Workshops at PPSN 2018

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Abstract. This article provides an overview of the 6 workshops held in conjunction with PPSN 2018 in Coimbra, Portugal. For each workshop, we list title, organizers, aim and scope as well as the accepted contributions.

1 Welcome from the Workshop Chairs

Workshops are an integral part of the conference series on Parallel Problem Solving From Nature (PPSN). They are intended as forums for presenting and discussing emerging approaches or critical reflections within a subfield. They provide an excellent opportunity to meet people with similar interests, to be exposed to cutting-edge research, and to exchange ideas in an informal setting.

About a year before the main conference, the organizing committee invited proposals for workshops to be held in conjunction with PPSN 2018. The organizers of an accepted workshop are responsible for its format, coordination, publicity, and technical program. Interactive sessions are encouraged. Most workshop contributions are short position papers or abstracts rather than full papers.

For PPSN 2018, the workshop chairs considered 8 high-quality workshop proposals and selected 6 of them for inclusion in the conference program based

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on scheduling constraints and synergy with other workshops and tutorials. All workshops were half-day workshops and were held during the first two days of the conference, carefully scheduled alongside the accepted tutorial program.

Benchmarking represented a key theme for many workshop sessions, with topics including on-going advances in benchmarks and methods for multimodal problems, choice of functions to include in standardized benchmarking studies, and use of machine learning problems for benchmarking. A further workshop sought to consider how practice-based considerations can influence the development and benchmarking of optimization algorithms. Hybridization of machine learning with evolutionary computation was also a theme, alongside a considered look at how to incorporate developmental processes observed in nature into artificial neural networks. Two of the workshops considered aspects of bridging the gap between theory and practice in nature-inspired optimization and were associated with COST Action CA15140 'Improving Applicability of Nature-Inspired Optimisation by Joining Theory and Practice' (ImAppNIO)[1,2].

Summaries for all workshops are presented in the next section. The total number of 31 contributions, as well as overview presentations and panel discussions, demonstrate the sustained popularity of the workshop format and represent a significant contribution to the overall PPSN conference program. Workshop organizers were based at 15 different institutions from 9 countries in Asia, Australia, and Europe and accepted presentations from a diverse set of authors from 20 countries in America, Asia, Australia, and Europe.

We hope that attendees have enjoyed interesting, thought-provoking and fruitful discussions in the workshops at PPSN 2018!

Robin Purshouse and Christine Zarges
PPSN 2018 Workshop Chairs

2 The Six Workshops

We summarize the content of the workshops at PPSN 2018 as follows:

1. Advances in Multimodal Optimization (Sect. 2.1)
2. Black-Box Discrete Optimization Benchmarking (BB-DOB) (Sect. 2.2)
3. Bridging the Gap Between Theory and Practice in Nature-Inspired Optimization (Sect. 2.3)
4. Developmental Neural Networks (Sect. 2.4)
5. Evolutionary Machine Learning (Sect. 2.5)
6. Investigating Optimization Problems from Machine Learning and Data Analysis (Sect. 2.6)

[1] http://imappnio.dcs.aber.ac.uk
[2] http://www.cost.eu/COST_Actions/ca/CA15140

2.1 Advances in Multimodal Optimization

Organizers:

- Mike Preuss, University of Münster, Münster, Germany
- Michael G. Epitropakis, Lancaster University, Lancaster, United Kingdom
- Xiaodong Li, RMIT University, Melbourne, Australia

URL: http://www.epitropakis.co.uk/ppsn2018-niching/

Aim and Scope: The workshop attempts to bring together researchers from evolutionary computation and related areas who are interested in Multi-modal Optimization. This is a currently forming field, and we aim for a highly interactive and productive meeting that makes a step forward towards defining it. The Workshop provides a unique opportunity to review the advances in the current state-of-the-art in the field of Niching methods. Further discussion will deal with several experimental/theoretical scenarios, performance measures, real-world and benchmark problem sets and outline the possible future developments in this area.

List of Accepted Contributions

Authors	Title
M. Epitropakis, X. Li, M. Preuss	Current State of Multimodal Optimization
H. Ishibuchi	Multi-Modal Multi-Objective Optimization: Test Problems, Algorithms and Performance Indicators
P. Kerschke	Exploiting a Problem's Multimodality for Improved Multi-Objective Optimization

2.2 Black-Box Discrete Optimization Benchmarking (BB-DOB)

Organizers:

- Pietro S. Oliveto, University of Sheffield, Sheffield, United Kingdom
- Markus Wagner, University of Adelaide, Adelaide, Australia
- Thomas Weise, Hefei University, Hefei, China
- Borys Wróbel, Adam Mickiewicz University, Poznań, Poland
- Aleŝ Zamuda, University of Maribor, Maribor, Slovenia

