How do exponential size solutions arise in Semidefinite Programming?

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September 29, 2023

Talk will take place in Martin M-103, from 11:15am - 12:05pm

Abstract: Semidefinite programs (SDPs) are some of the most popular and widespread optimization problems to emerge in the last thirty years. A curious pathology of SDPs is illustrated by a famous example of Khachiyan: feasible solutions of SDPs may need exponential space to even write down. Understanding such large solutions is a key to solve one of the most important open problems in optimization theory: can we decide feasibility of SDPs in polynomial time? We first address the question: how common are such large solutions in SDPs ? We prove that they are quite common: a linear change of variables transforms every strictly feasible SDP into a Khachiyan type SDP in which the leading variables are large. As to "how large", that depends on the singularity degree, a ubiquitous parameter of SDPs. Finally, we give a partial "yes" answer to the question: can we represent exponential size solutions in a compact fashion, in polynomial space? The talk will assume only minimal background, and should be accessible to first year graduate students.

Joint work with Alex Touzov.

Bio: Gabor Pataki is a Professor at the Department of Statistics and Operations Research at UNC Chapel Hill, where he has been since 2000. He received his PhD in Algorithms, Combinatorics, and Optimization from Carnegie Mellon University. Before joining UNC, he held a visiting position at the Department of Industrial Engineering at Columbia University. His main research interest is in the geometry, duality theory, and complexity theory of semidefinite programs.