Tightening Dual Bounds for QCQPs by Copositivity

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Resumo/Abstract:
Optimization problems with (nonconvex) quadratic objective subject to (nonconvex) quadratic constraints and additional linear constraints, are ubiquitous in applications. The potential weakness of Lagrangian dual bounds is well-known in nonconvex polynomial optimization. This talk will characterize both the Lagrangian and the Semi-Lagrangian dual of problems of above type as conic optimization problems. It turns out that even the weakest (lowest degree) approximation of the latter improves upon the former. The approach will also give rise to an apparently new approximation hierarchy which avoids memory problems with large Hessians because it mainly focuses on linear formulation, and only uses SDPs of a size of the original problem, in sharp contrast to higher-order sum-of-squares or moment approximation hierarchies which employ matrices of an order which increases with a power of the problem dimension.

Key words: Conic optimization, NP-hard problem, quadratic optimization, approximation hierarchies, bounds

References

[1] Bomze, I. , *Copositive relaxation beats Lagrangian dual bounds in quadratically and linearly constrained QPs.* , SIAM J. Optimiz. 25 (3), 12491275 (2015).