URL: http://iao.hfuu.edu.cn/bbdob-ppsn18

Aim and Scope: The aim of BB-DOB is to set up a process that will allow to achieve a standard methodology for the benchmarking of black-box optimization algorithms in discrete and combinatorial search spaces. Our long-term aim is to produce:

1. a well-motivated benchmark function testbed
2. an experimental set-up
3. generation of data output for post-processing and
4. presentation of the results in graphs and tables

In this workshop we encourage a discussion concerning which functions should be included in the benchmarking testbed (i.e., point (1) above). The functions should capture the difficulties of combinatorial optimization problems in practice but at the same time be comprehensible such that algorithm behaviors can be interpreted according to the performance on a given benchmark problem. The desired search behavior should be clear and algorithm deficiencies understood in depth. This understanding should lead to the design of improved algorithms. Ideally (not necessarily for all), the benchmark functions should be scalable with the problem size and non-trivial in the black-box optimization sense (the function may be shifted such that the global optimum may be any point). This workshop is organized in connection with and partly based upon work from COST Action CA15140 'Improving Applicability of Nature-Inspired Optimisation by Joining Theory and Practice', supported by COST (European Cooperation in Science and Technology, see footnotes 1 and 2).

List of Accepted Contributions

Authors	**Title**
V. Jacimovic	Consensus on Non-Euclidean Manifolds Over Complex Networks: Optimization Problems and Benchmark Functions
Q. Yang, J. Zou, G. Ruan, S. Yang, and J. Zheng	A Dynamic Preference-Based Evolutionary Multi-Objective Optimization Benchmark Based on Reference Point?
S. Wasik, M. Antczak, J. Badura, and A. Laskowski	Optil.io: Online Platform for Benchmarking Optimization Algorithms
A. Zamuda, G. Hrovat, E. Lloret, M. Nicolau, and C. Zarges	Examples Implementing Black-Box Discrete Optimization Benchmarking Survey for BB-DOB@GECCO and BB-DOB@PPSN
S. Raggl	Discrete Real-world Problems in a Black-Box Optimization Benchmark
P. Kerschke, J. Bossek, and H. Trautmann	Analyzing the Impact of Performance Indicator Parameterizations on the Assessment of Algorithm Performances
O. M. Shir, C. Doerr, and T. Bäck	Compiling a Benchmarking Test-Suite for Combinatorial Black-Box Optimization: A Position Statement
H. Wang, F. Ye, C. Doerr, S. van Rijn, and T. Bäck	IOHProfiler: A Benchmarking and Profiling Tool for Iterative Optimization Heuristics

2.3 Bridging the Gap Between Theory and Practice in Nature-Inspired Optimization

Organizers:

- Fernando G. Lobo, University of Algarve, Faro, Portugal
- Thomas Jansen, Aberystwyth University, Aberystwyth, United Kingdom

URL: http://fernandolobo.info/ppsn2018workshop/

Aim and Scope: Nature-inspired search and optimization heuristics have been used for decades to solve practical problems across different domains. Alongside, the theoretical understanding of them has been improving substantially, providing better understanding of what they can and cannot do in terms of solution quality and runtime. In spite of much improvement from the theoretical perspective, there is a large gap between theoretical foundations and practical applications. Theory and practice reinforce each other. Theory is driven by the need to improve understanding of challenges observed in practice. Likewise, practical applications can benefit from insights and guidelines derived from theory.

The workshop seeks to bring together researchers interested in the debate on how to narrow the gap between theory and practice. It is organized in connection with and partly based upon work from COST Action CA15140 'Improving Applicability of Nature-Inspired Optimisation by Joining Theory and Practice', supported by COST (European Cooperation in Science and Technology, see footnotes 1 and 2). We hope that this debate will improve the current state of the field.

List of Accepted Contributions

Authors	Title
C. M. Fonseca	It's All About the Problem: Some Thoughts on Nature-Inspired Solver Software Development
E. Tuba, C. M. Fonseca, and P. Machado	Towards a Combinatorial Optimization API for Nature-Inspired Optimization Algorithms
C. Doerr	Towards a More Practice-Aware Evaluation of Iterative Optimization Heuristics
F. Lobo	Interplay Between Theory and Practice

2.4 Developmental Neural Networks

Organizers:

- Dennis Wilson, University of Toulouse, Toulouse, France
- Julian Miller, University of York, York, United Kingdom

– Sylvain Cussat-Blanc, University of Toulouse, Toulouse, France

URL: https://www.irit.fr/devonn/

Aim and Scope: In nature, brains are built through a process of biological development in which many aspects of the network of neurons and connections change are shaped by external information received through sensory organs. Biological development mechanisms such as axon guidance and dendrite pruning have been shown to rely on neural activity. Despite this, most artificial neural network (ANN) models do not include developmental mechanisms and regard learning as the adjustment of connection weights, while some that do use development restrain it to a period before the ANN is used. It is worthwhile to understand the cognitive functions offered by development and to investigate the fundamental questions raised by artificial neural development. In this workshop, we will explore existing and future approaches that aim to incorporate development into ANNs. Invited speakers will present their work with neural networks, both artificial and biological, in the context of development. Accepted submissions on contemporary work in this field will be presented and we will hold an open discussion on the topic.

