Computational Intelligence Society
Nature-Inspired Problem Solving • cis.ieee.org
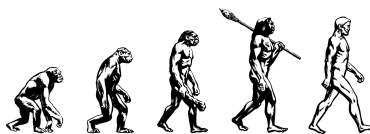
◆IEEE

IEEE CIS Newsletter, Issue 74, March 2019

Research Frontier

A Taxonomy for Metamodeling Frameworks for Evolutionary Multiobjective Optimization

Real world optimisation problems frequently have objective and constraint functions that are computationally expensive to compute. To overcome this problem, metamodels can be built based on a few high-fidelity solutions. The optimisation algorithm can then use such metamodels in the place of computationally expensive objective evaluations and constraint computations. However, when dealing with multi- or many-objective optimisation problems involving multiple constraints, the simple extension of this idea to use of one metamodel for each objective and constraint function may not be efficient. This is because the cumulative errors from each metamodel may be detrimental to the accuracy of the overall optimisation procedure. This paper proposes a taxonomy of different plausible metamodeling frameworks for multiobjective and many-objective optimization, and provides a comparative study of these frameworks. Intriguing observations about the behavior of each framework are reported, informing future studies in this emerging area of evolutionary multiobjective optimisation.

IEEE Transactions on Evolutionary Computation, Feb. 2019

Consensus Building With Individual Consistency Control in Group Decision Making

The individual consistency and the consensus degree are two basic measures to conduct group decision making with reciprocal preference relations. The existing frameworks to manage individual consistency and consensus degree have been investigated intensively and follow a common resolution scheme composed by the two phases: the consistency improving process, and the consensus reaching process. But in these frameworks, the individual consistency will often be destroyed in the consensus reaching process, leading to repeat the consistency improving process, which is time consuming. In order to avoid repeating the consistency improving process, a consensus reaching process with individual consistency control is proposed in this paper. This novel consensus approach is based on the design of an optimization-based consensus rule, which can be used to determine the adjustment range of each preference value guaranteeing the individual consistency across the process. Finally, theoretical and numerical analysis are both used to justify the validity of the proposed approach.

IEEE Transactions on Fuzzy Systems, Feb. 2019

fpgaConvNet: Mapping Regular and Irregular Convolutional Neural Networks on FPGAs

Convolutional neural networks (ConvNets) have demonstrated state-of-the-art performance in several machine learning problems. However, their deployment in real-world applications requires power efficient designs that meet the required performance needs. Field-programmable gate arrays (FPGAs) can provide a potential platform that can be tailored to application-specific requirements. However, with the complexity of ConvNet models increasing rapidly, the ConvNet-to-FPGA design space becomes prohibitively large. This paper presents an end-to-end framework for the optimized mapping of ConvNets on FPGAs called fpgaConvNet. The framework is able to generate hardware designs that are co-optimized for the ConvNet workload, the target device, and the application's performance metric of interest. Quantitative evaluation shows that the proposed methodology yields hardware designs that improve the performance by up to 6.65x over highly optimized graphics processing unit designs for the same power constraints and achieve up to 2.94x higher performance density compared with the state-of-the-art FPGA-based ConvNet architectures.
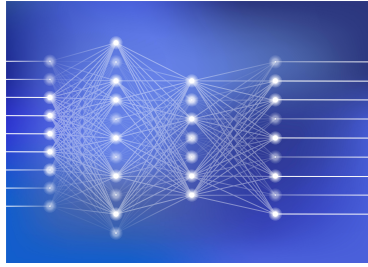
IEEE Transactions on Neural Networks and Learning Systems, Feb. 2019

Educational Activities

2019 Graduate Student Research Grants

The IEEE Computational Intelligence Society (CIS) funds scholarships for deserving undergraduate, graduate and PhD students who need financial support to carry out their research during an academic break period. The primary intent of these scholarships is to cover the expenses related to a visit to another university, institute or research agency for collaboration with an identified researcher in the field of interest of the applicant. Funds can be used to cover travel expenses as well as certain living expenses (such as housing).The field of interest of applicants is open, but should be connected with identifiable component of the CIS (neural networks, fuzzy systems, or evolutionary computation).

Deadline for submission of applications is **15 March 2019**. More information and application details can be found here.

FML-based Machine Learning Competition Human and Smart Machine Co-Learning

With the success of AlphaGo, there has been a lot of interest among students and professionals to apply machine learning to gaming and in particular to the game of Go. Several conferences have held competitions human players vs. computer programs or computer programs against each other. While computer programs are already better than human players (even high-level professionals), machine learning still offers interesting prospects, both from the fundamental point of view 1) to even further know the limits of game playing (having programs playing against each other), 2) to better understand machine intelligence and compare it to human intelligence, and from the practical point of view 3) to enhance the human playing experience by coaching professionals to play better or training beginners. The latter prospect also raises interesting questions of the explainability of machine game play. This competition will evaluate the potential of learning machines to teach human players. The goal of this competition includes:

- Understand the basic concepts of an FML-based fuzzy inference system.
- Use the FML intelligent decision tool to establish the knowledge base and rule base of the fuzzy inference system.
- Use the data predicted by Facebook AI Research (FAIR) Open Source Darkforest AI Bot as the training data.

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speaker invitation, please refer to the webpage.

