
Automatically generating high-performance heuristics from flexible algorithm frameworks

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Abstract The design of algorithms for computationally hard problems is time-consuming and difficult for a number of reasons such as the complexity of such problems, the large number of degrees of freedom in algorithm design, and the difficulties of algorithm analysis due to heuristic biases and stochasticity. In recent years, automatic algorithm configuration methods have been developed to effectively search large and diverse parameter spaces; these methods have been shown to be able to identify superior algorithm designs and to find performance improving parameter settings.

In this talk, I will highlight the advantages of addressing algorithm design and configuration by algorithmic techniques; describe the main existing automatic algorithm configuration techniques; and discuss various successful applications of automatic algorithm configuration. In particular, I will show how flexible algorithm frameworks can support the automatic design of high-performing hybrid stochastic local search algorithms. In fact, even for problems that have received very high attention in the literature new state-of-the-art algorithms can be obtained automatically, that is, without manual algorithm tuning. I will conclude arguing that automatic algorithm configuration has the potential to transform the way algorithms for difficult problems are designed and developed in the future.

Keywords algorithm design · algorithm configuration · performance tuning

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