Diego Cifuentes*, 77 Massachusetts Avenue, Room 2-246C, Cambridge, MA 02139, and Ankur Moitra. Polynomial time guarantees for the Burer-Monteiro method.

The Burer-Monteiro method is one of the most widely used techniques for solving large-scale semidefinite programs (SDP). The basic idea is to solve a nonconvex program in $Y$, where $Y$ is an $n \times p$ matrix such that $X = YY^T$. We show that this method can solve SDPs in polynomial time in a smoothed analysis setting. More precisely, we consider an SDP whose domain satisfies some compactness and smoothness assumptions, and slightly perturb the cost matrix and the constraints. We show that if $p \gtrsim \sqrt{(2 + 2\eta)m}$, where $m$ is the number of constraints and $\eta > 0$ is any fixed constant, then the Burer-Monteiro method can solve SDPs to any desired accuracy in polynomial time, in the setting of smooth analysis. Our bound on $p$ approaches the celebrated Barvinok-Pataki bound in the limit as $\eta$ goes to zero, beneath which it is known that the nonconvex program can be suboptimal. (Received September 14, 2020)