Guest Editorial

Soft computing and intelligent systems: Techniques and applications

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This special issue is a collection of selected papers submitted to the Third International Symposium on Intelligent Systems Technologies and Applications (ISTA' 17) held in Manipal University, India, during September 13-16, 2017. These papers have been peer reviewed and accepted for presentation at the symposium. A second review has been conducted to improve content and presentation of the manuscripts published in this special issue. The 48 papers cover a wide range of powerful techniques and current applications of soft computing and intelligent systems.

The International Symposium on Intelligent Systems Technologies and Applications aims to bring together researchers in related fields and provides a venue to explore and discuss various aspects of intelligent systems technologies and their applications. It provides excellent opportunities for the presentation and discussion of interesting new research results, which contributes to effective transfer of knowledge and dissemination of innovative ideas.

Listed is a summary of the contributions of the papers pertaining to various application domains:

Cybersecurity is an important concern for every organization. In this special issue, twelve papers deal with intrusion detection, integrity, and confidentiality. In [1], the authors describe an intrusion detection system for wireless mesh networks that identifies intrusion activities using a support vector machine classifier. The proposed method employs a hybrid genetic algorithm and a mutual-information technique for feature selection. In [2], a scheme is proposed to provide a secure outsourcing solution for the matrix-chain multiplication problem in cloud computing. For preserving data confidentiality, the client employs few linear transformation schemes. The proposed verification scheme helps to maintain the integrity of the computed result. In [3], the authors evaluate the efficiency of various deep learning methods to detect and classify domain names as either malicious or benign by automatically extracting the required features thus reducing the burden of manual feature engineering approaches. In [4], the effectiveness of recurrent neural network (RNN) and its variant long short-term memory (LSTM) is analyzed for Android malware detection of time-varying sequences of benign and malicious applications. This paper also provides a comparative analysis with other machine-learning classifiers. In [5], the authors propose a data-driven intrusion detection system for Industrial Internet of Things (IIoT) to hybridize both anomaly and specification-based schemes. In [6], an intelligent monitoring technique for smart grid

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security assessment using interleaved index is proposed. In [7], a dual encryption methodology using an optimal asymmetric encryption and a probabilistic approach is proposed for balancing both security and efficiency of the binding update for IPv6 mobility. In [8], the security of a chaotic system based image encryption algorithm is evaluated to reveal its unknown defects using chosen-plaintext and known-plaintext attacks. In [9], deep learning is employed for detecting malicious URLs. In [10], a scheme is proposed for secure information retrieval in the cloud. In this approach, the keywords extracted from the documents are distributed into different buckets and during the search process each search query is compared with the document indexes within appropriate buckets. In [11], the authors investigate the event data generated by the Domain Name System (DNS) Internet protocol for the purpose of Cyber threat situational awareness. Deep learning has been employed to classify the domain name as either benign or malicious. In [12], the authors present an extended taxonomy of intrusion detection systems and review the state-of-the-art techniques of related data pre-processing.

Biometrics technology is widely used as a security measure for verifying identity and detecting criminals. This special issue includes five papers on biometrics. In [13], speech data have been collected from various scenarios and a speaker identification system is developed. Based on the study, the authors conclude that performance degrades when mismatching occurs in training and testing sensors. In [14], a system level design for Hierarchical Temporal Memory (HTM) that exploits the combination of a memristive crossbar based Spatial Pooler and a conceptual analog Temporal Memory is presented. In [15], the authors propose a secured authentication protocol for remote Internet of Things (IoT)-based services. Another interesting idea is presented in [16] to detect face spoofing attacks by extracting various feature descriptors concatenated and classified by Logistic Regression. In [17], an automatic tongue-print identification method is proposed. The texture patterns are extracted from tongue images using the Local Binary Pattern (LBP) texture representation method.

Natural Language Processing (NLP) is an interdisciplinary area that is mainly applied for improving communication between humans and machines. Four papers in this special issue deal with issues related to NLP. In [18], a novel spell checker for the Malayalam language using deep learning is implemented.

The tool comprises of both error detection and error correction. In [19], a mechanism for extracting named entities in Tamil Tweets is proposed. The system extracts Tamil texts from Twitter, tags unlabelled corpora and experiments with tri-gram embedding in word and glove model. In [20], attention-based mechanism is employed for developing English to Punjabi neural machine translation system. The work also includes a parallel corpus for English-Punjabi language pair. In [21], a new authorship analysis technique using style word pattern identification is proposed. The method enables identification of author traits in case of authors belonging to the same domain of interest thus providing a mechanism to resist manipulations of online posting activities.

