

Mathematical Colloquia

Monday, 02 December 2019

17:15 h, Lecture Room 119

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Sum-Of-Squares Bounds via Boolean Function Analysis

Abstract:

This talk presents an example of how changing a perspective might be beneficial for addressing few open questions in complexity of semialgebraic proof systems.

We introduce a method for proving bounds on the SoS rank based on Boolean Function Analysis and Approximation Theory. We apply our technique to improve upon existing results, thus making progress towards answering several open questions. We consider two questions by Laurent. First, finding what is the SoS rank of the linear representation of the set with no integral points. We prove that the SoS rank is between $\text{ceil}[n/2]$ and $\text{ceil}[n/2 + \sqrt{n \log(2n)}]$. Second, proving the bounds on the SoS rank for the instance of the Min Knapsack problem. We show that the SoS rank is at least $\Omega(\sqrt{n})$ and at most $\text{ceil}[(n + 4 \text{ceil}[\sqrt{n}]) / 2]$. Finally, we consider the question by Bienstock regarding the instance of the Set Cover problem. For this problem we prove the SoS rank lower bound of $\Omega(\sqrt{n})$.