Title:

Multi-objective Evolutionary Algorithms

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Scientific Summary:

When optimizing a single objective problem, the goal is to find the best single design solution. However, for multi-objective problems with several (possibly conflicting) objectives, no single optimal solution is usually available, which means that the decision-maker has to select a solution from a finite set by making compromises. Since most actual optimization problems involve a trade-off between various conflicting objectives, for example minimum inconsistency or deficiency and maximum profits, the main goal of solving a Multi-Objective Optimization Problem (MOOP) is to provide a set (handful) of the best trade-off solutions, or Pareto-optimal solutions, which are a key tool in the decision-making process. In fact, an ideal MOO algorithm must identify a diverse set of Pareto-optimal solutions in the objective space [1,2].

Because classical search and optimization methods use a point-by-point approach, they obtain a single optimized (optimal) solution. However, in Evolutionary Algorithms (EAs), a population of solutions is applied in each iteration, which means that EAs are more suitable when it comes to realizing the twin goals of solving MOO problems (optimality and diversity). Genetic Algorithm (GA) is a robust EA that is applied to many MOOPs, in particular to production and operations management problems.

The open projects multi-objective evolutionary context:

- Proposing algorithms for finding *k*-best (trade-off) solutions. Proposing a fuzzy based dominance operator for saving such solutions.
- Modeling facility location problems in the multi-objective framework, and efficiently solving them using geometric and/or evolutionary approaches.
- Studying metric spaces and their hardness as search space for evolutionary algorithms.
- Proposing an efficient crossover operator or generally an EA for continuous search space.

References

[1] K. Deb, Multi-Objective Optimization using Evolutionary Algorithms, Wiley, 2001.
[2] C. A. Coello Coello, G. B. Lamont, D. A. Van Veldhuizen, Evolutionary Algorithms for Solving Multi-Objective Problems, Second Edition, 2007.