

AGCO Seminar

Speaker: Victor Verdugo, U O'Higgins.

Title: A 2-Approximation for the Bounded Treewidth Sparsest Cut Problem in FPT Time.

Abstract: In the non-uniform sparsest cut problem, we are given a supply graph G and a demand graph D , both with the same set of nodes V . The goal is to find a cut of V that minimizes the ratio of the total capacity on the edges of G crossing the cut over the total demand of the crossing edges of D . In this work, we study the non-uniform sparsest cut problem for supply graphs with bounded treewidth k . For this case, Gupta, Talwar and Witmer [STOC 2013] obtained a 2-approximation with polynomial running time for fixed k , and the question of whether there exists a c -approximation algorithm for a constant c independent of k , which runs in FPT time, remained open. We answer this question in the affirmative. We design a 2-approximation algorithm for the non-uniform sparsest cut with bounded treewidth supply graphs that runs in FPT time when parameterized by the treewidth. Our algorithm is based on rounding the optimal solution of a linear programming relaxation inspired by the Sherali-Adams hierarchy. In contrast to the classic Sherali-Adams approach, we construct a relaxation driven by a tree decomposition of the supply graph by including a carefully chosen set of lifting variables and constraints to encode information of subsets of nodes with super-constant size, and at the same time we have a sufficiently small linear program that can be solved in FPT time.

This is joint work with Vincent Cohen-Addad (Google Research Zurich) and Tobias Mömke (University of Augsburg). This work has been accepted at IPCO 2022.

Wednesday, March 23, 15:00 hrs.

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