CIS Conferences

⭐ Conference Calendar (2019-2021)

⭐ 2019 IEEE Conference on Computational Intelligence for Financial Engineering & Economics (CIFEr)
Shenzhen, China
4-5 May 2019

⭐ 2019 3rd International Symposium on Autonomous Systems (ISAS)
Shanghai, China
29-31 May 2019

⭐ 2019 IEEE Colombian Conference on Applications in Computational Intelligence (ColCACI)
Barranquilla, Colombia
4-7 June 2019
(Submission: 17 March 2019)

⭐ 2019 IEEE Congress on Evolutionary Computation (IEEE CEC 2019)
Wellington, New Zealand
10-13 June 2019

⭐ 2019 IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications (CIVEMSA)
Tianjin Shi, China
14-16 June 2019

⭐ 2019 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE 2019)
New Orleans, USA
23-26 June 2019

- Use the data predicted by Facebook AI Research (FAIR) Open Source ELF OpenGo AI Bot as the desired output of the training data.
- Optimize the FML knowledge base and rule base through the methodologies of evolutionary computation and machine learning in order to develop a regression model based on FML-based fuzzy inference system.

Deadline for submission of applications is **10 May 2019**. More information and application details can be found here.

Member Activities

Upcoming Webinar

"Evolutionary Strategies for Difficult Engineering Design Problems" by Professor Alice Smith
Date and Time: 1 April 2019 (4pm – 5pm GMT)
Registration URL: https://attendee.gotowebinar.com/register/6881759012778834434
Webinar ID: 345-590-011

This presentation will put forth several straightforward but successful implementations of an often overlooked evolutionary algorithm – evolutionary strategies (ES) – for the design of complex systems. ES was developed more than 50 years ago for optimizing engineering design problems in continuous space and is characterized by its simplicity and computational efficiency. There are few tunable parameters in the basic version and the search relies on the evolution of a population through mutation only, where mutation is a Gaussian which adapts automatically to the search history. Such simplicity is appealing for both algorithm development and implementation and tends to result in a robust search. The engineering design problems showcased in this talk are diverse and most involve two objectives optimized with ES simultaneously to identify a Pareto set of non-dominated designs. The applications are (1) the design of an airfoil for a flying drone considering drag and lift, (2) the design of heterogeneous communications networks considering resiliency and traffic efficiency, (3) the location of semi-obnoxious facilities in municipalities considering transport costs and social costs, and (4) the design of large order picking warehouses considering travel distance.

Call for Webinars

Are you interested in giving a webinar for the IEEE Computational Intelligence Society in 2019?

Webinars are a great way to disseminate advanced knowledge on hot topics in computational intelligence and are organized and distributed through the web free of charge to our members.

A webinar lasts no more than an hour and includes:

1. Brief introduction by the Chair
2. The presentation - only your screen is shared.
3. Questions and answer session

If you are interested - please contact Keeley Crockett (K.Crockett@mmu.ac.uk), Chair, IEEE Computational Intelligence Society Webinars Sub-committee 2019.

Call for Papers (Journal)

- IEEE TCDS Special Issue on Continual Unsupervised Sensorimotor Learning (15 March)
- IEEE TFS Special Issue on Fuzzy Rough Sets for Big Data (1 April)
- IEEE TFS Special Issue on Toward Humanoid Robots: Fuzzy Sets and Extensions (1 May)
- IEEE TFS Special Issue on Nature-inspired Optimization Methods in Fuzzy Systems (1 July)
- IEEE CIM Special Issue on Evolutionary Machine Learning (15 July)
- IEEE TFS Special Issue on Fuzzy Based AI: Emerging Techniques and their Applications (1 August)

⭐ 2019 International Conference on Process Mining (ICPM)
Aachen, Germany
24-26 June 2019

⭐ 2019 IEEE Conference on Computational Intelligence in Bioinformatics and Computational Biology (IEEE CIBCB 2019)
Siena, Italy
9-11 July 2019
Submission March 2019

⭐ 2019 International Joint Conference on Neural Networks (IJCNN 2019)
Budapest, Hungary
14-19 July 2019

⭐ 2019 Joint IEEE International Conference on Developmental Learning and Epigenetic Robotics (ICDL-EpiRob 2019)
Oslo, Norway
19-22 August 2019
(Submission: March 2019 -- extended)

⭐ 2019 IEEE Conference on Games (IEEE CoG 2019)
London, UK
20-23 August 2019
(Submission: 25 March)

⭐ 2019 IEEE International Conference on Data Science and Advanced Analytics (DSAA)
Washington, DC USA
5-8 October 2019
(Submission: 2 May)

⭐ 2019 Third International Conference on Intelligent Computing in Data Sciences (ICDS)
Marrakech, Morocco
28-30 October 2019
(Submission: 30 April)

⭐ 2019 IEEE Symposium Series on Computational Intelligence (IEEE SSCI 2019)

Xiamen, China

6-9 December 2019

(Submission: 10 July)

Call for Papers (Conference)

- [IEEE CEC Workshop on Understanding of Evolutionary Optimization Behavior (15 March)](#)
- [The 9th International Conference on Information Science and Technology (ICIST 2019) (1 April)](#)
- [The 15th ACM/SIGEVO Workshop on Foundations of Genetic Algorithms (FOGA XV) (17 April)](#)

⭐ 2020 IEEE World Congress on Computational Intelligence (IEEE WCCI 2020)

Glasgow, UK

19-24 July 2020

Call for Participation (Conference)

- [The 3rd International Symposium on Autonomous Systems (ISAS 2019) (29-31 May)](#)

⌄ Editor

Leandro L. Minku

University of Birmingham, UK

Email: l.l.minku@cs.bham.ac.uk

Career Opportunities

- [Full UK PhD scholarships in evolutionary computation / computational intelligence /data analytics / operations research / optimisation / simulation (3 March)](#)