

Thesis Abstract

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The Unique Games problem is central to the theory of hardness of approximation; it is conjectured to be **NP**-hard to distinguish between almost and barely satisfiable instances in the general case. This conjecture implies the optimality of approximation algorithms for several canonical **NP**-hard problems, like VERTEXCOVER and MAXCUT.

In this thesis, we study the Unique Games problem when the constraint graph is a metric graph, i.e. a complete graph equipped with a weight that obeys the triangle inequality. We give a randomized polynomial-time algorithm that selects a pivot and then rounds a solution to an extended linear-programming relaxation of the problem. Our algorithm is simple and achieves a 12-approximation in expectation, which separates our case from the general case, assuming the Unique Games Conjecture.