Multi-objective Bayesian global optimization for continuous problems and applications

Yang, K.

Stellingen

door Kaifeng Yang, auteur van

Multi-Objective Bayesian Global Optimization for Continuous Problems and Applications

1. Bayesian Global Optimization (BGO) can efficiently solve "expensive" evaluation problems, but the computational complexity of the algorithm itself is still expensive. [This thesis, Chapter 2.]
2. The most amazing property of Expected Hypervolume Improvement (EHVI) is that it inherently combines the predicted mean and the confidence of this prediction. [This thesis, Chapter 3.]
3. The exact calculation of EHVI was previously a time-consuming task. Now, it does not require so much time because the computational complexity of EHVI has been improved into asymptotically optimal $O(n \log n)$ both in 2-D and 3-D cases. [This thesis, Chapter 3.]
4. Probability of Improvement (PoI) is a powerful criterion when applied to search for the extreme points in an objective space. [This thesis, Chapter 3.]
5. Truncated expected hypervolume improvement manipulates a-priori knowledge of objective functions. Thus, it can produce a better Pareto-front approximation set and it can be efficiently applied in the field of preference-based multi-objective optimization problems. [This thesis, Chapter 4 & 5.]
6. A good stopping criterion in an evolutionary multi-objective optimization algorithm (EMOA) should reflect the distance between the current solution and the optimal solution.
7. Evolutionary algorithms (EAs) and control theory are two different approaches to find an optimal/robust parameter setting when designing a controller.
8. Finding an "optimal" parameter setting for a certain evolutionary algorithm is a subset of systems theory.
9. A good reference point for hypervolume-based computation is difficult to set albeit crucially important.
10. The ultimate goal of multi-objective optimization is to generate a Pareto-front approximation set as close as possible to the true one, which, in turn, can help a decision maker to understand the relationship among the objectives.
11. Working in a team, one plus one is usually more than two.
12. Life is like a process of optimization. People assume they could find the "optimal" decision when the time to choose comes, but only beings in a higher dimensional space can judge whether this decision is globally optimal or merely locally optimal.

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