

Preface

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Over the last 30 years Natural Computing Algorithms (NCAs) have been widely used paradigms to solve optimization problems in the field of Artificial Intelligence. They have been successfully applied in many academic as well as industrial environments.

One of application fields is Machine Learning (ML). Many of the tasks carried out in ML such as model building, feature subset selection, and data reduction can be often presented as hard optimization problems.

On the other hand, ML has been used also in the field of Evolutionary Algorithms (EAs), but with different objectives: to create new optimization approaches such as Estimation of Distribution Algorithms, to select the most appropriate optimization algorithm for a specific instance of a particular optimization problem, to choose the best parameters for an algorithm, etc.

The aim of this special issue is to promote the development of the interplay between NCAs and ML in a way which highlights recent developments concerning the combination of these two fields, clarifies outstanding issues for future progress, and disseminates this cross-fertilization

to a wider audience in order to attract more researchers from other fields.

Three papers were accepted for this special issue.

The first paper, “Tabu search algorithms for minimizing total completion time on a single machine with an actual time-dependent learning effect” by Chunhui Zheng, Huaping Chen, and Rui Xu, deals with a scheduling problem where the operation time/costs changes with time. As long as the workers learn to carry out the task, its operation time/costs decreases. The authors propose several algorithms to solve the problem, from constraint programming techniques through branch and bound and finally to a tabu search method. The authors study the performance of the algorithms relatively to the size of the instances. For the largest instances the tabu search turns out to be the only possibility.

The second paper, “Reconstructing Gene Regulatory Networks with a Memetic-Neural Hybrid based on Fuzzy Cognitive Maps” by Yaxiong Chi and Jing Liu, deals with the reconstruction of gene regulatory networks. The authors depart from a model based on fuzzy logic and neural networks. Using time series data, a memetic algorithm is proposed to fit the model to the data. A comparison with previous approaches shows a competitive behavior of the proposed approach.

The last paper, “Multiobjective sorting-based learning particle swarm optimization for continuous optimization” by Gang Xu, Binbin Liu, Jun Song, Shuijing Xiao, and Aijun Wuand, presents an enhancement of particle swarm optimization. The main idea is to approach the problem of choosing the guidance example from a multi-objective perspective where not only the fitness but also the diversity information is taken into account. The strategy is applied to several schemas of particle swarm optimization with outstanding results.

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