

Call for Papers
IEEE Transactions on Evolutionary Computation
Special Issue on Machine Learning Assisted Evolutionary Computation

I. Aims and Scope

Evolutionary computation has been highly successful solving complex problems. There remain challenges, however, towards designing high-performance algorithms, demanding collaborations between different communities. One such promising direction involves developing hybrid systems integrating optimization and learning. Recent research in optimization for machine learning, e.g., neural architecture search, evolutionary reinforcement learning, etc. achieved great success. There is, however, still a large scope to exploit the opposite of the integration machine learning into evolutionary computation.

This proposed special issue aims to bring together the latest developments of machine learning-assisted evolutionary computation for optimization problems.

In the recent literature, promising results in evolutionary computation assisted by data-driven techniques and machine learning have been obtained, containing rich knowledge, which is, however, often discarded, not further investigated, and not acted on. This knowledge assisting effective algorithms include different features of the problem / solutions to inform or drive the evolution / optimization, different settings / operators / heuristics in effective human designed or automatically designed evolutionary algorithms, and findings / evaluations of the search/fitness space. These can all be collected and processed as data, serving as an excellent new problem domain and challenge for the machine learning community to further inform and enhance evolutionary computation. Fostering, reusing, and interpreting the rich knowledge remains a challenge for researchers across disciplines, however, is highly rewarding to further advance human-designed or automatically designed evolutionary computation.

II. Topics

The main topics of this special issue include, but are not limited to, the following:

- Automated design (configuration, selection, composition, generation) of evolutionary algorithms with machine learning
- Data collection, analysis and visualization for machine learning in evolutionary computation (EC)
- Effective encoding of evolutionary algorithms and problem solutions with the support of machine learning
- Evolutionary multi-task optimization with machine learning
- Feature construction besides feature selection
- Feature selection and process of imbalanced or incomplete data for EC
- Frameworks integrating learning into EC

- Hyper-heuristics assisted by learning
- Machine learning assisted EC for combinatorial optimization or continuous optimization
- Machine learning assisted multi-objective EC
- Machine learning assisted EC for new real-world applications in combinatorial or continuous optimization
- Machine learning based prediction for dynamic optimization
- Machine learning for data streams used in EC
- Models development (e.g. reinforcement and ensemble learning) in EC
- Reusable/interpretable knowledge transfer in designing automated, general or new EC
- Surrogate-assisted EC for expensive optimization with the support of machine learning
- Theoretical studies on learning in evolutionary algorithms, e.g. fitness landscape analysis on algorithms

Please note that evolutionary computation for machine learning (e.g. AutoML and neural architecture search, etc). is not within the scope of this special issue call.

III. Submissions

Manuscripts should be prepared according to the information at <https://cis.ieee.org/publications/t-evolutionary-computation/ieee-tevc>. Submission of a manuscript implies that it is the authors' original unpublished work and is not being submitted for possible publication elsewhere. Please follow the submission instructions, select the article type as "MLEC", and clearly add "Machine Learning for Evolutionary Computation Special Issue" to the comments for the Editor-in-Chief.

VI. Important Dates

Submission opens: 1 December 2023

Submission deadline: 30 April 2024

Revised manuscripts submission: 15 September 2024

Submission of final manuscripts: 15 December 2024

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