LocalSolver: a mathematical optimization solver based on neighborhood search

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The talk deals with local search for combinatorial optimization and its extension to mixed-variable optimization. Although not yet understood from the theoretical point of view, local search is the paradigm of choice to tackle large-scale real-life optimization problems. Today end-users ask for interactivity with decision support systems. For optimization software, it means obtaining good-quality solutions quickly.

In this talk, we introduce LocalSolver, a heuristic solver for large-scale optimization problems. It provides good solutions in short running times for problems described in their mathematical form without any particular structure. Models supported by LocalSolver involve linear and nonlinear objectives and constraints including algebraic and logical expressions, in continuous and discrete variables. LocalSolver starts from a possibly infeasible solution and iteratively improves it by exploring some neighborhoods. A differentiator with classical solvers is the integration of small-neighborhood moves whose incremental evaluation is fast, allowing exploring millions of feasible solutions in minutes on some problems.

We will present the modeling formalism of LocalSolver through examples in combinatorial and continuous optimization. We will give the main ideas about how the solver works and illustrate its performance on various benchmarks. Finally, we will provide an overview of the ongoing developments in the areas of vehicle routing and black-box optimization.