IEEE Transactions on Evolutionary Computation
Special Issue on
Multi-objective Evolutionary Optimization in Machine Learning

I. Motivation

Optimization is at the heart of many machine learning techniques. However, there is still room to exploit optimization in machine learning. Every machine learning technique has several hyper-parameters that can be tuned to find the best model using evolutionary computation and optimization. Normally, there are multiple criteria such as bias, variance, complexity, and fairness to be considered in model selection. Multi-objective evolutionary optimization can help meeting these criteria for optimizing machine learning models. The existing approach to address multiple criteria is to transform the problem into a single-objective optimization problem. However, multi-objective optimization models work better than single-objective ones to achieve the aims of contributing to multiple intended objectives (criteria). In recent year evolutionary computation has been shown to be the premier method for solving multi-objective optimization problems, producing both optimal and diverse solutions beyond the capabilities of other heuristics. This is particularly true for very large solution spaces, which is the case in real-world machine learning problems with many features.

Multi-objective evolutionary optimization can be used to address machine learning challenges. In feature selection, it can help by minimizing the amount of bias and minimizing the number of predictors. In learning from incomplete data, it provides an opportunity to impute missing values and develop classification/prediction models at the same time. In semi-supervised clustering, it can recognize the patterns that not only have similar characteristics but are informative toward the labels. It can select the best training set in terms of maximizing the classification accuracy and minimizing the reduction rate. In imbalance learning, it can generate synthetic instances for minority class that are similar to minority instances, cover diversely the minority space, maintain the data distribution, and improve the performance of the classifiers. It also can develop a new classifier that minimizes the misclassification errors for all classes (or important classes) rather than total misclassification errors to avoid being biased towards the majority class. Multi-objective evolutionary optimization can develop versatile machine learning models that address several challenges simultaneously.

II. Topics

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

- Multi-objective evolutionary optimization in feature selection, imbalance, reinforcement, ensemble, and semi-supervised learning
- Multi-objective evolutionary optimization for incomplete data, transfer learning, fairness and interpretability
- Multi-objective Hyperparameter Optimization
- Multi-objective decision-making in machine learning
- Robust machine learning models using multi-objective evolutionary optimization
- New applications for multi-objective evolutionary optimization in machine learning

This special session aims to showcase the importance of multi-objective optimization in machine learning. The guest editors believe that there is great potential in using multi-objective optimization to address machine learning challenges such as imbalanced data, feature selection, missing values, and semi-supervised learning. The special issue promotes developing new models or integrated frameworks in machine learning, improving the efficiency of finding optimal solutions, and introducing novel research areas. It also encourages implementing developed models to solve real-world problems in different areas such as healthcare, manufacturing, and transport. The special issue will attract researchers and practitioners who work on machine learning, optimization, operations research, and evolutionary computation.

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 at https://mc.manuscriptcentral.com/tevc-ieee, by selecting the Manuscript Type "MOML" and clearly adding "Multi-objective Evolutionary Optimization in Machine Learning Special Issue" to the comments to the Editor-in-Chief. 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 opens: February 1, 2022
- Submission Deadline: May 31, 2022
- Submission of Revised Manuscripts: October 31, 2022
- Submission of Final Manuscripts: December 31, 2022

V. Guest Editors

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