe that readers will enjoy reading and sharing them among their colleagues. We are thankful for the hard work and diligence of all our authors and reviewers, without whom the current issue, and journal publication in general, would not be possible.

The first regular article, “Teaching Computational Thinking in Primary Schools: World-wide Trends and Teachers’ Attitudes” by Valentina Dagienė et al. begins this issue by examining worldwide tendencies in teaching computational thinking in primary education. A comprehensive survey and case study was performed to identify the level of teacher understanding of the subject and its integration approach in class activities, the results of which can be useful to primary school educators, educational initiatives, government authorities, policy makers, as well as e-learning system and content developers.

The second article, “Link Quality Estimation Based on Over-Sampling and Weighted Random Forest” by Linlan Liuet al. proposes a link quality estimation method which combines the K-means synthetic minority over-sampling technique (K-means SMOTE) and weighted random forest in order to address the problem of wireless link sample imbalance. Experimental results show that the proposed link quality estimation method has better performance with samples processed by K-means SMOTE, outperforming naive Bayesian, logistic regression and K-nearest Neighbor estimation methods.

In “Comparative Analysis of HAR Datasets Using Classification Algorithms,” Suvra Nayak et al. perform an experimental analysis on two publicly available human activity recognition (HAR) data sets using several classifiers: support vector machines, random forest and logistic regression. All algorithms perform very well on the given problems, with random forest notably outperforming the others on one of the data sets.

Maria Gorbunova et al., in their article “Distributed Ledger Technology: State-of-the-Art and Current Challenges” provide an exhaustive topical review of the state-of-the-art of distributed ledger technology applicability in various sectors, outlining the importance of the practical integration of technology-related challenges, as well as potential solutions.

“Entropy-based Network Traffic Anomaly Classification Method Resilient to Deception” authored by Juma A. Ibrahim and Slavko Gajin addresses the weakness of general entropy-based anomaly detection related to its susceptibility to deception by adding spoofed data that camouflage the anomaly. The article proposes two approaches focusing on, respectively, protection mechanism against entropy deception based on the analysis of changes in different entropy types, and extending the existing entropy-based anomaly detection approach with anomaly classification.

Davor Sutic and Ervin Varga, in “Scaling Industrial Applications for the Big Data Era” tackle the problems of power flow and island detection in power networks, and general

graph sparsification, focusing on scalability to large data sets. The authors introduce open source and distributed solutions involving algorithms for solving systems of linear equations, graph connectivity and matrix multiplication, and spectral sparsification of graphs, all featured in a released toolkit.

The article “A Graph-based Feature Selection Method for Learning to Rank Using Spectral Clustering for Redundancy Minimization and Biased PageRank for Relevance Analysis” by Jen-Yuan Yeh and Cheng-Jung Tsai addresses the feature selection problem in learning to rank (LTR). The proposed approach consists of four steps: (1) using ranking information to construct an undirected feature similarity graph; (2) applying spectral clustering to cluster the features; (3) utilizing biased PageRank to assign a relevance score with respect to the ranking problem to each feature; and (4) applying optimization to select features from each cluster.

“Deep RNN-Based Network Traffic Classification Scheme in Edge Computing System” by Kwihoon Kim et al. proposes a deep recurrent neural network based traffic classification scheme (deep RNN-TCS) for classifying applications from traffic patterns in a hybrid edge computing and cloud computing architecture, performing training on the cloud server and classification at the edge nodes. Extensive simulation-based experiments, show that the proposed approach achieves a notable improvement in accuracy while operating several orders of magnitude faster compared to the conventional scheme.

In “Building of Online Evaluation System Based on Socket Protocol,” Peng Jiang et al. describe the process of developing an online evaluation system for educational institutions based on the socket protocol, involving function design of students and teachers, data flow design, evaluation difficulty grading design, and system implementation. In addition, the article presents a method for difficulty classification of the evaluation, and of the test questions, laying the foundation for carrying out personalized testing and evaluation.

Miroslav Štampar and Krešimir Fertalj, in “Applied Machine Learning in Recognition of DGA Domain Names” address the problem of recognizing domain names generated by domain generation algorithms (DGAs) using machine learning algorithms. The authors engineered a robust feature set, and accordingly trained and evaluated 14 machine learning (ML), 9 deep learning (DL), and two comparative models on two independent data sets. Results show that if ML features are properly engineered, there is a marginal difference in overall score between top ML and DL representatives, which achieve performance comparable to the state-of-the-art.

“Semantic Web Based Platform for Harmonization of Teacher Education Curricula” by Milinko Mandić describes a semi-automatic software platform for harmonization of informatics curricula at all levels of education, involving ontology matching, as well as mapping informatics curricula to ontological models. Comparison of the informatics teacher education curriculum from the Republic of Serbia with the reference ACM K12 model, indicates that it is necessary to consider the improvement of teacher education curriculum, and application of new matching techniques.

Zorica Srđević et al. in “How MCDM Method and the Number of Comparisons Influence the Priority Vector” tackle the issue in multi-criteria decision making of determining the number of required judgments a decision-maker/analyst needs to perform. The article presents a comparison of the results obtained by standard analytic hierarchy process (AHP), limited AHP and best-worst method (BWM) if the number of criteria is 6, 7, and 8.

The examples show that BWM's results are comparable with the results if standard AHP is used, while the limited version of AHP is generally inferior to the other two methods.

The article "Explainable Information Retrieval using Deep Learning for Medical Images" by Apoorva Singh et al. proposes an efficient deep learning model for image classification which tackles the following problems: (1) numerous image features; (2) complex distribution of shapes, colors and textures; (3) imbalance data ratio of underlying classes; (4) movements of the camera, objects; and (5) variations in luminance for site capture. Experimental evaluation on a real-world streaming data set demonstrates comparatively better performance than traditional methods.

The final regular article "RICNN: A ResNet&Inception Convolutional Neural Network for Intrusion Detection of Abnormal Traffic" authored by Benhui Xia et al. proposes a ResNet and inception-based convolutional neural network (RICNN) model for abnormal traffic classification. Experimental results on the show that RICNN not only achieves superior overall accuracy compared to a variety of CNN and RNN models, but also has a high detection rate across different categories, especially for small samples.

