

Special Session on Computational Intelligence for Scheduling and Combinatorial Optimization

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Aim and Scope:

Computational Intelligence has been successfully used to solve challenging scheduling and combinatorial optimization problems in a variety of areas such as manufacturing, supply chain, timetabling, journey planning, tourist trip design, etc. These problems are normally NP-hard. Thus, it is impractical, if not impossible, to solve them by exact methods such as mixed integer programming. Computational Intelligence, in this case, is a promising approach due to its capability of providing near-optimal solutions within a reasonable time budget. For solving scheduling and combinatorial optimization problems with computational intelligence, the main challenges can include solution representation (e.g. binary/continuous/permutation-based, fixed-length/variable-length, tree-based/graph-based, explicit/implicit), problem specific search operators that take the complex constraints and domain knowledge into account, hybrid mechanisms combining global and local search to achieve a better exploration-exploitation tradeoff, multiple conflicting objectives in a discrete and combinatorial search space, uncertain and dynamic environment, large scale problem with interdependent modules, etc. More and more techniques based on computational intelligence have been designed for solving these hard problems more effectively. Computational Intelligence for Scheduling and Combinatorial Optimization has become an active research area in both Artificial Intelligence and Operations Research.

This special session focuses on both theoretical and practical aspects of Computational Intelligence for Scheduling and Combinatorial Optimization. Examples of methods include genetic algorithm, genetic programming, evolutionary strategies, ant colony optimization, particle swarm optimization, meta- and hyper-heuristics, memetic algorithms, neural network, fuzzy systems, and hybrid methods. Topics of this special session include but not limited to:

- Production scheduling
- Timetabling
- Vehicle routing
- Transport scheduling
- Grid/cloud scheduling
- Project scheduling
- 2D/3D strip packing
- Orienteering
- Space and resource allocation
- Multi-objective scheduling
- Large scale scheduling

- Scheduling in dynamic environment
- Scheduling with interdependent modules
- Automated heuristic design
- New real-world and innovative applications

Yi Mei is currently a Research Fellow at Victoria University of Wellington, New Zealand. He has been working on optimisation for more than ten years. In particular, his expertise is in solving scheduling and routing optimisation problems, such as arc routing problems, warehouse optimisation and travelling thief problem, with computational intelligence. His major contributions include the design of efficient problem-specific strategies to jump out of local optima, handle constraints, divide and conquer large scale problems, balance the optimisation of multiple objectives, and deal with interacting modules. Being an early-career researcher who received his Ph.D. degree in 2010, Dr. Mei has built a strong track record, including a number of top-notch publications in IEEE Transactions on Evolutionary Computation and IEEE Transactions on Systems, Man, and Cybernetics: Part B, as well as various research grants and awards. As the sole investigator, he won the 2nd prize of the Competition at IEEE World Congress on Computational Intelligence 2014: Optimisation of Problems with Multiple Interdependent Components. Dr. Mei was the recipient of the 2010 Chinese Academy of Sciences Dean's Award (top 200 postgraduates all over China) and the 2009 IEEE Computational Intelligence Society (CIS) Postgraduate Summer Research Grant (three to four recipients all over the world). Dr. Mei serves as the committee member of IEEE ECTC Task Force on Evolutionary Scheduling and Combinatorial Optimisation and IEEE CIS Task Force on EC for Feature Selection and Construction.

Su Nguyen is a Lecturer at Hoa Sen University, Vietnam, and a Research Fellow in Evolutionary Computation Research Group (ECRG), Victoria University of Wellington, New Zealand. Su Nguyen has also taken different research positions focusing on quantitative methods for operations management. He was the Research Associate in Industrial and Manufacturing Engineering at the School of Engineering and Technology, AIT from 2009 to 2010 and the Research Assistant at VUW from 2011 to 2013. From 2014 to 2015, he was the lecturer in Industrial and Systems Engineering at International University, VNU-HCMC, Vietnam. His primary research interests include computational intelligence, optimization, statistical analysis, AI, discrete-event simulation and their applications in production and operations management. He is currently the Chair of IEEE Task Force on Evolutionary Scheduling and Combinatorial Optimization.

Mengjie Zhang is Professor of computer science at Victoria University of Wellington, New Zealand, where he is heading the interdisciplinary Evolutionary Computation Research Group. He has been working in the area of evolutionary computer vision and signal processing for over 10 years. He has over 350 publications in international conferences and journals including over 100 in evolutionary computer vision and has been supervising over 50 research students in this area. He is currently the Chair of IEEE CIS Evolutionary Computation Technical Committee, a member of IEEE CIS Intelligent Systems and Application Technical Committee, an Associate Editor or Editorial Board for six international journals including IEEE Transactions on Evolutionary Computation, the Evolutionary Computation Journal (MIT Press) and Genetic Programming and Evolvable Machines (Springer). He is also a Vice-Chair of the IEEE CIS Task Force on Evolutionary computer vision and image processing, a Vice-Chair of the IEEE CIS Task Force on Evolutionary Feature Selection and Construction, and the founding Chair of the IEEE Chapter on Computational Intelligence in New Zealand (Central Section).