Special Issue on Benchmarking of Computational Intelligence Algorithms

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Computational Intelligence (CI) is a huge and expanding field which is rapidly gaining importance, attracting more and more interests from both academia and industry. It includes a wide and ever-growing variety of optimization and machine learning algorithms, which, in turn, are applied to an even wider and faster growing range of different problem domains. For all of these domains and application scenarios, we want to pick the best algorithms. Actually, we want to do more, **we want to *improve upon* the best algorithm**. This **requires a deep understanding** of the problem at hand, the performance of the algorithms we have for that problem, the features that make instances of the problem hard for these algorithms, and the parameter settings for which the algorithms perform the best. Such knowledge can only be obtained empirically, by collecting data from experiments, by analyzing this data statistically, and by mining new information from it. Benchmarking is the engine driving research in the fields of optimization and machine learning for decades, while its potential has not been fully explored. **Benchmarking the algorithms of Computational Intelligence is an application of Computational Intelligence itself!** This virtual special issue of the EI/SCIE-indexed *Applied Soft Computing* journal published by Elsevier solicits novel contributions from this domain according to the topics listed below.

Topics of Interest

- mining of higher-level information from experimental results
- modelling of algorithm behaviors and performance
- visualizations of algorithm behaviors and performance
- statistics for performance comparison (robust statistics, PCA, ANOVA, statistical tests, ROC, …)
- evaluation of real-world goals such as algorithm robustness, reliability, and implementation issues
- theoretical results for algorithm performance comparison
- comparison of theoretical and empirical results
- new benchmark problems
- automatic algorithm configuration and selection
- the comparison of algorithms in "non-traditional" scenarios such as
    - multi- or many-objective domains
    - parallel implementations, e.g., using GGPUs, MPI, CUDA, clusters, or running in clouds
    - large-scale problems or problems where objective function evaluations are costly
    - dynamic problems or where the objective functions involve randomized simulations or noise
    - deep learning and big data setups
- comparative surveys with new ideas on
    - dos and don'ts, i.e., best and worst practices, for algorithm performance comparison
    - tools for experiment execution, result collection, and algorithm comparison
    - benchmark sets for certain problem domains and their mutual advantages and weaknesses
- survey and review of benchmarking, algorithm performance statistics, and performance-related theorems
- performance indicators, objective (problem) reduction

The focus of this special issue is the methodology of exploring, comparing, and understanding algorithm performance. Submissions on this topic in the fields of optimization, machine learning, metaheuristics, decision making, operational research, business logic, fuzzy logic, fuzzy information processing are welcome. The goal of this special issue is *not* to introduce new optimization algorithms or new real-world problems.

Submission Process

The *Applied Soft Computing* journal subscribes to the concept of *Virtual Special Issues* (VSIs). In a VSI, submissions are made through the editorial system http://ees.elsevier.com/asoc/ at any time until the final submission deadline. They go through the normal editorial process (managed by the guest editors), and, if accepted, are published immediately after acceptance. Accepted papers can appear at different times, but are bundled to the VSI.

IMPORTANT: Please choose "VSI: Benchmarking CI" when specifying the Article Type.

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Important Dates

Virtual Special Issue Start: July 2018
Final Deadline for Submissions: May 19, 2019
Review notification about 12 weeks after submission.
Up to 2 rounds of revisions.
Publication immediately after receipt of accepted final version.

Guest Editors

Prof. Dr. Thomas Weise obtained the MSc in Computer Science in 2005 from the Chemnitz University of Technology and his PhD from the University of Kassel in 2009. He then joined the University of Science and Technology of China (USTC) as PostDoc and subsequently became Associate Professor at the USTC-Birmingham Joint Research Institute in Intelligent Computation and Its Applications (UBRI) at USTC. In 2016, he joined Hefei University as Full Professor to found the Institute of Applied Optimization at the Faculty of Computer Science and Technology. Prof. Weise has more than seven years of experience as a full time researcher in China, having contributed significantly both to fundamental as well as applied research. He has more than 80 scientific publications in international peer reviewed journals and conferences. His book "Global Optimization Algorithms – Theory and Application" has been cited more than 730 times. He has acted as reviewer, editor, or program committee member at 70 different venues.

Prof. Dr. Bin Li received the B.S. degree from Hefei University of Technology, Hefei, China, in 1992, the M.Sc. degree from Institute of Plasma Physics, China Academy of Science, Hefei, China, in 1995, and the Ph.D. degree from University of Science and Technology of China (USTC), China in 2001. He is currently a professor with the School of Information Science and Technology, USTC, Hefei, China. He has authored and co-authored more than 40 refereed publications. His major research interests include evolutionary computation, memetic algorithms, pattern recognition, and real-world applications. Dr. Li is the Founding Chair of IEEE CIS Hefei Chapter, Counselor of IEEE USTC Student Branch, senior member of Chinese Institute of Electronics (CIE), member of the Technical Committee of Electronic Circuits and Systems Section of CIE.

Dr. Markus Wagner is a Senior Lecturer at the School of Computer Science, University of Adelaide, Australia. He has done his PhD studies at the Max Planck Institute for Informatics in Saarbrücken, Germany and at the University of Adelaide, Australia. His research topics range from mathematical runtime analysis of heuristic optimization algorithms and theory-guided algorithm design to applications of heuristic methods to renewable energy production, professional team cycling and software engineering. So far, he has been a program committee member 30 times, and he has written over 70 articles with over 70 different co-authors. He has chaired several education-related committees within the IEEE CIS, is Co-Chair of ACALCI 2017 and General Chair of ACALCI 2018.

Prof. Dr. Xingyi Zhang received the B.Sc. from Fuyang Normal College in 2003, and the M.Sc. in 2006 and Ph.D. in 2009 both from Huazhong University of Science and Technology. Currently, he is a professor in the School of Computer Science and Technology, Anhui University. His main research interests include unconventional models and algorithms of computation, multi-objective evolutionary optimization and membrane computing. He is the chair of 2017 Data Driven Optimization of Complex Systems and Applications and 2015 Asian Conference on Membrane Computing. He also serves as Editorial Board Member of Complex & Intelligent Systems and International Journal of Bio-inspired Computing.

Prof. Dr. Jörg Lässig leads the Enterprise Application Development Group of the University of Applied Sciences Zittau/Görlitz in Germany since 2011. He holds degrees in Computer Science, Computational Physics, and received a Ph.D. in Computer Science for his research on efficient algorithms and models for the generation and control of cooperation networks at Chemnitz University of Technology (Germany), which he finished in 2009. Prof. Lässig has PostDocs at the Università della Svizzera italiana, Institute of Computational Sciences (Lugano, Switzerland) and the International Computer Science Institute Berkeley (California, USA). His research directions include sustainable IT services, energy efficiency benchmarking, regional carbon footprints and energy informatics.