EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

Solving Quadratic Equations via Non-convex Optimization: Theory and Algorithms

ABSTRACT – Solving quadratic equations in higher dimensions arise ubiquitously in science and engineering. Applications range from combinatorial optimization problems such as max-cut to phase retrieval in imaging. While I will present effective convex relaxations to such problems, the focus will be on a class of novel non-convex algorithms, which can be provably exact. This class of algorithms, dubbed Wirtinger flows, finds the solution to randomized quadratic systems from a number of equations (samples) and flops that are both optimal. At a high level, the algorithm can be interpreted as a sort of stochastic gradient scheme, starting from a guess obtained by means of a spectral method. The empirical performance shall be demonstrated on phase retrieval problems aimed, among other things, at determining the 3D structure of large protein complexes. Time permitting, I will also discuss the implications of our analysis for other non-convex heuristics such as those arising in low-rank matrix recovery problems.

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SPEAKER BIO – Dr. Mahdi Soltanolkotabi completed his Ph.D. in electrical engineering at Stanford University in 2014. He was a postdoctoral researcher in the EECS and Statistics departments at UC Berkeley during the 2014-2015 academic year. His research focuses on design and mathematical understanding of computationally efficient algorithms for optimization, high dimensional statistics, machine learning, signal processing and computational imaging. Recently, a main focus of his research has been on developing and analyzing algorithms for non-convex optimization with provable guarantees of convergence to the global optimum.

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3:30PM – 4:50PM
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