

IEEE Transactions on Evolutionary Computation

Special Issue on Multi-task Evolutionary Computation

I. AIMS AND SCOPE

The field of evolutionary computation (EC) comprises a plethora of techniques involving iterative solution selection, derivative-free stochastic sampling and evaluation of input data guiding the search towards the global optimum. Over the years, the immense flexibility of these methods has led to many success stories in various practical domains, including engineering design, operations research, search-based software engineering, neuro-evolution or other evolutionary machine learning applications. However, it is worth noting that despite the vast amounts of data (i.e., evaluated solution samples) generated in each run of an EC algorithm, a common feature of existing implementations is that they do not learn with experience. Every problem is essentially solved from scratch, ignoring recurring solution patterns that may exist in the data of a related task. This is much in contrast to human experts, who, by virtue of their acquired knowledge, are able to arrive at quick decisions by simply leveraging on what they already know. It may thus be argued that the practical utility of EC is yet to be fully tapped, as the general lack of inter-task knowledge transfer ability can render them ineffective for highly complex / deceptive tasks or those requiring optimizations within short time scales.

Given the above, the key aim of this special issue (SI) is to advance theories and methodologies in the emerging subject of *multi-task EC* (also referred to as *evolutionary multitasking*). The focus shall be on novel algorithms that exploit the population-based search strategy of EC to tackle multiple optimization problems in unison. Most importantly, proposed algorithms must depict some form of direct or indirect knowledge exchange between tasks; for instance, through crossover-based implicit genetic transfers (as in multifactorial evolutionary algorithms), cross-task solution sampling, etc. On the whole, the salient feature of the SI lies in its learning-centric view of EC, enabling associated algorithms to automatically extract, adapt, integrate and reuse data from related tasks to orchestrate efficient search behaviors on the fly.

We invite high quality scientific contributions that explore the theory and practice of multi-task EC. Real-world applications of the proposed algorithms are of significant interest. In addition to experimental studies, mathematical investigations that rigorously analyze the core concepts of evolutionary multitasking are welcome.

II. TOPICS

The areas of interest for this SI shall include, but are not limited to:

- Continuous and discrete space evolutionary multitasking
- Multi-task EC with single, multi or many-objectives
- Efficient scaling from multi to many tasks
- Online and offline inter-task similarity modeling
- Adaptive knowledge transfers in multi-task EC
- Analysis of positive and negative transfers
- Convergence / convergence rate analysis of multi-task EC
- Model-free and model-based knowledge transfer methods

- Surrogate-assisted evolutionary multitasking for computationally expensive problems
- Multitask neuro-evolution in supervised, unsupervised, and reinforcement learning
- Novel practical applications of multi-task EC spanning engineering design, operations research, search-based software engineering, evolutionary machine learning, etc.

III. SUBMISSION

Manuscripts should be prepared according to the “Information for Authors” section of the journal found at <https://cis.ieee.org/publications/t-evolutionary-computation/tevc-information-for-authors> and submissions should be made through the journal submission website: <https://mc.manuscriptcentral.com/tevc-ieee>, by selecting the Manuscript Type “MTEC Special Issue Papers” and clearly adding “MTEC Special Issue Paper” to the comments to the Editor-in-Chief. Submitted papers will be reviewed by at least three expert reviewers. Submission of a manuscript implies that it is the authors’ original unpublished work and is not being submitted for possible publication elsewhere.

IV. IMPORTANT DATES

Submission open: May 1, 2020

Submission deadline: November 1, 2020

Tentative publication date: 2021

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