ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

INVITATION TO THE DOCTORAL SEMINAR

Computational study of rounded psd inequalities for the Max-Cut and k-cluster problem

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ABSTRACT

Given an edge-weighted undirected graph, the Max-Cut problem asks for a bipartition of the vertices such that the sum of the weights of the edges across the bipartition is maximized. In combinatorial optimization, we usually formulate a problem as a zero-one program, and then derive strong linear inequalities that must be satisfied by all feasible solutions. Such inequalities can then be exploited algorithmically within a branch-and-bound framework to solve the problem to optimality. A wide array of such inequalities have been discovered for the Max-Cut problem. In particular, Laurent and Poljak introduced gap inequalities, an interesting class of valid inequalities for the Max-Cut problem that provides a rich source of cutting planes that can tighten the relaxations. Gap inequalities include rounded psd inequalities, hypermetric inequalities and odd clique inequalities as special cases.

We will present a computational study of SDP-based bounds for Max-Cut and k-cluster problems that use rounded psd inequalities as cutting planes to strengthen

the basic relaxation. We propose a fast optimization algorithms to efficiently separate violated rounded psd inequalities and use the augmented Lagrangian method as a bounding routine. Two simple and effective heuristics based on the greedy algorithm and a variation of the alternating direction method of multipliers (ADMM) are presented. Our numerical experiments show that our approach is very efficient in finding cutting planes with large violation and provide strong upper bounds in practice.

We hope to see you there!

