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Editorial

Special Issue SOCO 2017: New trends in soft computing and its application in industrial and environmental problems

The eight papers included in this special issue represent a selection of extended contributions presented at the 12th International Conference on Soft Computing Models in Industrial and Environmental Applications, SOCO 2017 held in León, Spain, September 2017, and organized by the BISITE and the research group and University of León.

Soft computing represents a collection or set of computational techniques in machine learning, computer science and some engineering disciplines which investigate, simulate and analyze very complex issues and phenomena.

This special issue is aimed at practitioners, researchers and postgraduate students who are engaged in developing and applying advanced intelligent systems principles to solving real-world problems on the mentioned fields. The papers are organized as follows.

In the first contribution, by Ruiz-Aguilar et al., a time series data of freight inspection volume at the Border Inspections Posts in the Port of Algeciras Bay was used to construct 4 datasets based on different sizes of autoregressive window. Several machine learning and ensemble models were used to aid decision-making in the inspection process. Moreover, an aggregation/disaggregation procedure to make predictions was proposed and compared to two different prediction horizons: daily $(t + 1)$ and weekly $(t + 7)$ predictions. In general, results showed that neural networks performed better than any other model independently of the size of the autoregressive window. The result obtained by a weighted average ensemble model was better and statistically significant than any other model. Moreover, the proposed aggregation/disaggregation procedure provided better performance results and more robust in terms of variance than considering daily or weekly predictions.

In the next contribution, Griol et al. present a statistical model for spoken dialog segmentation that decides the current phase of the dialog by means of an automatic classification process. Authors applied the proposal to three practical conversational systems acting in different domains. The results of the evaluation show that is possible to attain high accuracy rates in dialog segmentation when using different sources of information to represent the user input. The results indicate how the module proposed can also improve dialog management by selecting better system answers. The statistical model developed with human-machine dialog corpora was applied in one experiment to human-human conversations and provides a good baseline as well as insights in the model limitation.

Third paper, by Grzenda et al., has as primary objective to address the way the latency in location data acquisition, referred to also as timeliness, can be dealt with. Authors propose a hybrid method combining machine learning models such as multilayer perceptron trained in batch mode and online learning methods to perform short-term prediction of vehicle delay data. The method they propose successfully integrates stream mining methods developed for stationary and non-stationary conditions i.e. also the methods developed for concept drifting data streams. For all examined reference data sets and hybridized stream methods, the method reduced prediction error and addressed the risk of using static prediction models not matching or no longer matching the evolving process for which the prediction is performed.

Subsequent contribution, by Streckenbach et al., examines the application of evolution strategies for the optimization of electrical discharge machining (EDM), especially electrical discharge (ED) drilling. Authors present a new method of finding the optimal set of parameters concerning the electrode materials or geometries in electrical discharge machining (EDM).

Here, the performance of the evolution strategy (ES), a stochastic, metaheuristic optimization method, is investigated. The method involved a randomized and a derandomized ES, based on a non-elitist (μ, λ)-ES with one parent and four children. The two ES were initialized from an unfavorable starting point (A) and from a favorable starting point (B) to investigate their effectiveness. It could be demonstrated that starting from the unfavorable starting point A the erosion duration t_{ero} could be reduced by a maximum of 77% with a slightly smaller linear wear of the tool electrode Δl_E after 40 trials.

Fifth article, by Castejón-Limas et al., reports the usage of the occurrence vector provided by the PAELLA algorithm in the context of robust regression. PAELLA was originally conceived as an outlier detection and data cleaning technique. A novel approach is to use this algorithm not for discarding outliers but to generate information related to the reliability of the observations recorded in the dataset. This approach proves to provide successful results when compared to traditional common practice such as outlier removal. A set of experiments using a contrived difficult artificial dataset are described using both neural networks and classical polynomial fitting. Finally, a successful comparison of authors approach to two state-of-the-art algorithms proves the benefits of using the PAELLA algorithm in the context of robust regression.

In the next contribution, by Chaves et al., an intelligent system, applied to plastic injection molding processes, which is based on fuzzy logic is proposed and the membership functions are defined from defect behavior tendency curves. The proposed hybrid fuzzy logic system is tuned considering the expertise of an operator by

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means of a set of adaptive regression membership functions. So, the defined rules make possible for the expert system to correlate qualitative inspection of manufactured parts made by an operator with a quantitative inspection determining the set of appropriate process parameters that produce high quality parts. Experimental results show that the effectiveness is improved, and the process time is also reduced in 40%.

Seventh paper, by Sánchez et al., proposes the use of a recurrent neural network with fractional order dynamics for assessing the health of LFP rechargeable automotive batteries through incremental capacity analysis. The proposed algorithm learns a dynamical model of the battery voltage from samples of current and voltage taken on a vehicle. The performance of the new method is assessed in three different batteries with varying states of health. A usable estimation of the incremental capacity curve was attained for low to moderate discharge currents. The state of health estimation produced by the fractional order network was consistently better than statistical and fuzzy models, Long Short-Term Memory networks (LSTM) and Echo State Networks for all the batteries under study.

In the final contribution, Seul-Gi and Sung-Bae propose a stimuli control system to adjust the group emotion in service spaces. It is a stand-alone system that can determine optimal stimuli by utility table and modular tree-structured Bayesian networks designed for emotion prediction model proposed in the previous study. To verify the proposed system, authors collected data using several scenarios at a kindergarten and a senior welfare center. Each space is equipped with sensors for collection and equipment for controlling stimuli. As a result, the system shows a performance of 78% in the kindergarten and 80% in the senior welfare center. The proposed method shows much better performance than other classification methods with lower complexity. Also, reinforcement learning is applied to improving the accuracy of stimuli decision for a positive effect on system performance.

The guest editors wish to thank Professor Zidong Wang (Editor-in-Chief of Neurocomputing) for providing the opportunity to edit this special issue. We would also like to thank the referees who have critically evaluated the papers within the short time. Finally, we hope the reader will share our joy and find this special issue very useful.

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