Globally Solving Nonconvex Quadratic Programming Problems via Semidefinite Relaxations

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Abstract

Nonconvex quadratic programming (QP) is an NP-hard problem that optimizes a general quadratic function over linear constraints. QP has applications in many areas including combinatorial optimization, numerical partial differential equation, and general nonlinear programming. In particular, trust-region methods in nonlinear programming require solving a sequence of QP subproblems.

This talk introduces a new global optimization algorithm for this problem, which combines two ideas —finite branching based on the first-order KKT conditions and polyhedral-semidefinite relaxations of completely positive programs. Through a series of computational experiments comparing the new algorithm with two existing codes on a diverse set of test instances, we demonstrate that the new algorithm is an attractive method for globally solving nonconvex QP. As an extension, we illustrate how to use our algorithm for efficiently computing the global solution of the (Euclidean norm) trust region subproblem with bound constraints.