Yuan Zhou

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10:30 am

Maple Room, IMU

Understanding the Power of Convex Relaxation Hierarchies: Effectiveness and Limitations

Abstract: Optimization is a broad class of problems arising everywhere in computer science, operations research, etc. Efficient algorithms that approximate the optimal solution are desirable for many optimization problems that seem computationally intractable. Convex programming relaxation hierarchies have proven to be the most powerful tool to design approximation algorithms for optimization problems.

In this talk, I will introduce convex relaxation hierarchies and explain how to understand their computational power. Using several fundamental optimization problems like Max-Cut and Sparsest-Cut as examples, I will illustrate: 1) how to design approximation algorithms via hierarchies, 2) how certain problems are resistant to hierarchies, and their significance, and 3) a surprising connection between hierarchies and the theory of algebraic proof complexity.

In the end, I will propose directions to further explore the power of convex relaxation hierarchies, which hopefully will lead to answer the most important question in approximation algorithms research -- whether the simplest semidefinite programming relaxation is optimal for many optimization problems.

Short Bio: Yuan Zhou is a graduate student at Carnegie Mellon University under the supervision of Professors Venkatesan Guruswami and Ryan O'Donnell. He received his bachelor's degree in computer science from Tsinghua University in 2009, where he attended the Special Pilot CS Class supervised by Turing Award laureate Professor Andrew Yao. He also obtained his M.S. in computer science from Carnegie Mellon University in 2013. Yuan was an intern at Microsoft Research Asia (2009), New England (2011), Silicon Valley (2012) and Toyota Technological Institute at Chicago (2010 and 2013). He was also a recipient of the Simons Graduate Fellowships in theoretical computer science.

Yuan's research interests focus on approximability of fundamental optimization problems. He also publishes work on other topics in theoretical computer science, statistical machine learning, and operations research, including analysis of Boolean functions, algebraic dichotomy theory, algorithmic game theory, quantum information theory, optimal learning for data analytics, and process flexibility in supply chains.