IEEE Computational Intelligence Magazine
Call for Papers

Special Issue on Evolutionary Machine Learning

Aims and Scope

Evolutionary machine learning (EML) is an emerging research field, which fuses the search and optimization abilities of evolutionary computation (EC) and the learning ability of machine learning (ML) for various tasks including optimization, classification, regression, clustering, and modelling. We consider the description of ML as a computer program that learns from experience with respect to some class of tasks with a performance measure, such that its measured performance on the task improves with experience. We further consider that the learnt performance improvements from experience are orchestrated through EC techniques defined by their population-based search methods.

There are three methods to fuse EC and ML.
1. When we use EC on top of ML, any parameters and model structure of ML techniques can be optimized through the evolutionary process. In addition to the powerful search ability of EC, EML can freely specify the objective function(s) to be considered in the ML technique. For example, the model complexity can be minimized from the viewpoint on the explainability, which is missing in current AI techniques.

2. When we use ML on top of EC, evaluated candidate solutions are regarded as a dataset and ML can approximate the problem model or the fitness landscape to be solved by EC, thus reducing the computational resources needed. This is necessary for computationally expensive problems and understanding the problem structure. ML can also adapt the parameters in EC to the search situation and the corresponding problem in both online and offline manners.

3. An embedded approach can be adopted where ML can direct the search within EC by updating individual members of a population. The archetypal technique being Learning Classifier Systems, a form of evolutionary rule-based system, where supervised or reinforcement learning guides rule formation.

This special issue covers all approaches within EML and highlights the most recent advances in the field of computational intelligence. There is a surge in interest in EML as the complementary nature of EC and ML successfully addresses each other's issues. Methodological developments, practical applications and/or theoretical considerations (especially with regard to the stochastic nature of EML) are welcome. Insight into where the fusion of EC **and** ML can be more powerful than the techniques separately is encouraged.

Topics

The topics to be highlighted in this special issue include, but are not limited to, the following:
  - Population-based reinforcement learning

- Evolutionary rule-based learning systems
- Evolutionary neural networks, including neuroevolution
- Evolutionary deep learning, including structure learning
- Hyper-parameter tuning with EC
- Evolutionary decision trees
- Evolutionary cascade systems
- Evolutionary fuzzy systems
- Evolutionary reinforcement learning
- Evolutionary ensemble systems
- Genetic programming based ML
- Evolutionary feature selection and construction for ML
- Evolutionary transfer learning
- Explainable systems design
- Surrogate-model design by ML for EC
- Landscape analysis by ML for EC
- Knowledge acquisition from solutions obtained by EC
- Parameter learning and adaptation of EC by ML
- Real-world applications of EML

Submission Process

All manuscripts must be submitted electronically in PDF format. Manuscripts must be typed in 12-point font, double spaced in single column format and adhere to a maximum length of 20 pages. Additional information on manuscript details and submission guidelines can be accessed from the IEEE CIM website:
https://cis.ieee.org/publications/ci-magazine/cim-information-for-authors

1. Submissions must be made via the EasyChair link :
   https://easychair.org/conferences/?conf=cimeml2020
2. Send also an email to guest editors Will N. Browne and Yusuke Nojima (cimeml2020@easychair.org) with subject "IEEE CIM special issue submission" to notify about your submission.
3. Early submissions are welcome. We will start the review process as soon as we receive your contribution.

Important Dates
Submission Deadline: July 15, 2019
Notification of Review Results: September 30, 2019
Submission of Revised Manuscripts: October 31, 2019
Submission of Final Manuscripts: December 15, 2019
Special Issue Publication: May 2020

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