FITNESS LANDSCAPE ANALYSIS FOR UNDERSTANDING AND DESIGNING INTELLIGENT OPTIMIZATION ALGORITHMS

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Evolutionary algorithms and other classes of meta-heuristics are often used to solve computationally hard single-/multi-objective continuous/combinatorial optimization problems. Such randomized search heuristics include evolutionary algorithms, neighborhood-based search, simulated annealing, tabu search, iterated local search, evolution strategy, memetic algorithms, hyper-heuristics, etc. Successful applications of evolutionary computation can be found in fields like engineering, scheduling, timetabling, planning, network design, transportation and distribution problems, vehicle routing, traveling salesman, packing, power systems, image processing, among many others.

This special session aims at bringing together researchers working on understanding the relations between the problem structure and the algorithm performance.

Topics

- Understanding problem difficulty and algorithm complexity
- Problem structure analysis, fundamental search space properties
- Gain problem knowledge and learn about the problem structure
- Metrics and descriptors for describing problem features
- Estimating problem features for large-size problem instances
- Characterizing local optimality, ruggedness and neutrality
- Graphs and complex networks for modeling fitness landscapes
- Theory and applications of elementary landscapes
- Algorithm behavior and search performance

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- Choice for representation, evaluation, neighborhood structures and variation operators
- Feature-based performance analysis, correlation and regression
- Fitness landscape analysis for the configuration and selection of algorithms
- Automated off-line/tuning and on-line/control/adaptation of parameters, hyper-heuristics
- Performance prediction, performance robustness and scalability issues in the search space (large-scale optimization) and in the objective space (many-objective optimization)
- Software and visualization tools for fitness landscape analysis
- Benchmarking, construction of new models and test problems, problem taxonomies
- Fitness landscape analysis for problems with continuous, combinatorial, and mixed variables
- Fitness landscape analysis for single and multi-objective optimization
- Fitness landscape analysis of real-world applications