

Guest Editorial Preface

Intelligent Automation and Control Using Meta-Heuristic Optimization Techniques

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Recent development in evolutionary algorithms brings a revolution and act as a catalyst in the industrial revolution. The recent advanced algorithms are expected to be the hottest topic in the next few years. There are papers demonstrating architectures, applications, services, experiments and simulations in these areas to support the cases for industrial revolution. Specifically, adaptive control, fractional control, robust control, power system control, control in IoT, control in cloud computing, system dynamics etc. are the emerging paradigms in the recent developments of control systems. For developing and refining new applications, more emphasis is given to these complex systems. In addition, the uses of intelligent techniques based on soft computing are of great importance to deal with the complex systems.

The objective of this special issue is to provide the latest advancements in the highly interdisciplinary research and development area of evolutionary and soft computing techniques in control systems and related applications.

In this issue, the first contribution is by Amrane et al. They implemented a parallel hybrid cellular genetic algorithm in order to reach the best solutions at a minimum execution time. To avoid additional computation time and for real-time control, the fitness evaluation and genetic operations are entirely executed on a graphic processing unit in parallel. Moreover, the chosen genetic representation, as well as the crossover, gives a feasible solution. They also, propose a two-level scheme, the first and fastest uses several subpopulations in the same block, and the best solutions migrate between subpopulations. The solution speeds up the performance in comparison to the state of art algorithms.

The second paper is by Dey et al. on the topic multi-objective Economic Environmental/Emission Dispatch (EED) problem. The authors have considered the problem in a variable head hydro-wind-thermal power system. The objectives - cost, NO_x emission and SO₂ emission are optimized at the same time using the Non-dominated Sorting Genetic Algorithm-II (NSGA-II). The simulation study has been performed applying the two test systems on the proposed scheme have been evaluated against Strength Pareto Evolutionary Algorithm 2 (SPEA 2).

Brahma and Panigrahi, in the third paper, model the behavior of roles instead of users by applying Adaptive Resonance Theory Neural Network in the intrusion detection system. The observed behavior which deviates from any of the established role profiles is treated as malicious. The proposed model has the advantage of identifying insider threat and is applicable for large organizations as it is based on role profiling instead of user profiling. The proposed system is capable of detecting intrusion with high accuracy along with minimized false alarms.

In the fourth paper, Nayak et al., proposed a method for clustering using fuzzy partitioning and crow search algorithm for biomedical data analysis. The major contributions of this paper are: i) projecting an efficient machine learning model based on Fuzzy C-Means and meta-heuristic optimization for biomedical data classification, ii) employing benchmark validation techniques and

critical hypotheses testing, iii) providing a background for biomedical data processing with a view of data processing and mining.

The fifth paper, authored by Sharma and Kapoor, presents a routing algorithm for IOT by using grey wolf optimization. The optimization process helps to improve more in terms of parameters such as drop, energy etc. The proposed hunting behavior of grey wolves based routing improves the routing efficiency compared to the conventional approach. This nature inspired optimized technique helps in achieving energy efficient routing and minimizes the delay which results in its significant applications in healthcare systems for the care of ICU patients and other patients and for detecting the forests and field fires.

The last paper is authored by Nassima and Zakaria is based on a dynamic hybridization method for feature selection. The objective of this work is to propose a novel dynamic hybridization method (GPBD) that generates the most suitable sequential hybridization between GA, PSO, BAT and DE metaheuristics, according to each problem. They have considered the best feature selection problem in a wrapper tactic, performed on face image recognition datasets, with the K nearest neighbor (KNN) learning algorithm. The comparative study of the metaheuristics and their hybridization GPBD shows that the proposed approach achieved the best results.

Finally, we would like to express our sincere appreciation to the authors for submitting their original papers, and to the reviewers who spent time reviewing the papers and provided valuable comments to help the review process for this special issue. At last but not the least, we convey our heartfelt thanks to Editor in Chief, Prof. Peng-Yeng Yin for his valuable and continuous guidance to make this special issue successful.

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