IEEE Transactions on Evolutionary Computation

Special Issue on Evolutionary Computation Meets Deep Learning

I. AIM AND SCOPE

Deep learning is a popular research direction in machine learning, where breakthrough progress has been made in both academe and industries, bringing promising results in speech recognition, computer vision, industrial control and automation, etc. The motivation of deep learning is to establish a model to simulate the neural connection structure of human brain. While dealing with the complex task, deep learning adopts a number of transformation stages to deliver the in-depth interpretation of the data. Deep learning achieves exceptional power and flexibility by learning to represent the task through a nested hierarchy of layers, with more abstract representations formed in terms of less abstract ones. One of the key issues of existing deep learning approaches is that the meaningful representations can be learned only when their hyper-parameter settings are properly specified beforehand, and general-parameters are learned during the training process. Until now, not much research has been dedicated to automatically set the hyper-parameters, and accurately find the globally optimal general-parameters. However, this problem can be well formulated as optimization problems including discrete optimization, constrained optimization, large-scale global optimization and multi-objective optimization, by engaging mechanisms of evolutionary computation.

For more than three decades, evolutionary computation and various meta-heuristic techniques have shown powerful abilities and superiority in addressing real-world discrete, constrained, large-scale and multi-objective optimization problems. Evolutionary computation for deep learning aims at solving the optimization problems involved in deep learning algorithms. Their learning and adaptation capabilities enable structure and parameter optimization of deep learning systems for different kinds of machine learning tasks, such as clustering, classification, regression, rule mining, and many others. Their flexible frameworks also enable handling multiple objectives, e.g. accuracy and interpretability maximization, and many kinds of data types like imbalanced, missing, and privacy-preserving data sets. Evolutionary computation can be efficiently used in deep learning to address complex and challenging issues. Deep learning approaches with evolutionary computation have frequently been used in a large variety of applications and have started to address complex and challenging issues of deep learning systems.

II. THEMES

The goal of this Special Issue is to investigate both the new theories and methods on how deep learning can be achieved with different evolutionary computation algorithms, and how evolutionary computation can be adopted in deep learning and the applications of deep learning with evolutionary computation in real-world problems. This will deliver a snapshot of the latest advances in the contribution of evolutionary computation to the field of deep learning. The topics of interest include, but are not limited to:

- Evolutionary computation for learning in deep neural networks
- Adaptive weight parameter optimization of evolutionary deep learning
- Evolutionary neural architecture design of deep learning systems
- Deep learning in evolutionary computation for regression/ clustering/classification
- Evolutionary deep learning for scheduling and combinatorial optimization tasks
- Evolutionary computation for deep learning with granular computing
- Evolutionary multi/many-objective optimization for deep learning
- Convergence analysis of evolutionary deep learning
- Parallelized and distributed realizations of evolutionary deep learning
- Co-evolution for deep learning
- Hybridization of evolutionary fuzzy systems and memetic computing for deep learning
- Evolutionary deep learning to real-world applications

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: http://mc.manuscriptcentral.com/tevc-ieee/, by selecting the Manuscript Type of "ECDL Special Issue Papers" and clearly adding "ECDL Special Issue Paper" to the comments to the Editor-in-Chief.

Submitted papers will be reviewed by at least three different 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 DATAS

Submission open: March 1, 2020
Submission deadline: November 1, 2020
Tentative publication date: 2021
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