

Editorial

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This third issue of Volume 18 of Computer Science and Information Systems in 2021 contains 22 regular articles. We thank all authors and reviewers for their hard work, without which the current issue, and journal publication in general, would not be possible.

The first regular paper, “FPGA Implementation of Fuzzy Medical Decision Support System for Disc Hernia Diagnosis” by Tijana Šušteršič et al. uses sensor measurements of foot force in combination with fuzzy logic to implement a decision support system for disc hernia diagnostics on a Field Programmable Gate Array (FPGA). Experimental results show that the system performs comparably to its non-FPGA counterpart in both pre-op and post-op scenarios, at the same time representing an inexpensive, portable expert system for real-time data acquisition and processing, as well as disc hernia diagnosis and patient condition tracking.

The second article, “A New Approximate Method for Mining Frequent Itemsets from Big Data” authored by Timur Valiullin et al. proposes a new approach for approximately mining of frequent itemsets in a big transaction database that can miss some true item sets, but on the other hand can be implemented in a distributed environment. The issue of false negatives is tackled by introducing an additional hyperparameter to the algorithm.

“Reverse Engineering Models of Software Interfaces” by Debjyoti Bera et al. presents a passive learning technique for interface models inspired by process mining techniques. The approach is based on representing causal relations between events in an event log and their timing information as a timed-causal graph, which is further processed and transformed into a state machine with a set of timing constraints.

In the article entitled “DrCaptcha: An Interactive Machine Learning Application,” Rafael Glikis et al. describe an interactive machine learning system that provides third-party applications with a CAPTCHA service and, at the same time, uses the user’s input to train artificial neural networks that can be combined to create a powerful OCR system. This way, two problems with constructing machine learning systems identified in the article are tackled: overfitting the training data and human involvement in the data preparation process.

Sabina-Adriana Floria and Florin Leon, in “A Novel Information Diffusion Model Based on Psychosocial Factors with Automatic Parameter Learning,” propose a model for imitating the evolution of information diffusion in a social network. Individuals are modeled as nodes with two factors (psychological and sociological) that control their probabilistic transmission of information, with a genetic algorithm being used to tune the parameters of the model to fit the evolution of information diffusion observed in two real-world datasets.

“Arabic Linked Drug Dataset Consolidating and Publishing,” authored by Guma Lakshen et al. examines the process of creating and publishing an Arabic linked drug dataset based on open drug datasets from selected Arabic countries and discusses quality is-

sues considered in the linked data lifecycle when establishing a semantic data lake in the pharmaceutical domain. The article showcases how the pharmaceutical industry can take leverage emerging trends for building competitive advantages, at the same time acknowledging that better understanding of the specifics of the Arabic language is needed in order to extend the usage of linked data technologies in Arabic companies.

Dragana Radojičić et al. in their article “A Multicriteria Optimization Approach for the Stock Market Feature Selection” explore the informativeness of features extracted from limit order book data in order to classify market data vectors into two classes (buy/idle) using a long short-term memory (LSTM) deep neural network. New technical indicators based on support/resistance zones are introduced to enrich the set of features, and multicriteria optimization is employed to perform adequate feature selection among the proposed approaches with respect to precision, recall, and the F-score.

The article “End-to-End Diagnosis of Cloud Systems Against Intermittent Faults,” by Chao Wang et al. proposes a fault diagnosis method that can effectively identify and locate intermittent faults originating from processors in the cloud computing environment. The method is end-to-end in that it does not rely on artificial feature extraction for applied scenarios (making it more generalizable than conventional neural network-based methods), it can be implemented with no additional fault detection mechanisms, and is realized by software with almost zero hardware cost.

“Distance based Clustering of Class Association Rules to Build a Compact, Accurate and Descriptive Classifier” by Jamolbek Mattiev and Branko Kavšek introduces new methods that are able to reduce the number of class association rules produced by “classical” class association rule classifiers, while maintaining an accurate classification model that is comparable to the ones generated by state-of-the-art classification algorithms. This is achieved by employing distance-based agglomerative hierarchical clustering as a post-processing step to reduce the number of rules, and different strategies based on database coverage and cluster center in the rule-selection step.

Lamia Cheklat et al., in their article “CHEARP: Chord-based Hierarchical Energy-Aware Routing Protocol for Wireless Sensor Networks” design an energy efficient location-independent routing protocol for data delivery in wireless sensor networks (WSNs). Contrary to existing protocols that connect nodes independently of their physical proximity, this article proposes an approximate logical structure to the physical one, where the aim is to minimize the average paths’ length.

In “Decision-Making Support for Input Data in Business Processes according to Former Instances,” José Miguel Pérez Álvarez et al. propose learning the evolution patterns of the temporal variation of the data values in a process model extracted from previous process instances by applying constraint programming techniques. The knowledge obtained is applied in a decision support system (DSS) which helps in the maintenance of the alignment of the process execution with the organizational strategic plans, through a framework and a methodology.

