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Reducing the Computational Overhead of Metaheuristics Parameterization with Exploratory Landscape Analysis

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Abstract : The performance of a metaheuristic on a given problem class depends on the class itself and the choice of parameters. Parameter tuning is the most time-consuming phase of the optimization process after the main calculations and it often nullifies the speed advantage of metaheuristics over traditional optimization algorithms. Several off-the-shelf parameter tuning algorithms are available, but when the objective function is expensive to evaluate, these can be prohibitively expensive to use. This paper presents a surrogate-like method for finding adequate parameters using fitness landscape analysis on simple benchmark functions and real-world objective functions. The result is a simple compound similarity metric based on the empirical correlation coefficient and a measure of convexity. It is then used to find the best benchmark functions to serve as surrogates. The near-optimal parameter set is then found using fractional factorial design. The real-world problem of NACA airfoil lift coefficient maximization is used as a preliminary proof of concept. The overall aim of this research is to reduce the computational overhead of metaheuristics parameterization.

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