Three papers are related to control and robotics. In [22], a design of a novel Nonlinear Fractional Proportional-Integral-Derivative (NLF-PID) for control of a two-link rigid manipulator is presented. The controller is developed by cascading a hyperbolic function of instantaneous state and current error with linear FO-PID scheme. In [23], a self-learning adaptive and optimal Lyapunov fuzzy Markov game controller for safe and stable tracking control of two-link robotic manipulators is proposed. In [24], the authors use Interval Type-2 fuzzy logic controller design to control chaos and associated instability in a nonlinear dynamical power system.

Another important area in decision making are the recommendation systems that provide suggestions based on previous usage behaviour. In [25], the authors present a recommender system that utilizes clickstream data. The proposed system predicts the preferences for the products clicked by the customers with the help of machine learning classifiers. In [26], the authors propose a community-based hash-tag recommender system for twitter users. The work applies sentiment analysis for community detection using collaborative filtering. In [27], a parallel proactive cross-domain recommender system that helps to accelerate the computation in the multi-agent environment is proposed. In [28], the authors define fuzzy soft cardinality and fuzzy soft relative cardinality and discuss the related properties. Finally, the lattice ordered fuzzy soft group is applied in decision-making problems to find suitable solutions. In [29], a hybrid credit scoring model based on Neighborhood Rough Set and layered ensemble classification with weighted voting is proposed for computing the credit score.

Nine papers in this special issue discuss optimization and nature-inspired techniques. In [30],

a scheme based on ant colonies for solving the load imbalance problem in multiprocessor environments is proposed. In [31], a power efficient scheduling and Virtual Machine (VM) Consolidation algorithm is proposed for effectively managing energy resources. In [32], a population-based nature-inspired optimization algorithm that simulates the hunting mechanism of barn owls is proposed. In [33], the authors present an extended version of Teaching Learning Based Optimization (TLBO) for enhancing the exploration and exploitation capacities by introducing the concept of Neighbour Learning strategy. In [34], a privacy-preserving collaborative e-healthcare system that employs a k-centroid multi-view point clustering scheme is proposed. In [35], the authors propose a multi-directional model for rule analysis and risk prediction of any disease based on input parameters. In [36], a top down semi-supervised subspace clustering is proposed to identify a subset of important attributes based on the known label for each data instance. In [37], the authors propose a training method that employs Deep Neural Networks (DNNs) to map the sensory data into a representation space aligned with human concepts. The DNNs become interpretable with human knowledge and become easy to be trained by a small amount of training data with prior knowledge. In [38], an algorithm for finding the all-pair shortest-path using the transitive closure property that reduces the number of iterations in finding the path is proposed.

Seven papers in this special issue address important problems in image and signal processing areas. In [39], a memristor-based circuit design that exhibits parallel processing capabilities and neuromorphic architectures to perform G-neighborhood selection for image denoising applications is proposed. In [40], the authors applied two classification techniques on electroencephalogram (EEG) signals to diagnose epileptic seizure by extracting various time and frequency domain features. In [41], region and texture features are employed for image forgery detection. These features are optimized using Non-Negative Matrix Factorization and fed to a Support Vector Machine for classification. In [42], LWT based watermarking scheme incorporating an artificial neural network (ANN) for digital watermark extraction is proposed. In [43], the authors propose a two-step approach using Variational Mode Decomposition and l1 trend filter for enhancing speech signals degraded by white Gaussian noise. In [44], an eye gaze-based optic disc detection system is proposed to detect the optic disc (OD) using eye-gaze tracking along with

an image-processing technique. In [45], the effect of gravitational perturbation forces on the orbital elements is discussed. Based on several experimental results, the authors conclude that the variations in semi-major axis affect the spatial representation of selected features registered in the satellite image data that have a direct bearing on the gravity-based perturbation forces.

Three papers are related to the software engineering field. In [46], a modelling framework for automotive software design and optimal test path generation scheme is proposed. In [47], the authors propose a fuzzy-based recommendation system that recommends programming skills and competency level of individuals based on eye movement data. In [48], the authors primarily explore the capability of evolution-based metrics when used in conjunction with object-oriented metrics for ascertaining change prone nature of classes. Four possible scenarios were evaluated for predicting change prone. The study also evaluates the use of seven machine learning techniques to determine change prone nature of classes in object-oriented software.

In conclusion, this special issue would not have been possible without the help of many people. As guest editors, we would like to take this opportunity to thank the authors for their contributions and the reviewers for their invaluable comments and timely responses. We would also like to thank the JIFS Editor-in-Chief and staff for their support during the preparation and production of this special issue.

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