

abstract

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Topic:

Speaker:

Affiliation:

Date:

Time/Room:

We consider the following two questions:

- 1) Is the MAX-CUT problem hard on random geometric graphs of the type considered by Feige and Schechtman (2002)?
- 2) Is the value of a mathematical relaxation such as semi-definite programming (SDP) for a constraint-satisfaction problem preserved when one passes from an instance to a random induced sub-instance?

It turns out that the answer to the first question is "no" and in fact this is intimately related to the second question. The answer to the second question is much more subtle, and, in contrast to the objective value of the CSP -that was shown to be preserved under subsampling by Alon, de la Vega, Kannan and Karpinski (2002) -- for mathematical relaxations this depends on the particular relaxation and constraint satisfaction problem.

We show that the "Basic-SDP" program of Raghavendra, as well as its linear programming analog "Basic-LP", are preserved under subsampling for every constraint satisfaction problem. For stronger semi-definite programs with constraints from the Lasserre hierarchy we show a weak preservation of the value (preserving 1-value up to a constant factor) for unique games-type constraint satisfaction problem. In contrast we show that subsampling does not even weakly preserve the value of strong SDPs for some non unique constraints, and does not even weakly preserve the value of strong linear programs even on unique games.

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Our weak subsampling theorem for unique games allows us to give a polynomial-time algorithm that on input a Feige-Schechtman random geometric graph with max-cut value $1-\epsilon$, certifies that the max-cut value is at most $1-\epsilon/10$.

Joint work with Moritz Hardt, Thomas Holenstein, and David Steurer.