

EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

Efficient Computational Methods for Nonlinear Optimization, Data Analysis, and Learning Problems

ABSTRACT - Nonlinear optimization problems appear in many areas, such as control theory, power systems, and machine learning. The design of efficient computational methods for nonlinear optimization has been an active area of research in the field of optimization theory for many years, but has recently been shaping the mathematical foundation of data science. In this talk, we will investigate two different strategies for finding a high-quality solution of a nonlinear optimization, data-analysis or learning problem. The first method relies on the development of a penalized conic optimization framework, which we will study using the notions of treewidth and low-rank optimization. The second method is based on low-complexity local search techniques, which we will analyze using the notions of global functions and restricted isometry property. We will apply the developed results to different canonical problems, such as state estimation in power systems and tensor decomposition in machine learning.



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SPEAKER BIO - Javad Lavaei is an Associate Professor in the Department of Industrial Engineering and Operations Research at UC Berkeley. He was an Assistant Professor in Electrical Engineering at Columbia University from 2012 to 2015. He obtained the Ph.D. degree in Control & Dynamical Systems from California Institute of Technology in 2011, and was a postdoctoral scholar at Electrical Engineering and Precourt Institute for Energy of Stanford University for one year. He is the recipient of the Milton and Francis Clauser Doctoral Prize for the best university-wide Ph.D. thesis, entitled "Large-Scale Complex Systems: From Antenna Circuits to Power Grids". He has worked on different interdisciplinary problems in power systems, optimization theory, data science, and control theory. Javad Lavaei has won several awards, including DARPA Young Faculty Award, ONR Young Investigator Award, AFOSR Young Investigator Award, NSF CAREER Award, DARPA Director's Fellowship, Office of Naval Research's Director of Research Early Career Grant, Google Faculty Award, and Canadian Governor General's Gold Medal. Javad Lavaei is an associate editor for the IEEE Transactions on Automatic Control, IEEE Transactions on Smart Grid, and IEEE Control Systems Letters, and serves on the conference editorial boards of the IEEE Control Systems Society and European Control Association. His work has been recognized by the CDC 2014 Best Student Paper Award Finalist, ACC 2019 Best Student Paper Award Finalist, 2015 IEEE PES Best Paper Award, 2015 INFORMS Optimization Society Prize for Young Researchers, 2016 Donald P. Eckman Award, 2016 INFORMS ENRE Energy Best Publication Award, and 2017 SIAM Control and Systems Theory Prize.

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