Abstract Submitted
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Optimally Stopped Optimization WALTER VINCI, DANIEL LIDAR, Univ of Southern California — We combine the fields of heuristic optimization and optimal stopping. We propose a strategy for benchmarking randomized optimization algorithms that minimizes the expected total cost for obtaining a good solution with an optimal number of calls to the solver. To do so, rather than letting the objective function alone define a cost to be minimized, we introduce a further cost-per-call of the algorithm. We show that this problem can be formulated using optimal stopping theory. The expected cost is a flexible figure of merit for benchmarking probabilistic solvers that can be computed when the optimal solution is not known, and that avoids the biases and arbitrariness that affect other measures. The optimal stopping formulation of benchmarking directly leads to a real-time, optimal-utilization strategy for probabilistic optimizers with practical impact. We apply our formulation to benchmark the performance of a D-Wave 2X quantum annealer and the HFS solver, a specialized classical heuristic algorithm designed for low tree-width graphs. On a set of frustrated-loop instances with planted solutions defined on up to $N = 1098$ variables, the D-Wave device is between one to two orders of magnitude faster than the HFS solver.

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