List of Accepted Contributions

Authors	Title
S. Pautot	Keynote Presentation on Neurosciences
J. F. Miller, D. G. Wilson, and S. Cussat-Blanc	Evolving Programs That Build Neural Networks for Multiple Problems
J. Stork, M. Zaefferer, and T. Bartz-Beielstein	Distance-Based Kernels for Surrogate Model-Based Neuroevolution
Y. Ying, A. Rose, A. Siddique, and W. N. Browne	Minimum Requirements for an Artificial Rat
D. G. Wilson, S. Cussat-Blanc, and H. Luga	A Gene Regulatory Network Model for Axon Guidance

2.5 Evolutionary Machine Learning

Organizers:

– Giovanni Squillero, Politecnico di Torino, Torino, Italy
– Alberto Tonda, National Institute of Agronomic Research, Thiverval-Grignon, France

URL: https://evolearning.github.io/ppsn18/

Aim and Scope: Evolutionary machine-learning (EML) could be easily defined as a crossbreed between the fields of evolutionary computation (EC) and machine

learning (ML). However, as the 'obvious connection' between the processes of learning and evolution has been pointed out by Turing back in 1950, to avoid a blatant pleonasm, the term is mostly used referring to the integration of well-established EC techniques and canonical ML frameworks. A first line of research ascribable to EML predates the recent ML windfall and focuses on using EC algorithms to optimize frameworks: it included remarkable studies in the 1990s, such as the attempts to determine optimal topologies for an artificial neural network using a genetic algorithm. The other way around, a line tackling the use of ML techniques to boost EC algorithms appeared before 2000. More recently, scholars are proposing truly hybrid approaches, where EC algorithms are deeply embedded in frameworks performing ML tasks.

List of Accepted Contributions

Authors	**Title**
I. Bonnici, A. Gouaïch, and F. Michel	Eco-Evolutionary Search in a Metamorph Learner
B. Doerr, C. Doerr, and J. Yang	Provably Efficient Search Heuristics by Learning-Inspired Parameter Control
S. Al-Maliki, E. Lutton, F. Boué, and F. Vidal	MRI Gastric Images Processing Using a Multiobjective Fly Algorithm
E. Medvet, A. Bartoli, A. Ansuini, and F. Tarlao	Observing the Population Dynamics in GE by Means of the Intrinsic Dimension
Y. Nojima, S. Sakai, N. Masuyama, and H. Ishibuchi	Multiobjective Evolutionary Classifier Design Using Class Scores by a Deep Convolutional Neural Network
C. Pageau, A. Blot, H. H. Hoos, M.-E. Kessaci, and L. Jourdan	Automatic Design of a Dynamic Multi-Objective Local Search Algorithm
R. Denysiuk, R. Pinto, M. F. Costa, L. Costa, and A. Gaspar-Cunha	Feature Selection Using Multiobjective Evolutionary Algorithms
D. G. Wilson, K. Harrington, S. Cussat-Blanc, and H. Luga	Evolving Differentiable Gene Regulatory Networks

2.6 Investigating Optimization Problems from Machine Learning and Data Analysis

Organizers:

- Marcus Gallagher, University of Queensland, Brisbane, Australia
- Mike Preuss, University of Münster, Münster, Germany
- Pascal Kerschke, University of Münster, Münster, Germany

URL: https://sites.google.com/view/optml-ppsn18/home

Aim and Scope: In continuous black-box optimization, there are a number of benchmark problem sets and competitions. However, the focus has mainly been on the performance and comparison of algorithms on artificial problems. The aim of this workshop is to instead make a set of optimization problems the centre of focus, bringing together researchers to discuss and develop deeper insights into the structure and difficulty of the problem set, as well as experimental methodology (including algorithms). Several problem classes (and specific problem instances) from the area of machine learning and data analysis were proposed in advance of the workshop submission deadline. Submission of brief papers that show new insights into the problems, for example via exploratory landscape analysis, algorithm performance (with a focus on 'why') or analysis of the quality/diversity of solutions present in the problem instances are invited.

List of Accepted Contributions

Authors	**Title**
M. Gallagher and S. Saleem	Exploratory Landscape Analysis of the MLDA Problem Set
S. H. Zhan and M. A. Muñoz	Recurrence Quantification Analysis of the State Space Trajectories of Black-Box Continuous Optimization Algorithms
M. Gallagher, S. Saleem, S. Van Ryt, and Y. Qiao	Evaluating Algorithm Performance on the MLDA Problem Set