The article “Intrusion Prevention with Attack Traceback and Software-defined Control Plane for Campus Networks” by Guangfeng Guo et al. proposes an intrusion prevention system (IPS) based on coordinated control between the detection engine, the attack traceback agent, and the software-defined control plane. The solution includes a novel algorithm to infer the best switch port for defending different attacks of varied scales based

on the inverse header space analysis (HSA) and the global view of the software-defined controller.

“Class Balancing in Customer Segments Classification Using Support Vector Machine Rule Extraction and Ensemble Learning” by Suncica Rogic and Ljiljana Kascelan proposes a class balancing approach based on support vector machine-rule extraction (SVM-RE) and ensemble learning in order to improve predictive models of customer segments for effective marketing. The approach also allows for rule extraction, which can help in describing and explaining different customer segments.

In “Real Time Availability and Consistency of Health-Related Information Across Multiple Stakeholders: A Blockchain Based Approach,” Zlate Dodevski et al. examine different approaches and application of blockchain technology and identify which implementations of components are more suitable and beneficial for a specific electronic health record (EHR) eco-system. The article presents alternative way of dealing with information exchange across multiple stakeholders by justifying the use of the decentralized approach, distributed access and solution to comprehensively track and assemble health related data.

“Predicting Dropout in Online Learning Environments” by Sandro Radovanović et al. employs the lasso and ridge logistic regression techniques to create a prediction model for student dropout on the Open University database. Two interesting questions are investigated: how early dropout can be predicted, and why dropouts occur.

The next article, “Deep Reinforcement Learning for Resource Allocation with Network Slicing in Cognitive Radio Network” by Siyu Yuan et al. establishes a cognitive radio network model based on the underlay model and proposes a cognitive network resource allocation algorithm based on the double deep Q network (DDQN) reinforcement learning technique. The algorithm jointly optimizes the spectrum efficiency of the cognitive network and quality of experience of cognitive users through channel selection and power control.

“Patient Length of Stay Analysis with Machine Learning Algorithms,” authored by Savo Tomović, tackles the problem of measuring factor importance on patient length of stay in a medical emergency department. Based on a historical dataset containing average patient length of stay per day, and factors agreed with domain expert, the article solves the task of providing factors’ impact measure on specific days that do not belong to the historical dataset (new observations) for which the average length of stay is higher than the specified threshold.

Haiyan Li and Dezhi Han, in “Multimodal Encoders and Decoders with Gate Attention for Visual Question Answering” present a visual question answering (VQA) model based on multimodal encoders and decoders with gate attention (MEDGA). Each encoder and decoder block in the MEDGA applies not only self-attention and cross-modal attention but also gate attention, so that the new model can better focus on inter-modal and intra-modal interactions simultaneously within visual and language modality.

“Identifying Key Node in Multi-region Opportunistic Sensor Network based on Improved TOPSIS” by Linlan Liu et al. proposes a novel approach based on the improved TOPSIS method to distinguish the key node from the ferry node in a multi-region opportunistic sensor network. Dynamic topology information is represented by a temporal reachable graph, based on which three attributes are constructed to identify the key node. Game theory with a combination weighting method is employed to combine the subjective weight and objective weight, which is then used to improve the TOPSIS method.

The article “Dynamic Fractional Chaotic Biometric Isomorphic Elliptic Curve for Partial Image Encryption” by Ahmed Kamal et al introduced a modular fractional chaotic sine map (MFC-SM) to achieve high Lyapunov exponent values and completely chaotic behavior of the bifurcation diagram for high level security in image encryption. MFC-SM is combined with various other approaches in the image encryption pipeline in order to obtain an algorithm that is robust against common signal processing attacks and provides a high security level and high speed for image encryption applications.

In “Time-aware Collective Spatial Keyword Query,” Zijun Chen et al. define the time-aware collective spatial keyword query (TCoSKQ), which considers the positional relevance, textual relevance, and temporal relevance between objects and query at the same time. Two evaluation functions are defined to meet different needs of users, for each of which an algorithm is proposed, with effective pruning strategies introduced to improve query efficiency based on the two algorithms.

Concluding the issue, “Conflict Resolution Using Relation Classification: High-Level Data Fusion in Data Integration” by Zeinab Nakhaei et al. tackle the problem of conflict resolution in data integration systems by bridging the gap between relation estimation and truth discovery, demonstrating that there is a natural synergistic relationship between machine learning and data fusion. Relational machine learning methods are used to estimate the relations between entities, and then these relations are employed to estimate the true value using some fusion functions.

We hope that this issue brings forth interesting and diverse articles that cover a wide range of contemporary research topics. Besides being an informative read, we believe that the presented research could be attractive and represent a good starting point and/or motivation for other authors to extend the presented scientific achievements and continue with similar research efforts.