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Exploiting structured sparsity in mixed-integer polynomial optimization

Many ideas in (continuous) polynomial optimization algorithms make use of the structural sparsity of the intersection graph of the constraints (Waki et al, Lasserre et al). Often this leads to e.g. sum-of-squares or semidefinite relaxations whose solution is made more efficient by leveraging the sparsity; however concrete convergence results are scarce. In this talk we describe linear programming approximations to mixed-integer polynomial optimization problems where the intersection graph of the constraints has fixed tree-width. The LP formulations, given ϵ, are polynomially large in the problem data and in ϵ^{-1}, and provably attain ϵ-optimality and feasibility guarantee. As a consequence we obtain an LP-based polynomial-time approximation algorithm for the ACOPF problem on graphs with bounded tree-width.