



APPLIED MATHEMATICS COLLOQUIUM: Online Nonnegative Matrix Factorization for Markovian and Other Real Data

Deanna Needell

Professor of Mathematics
University of California, Los Angeles

Date:

11/13/2020

Time:

3:00 PM – 4:20 PM

Link:

Please email
snsgradstaff@ucmerced.edu
for Zoom link and passcode.

About The Speaker:

Deanna Needell earned her PhD from UC Davis before working as a postdoctoral fellow at Stanford University. She is currently a full professor of mathematics at UCLA. She has earned many awards including the IEEE Best Young Author award, the Hottest paper in Applied and Computational Harmonic Analysis award, the Alfred P. Sloan fellowship, an NSF CAREER and NSF BIGDATA award, and the prestigious IMA prize in Applied Mathematics. She has been a research professor fellow at several top research institutes including the Mathematical Sciences Research Institute and Simons Institute in Berkeley. She also serves as associate editor for IEEE Signal Processing Letters, Linear Algebra and its Applications, the SIAM Journal on Imaging Sciences, and Transactions in Mathematics and its Applications as well as on the organizing committee for SIAM sessions and the Association for Women in Mathematics.

Abstract:

Online Matrix Factorization (OMF) is a fundamental tool for dictionary learning problems, giving an approximate representation of complex data sets in terms of a reduced number of extracted features. Convergence guarantees for most of the OMF algorithms in the literature assume independence between data matrices, and the case of dependent data streams remains largely unexplored. In this talk, we present results showing that a non-convex generalization of the well-known OMF algorithm for i.i.d. data converges almost surely to the set of critical points of the expected loss function, even when the data matrices are functions of some underlying Markov chain satisfying a mild mixing condition. As the main application, by combining online non-negative matrix factorization and a recent MCMC algorithm for sampling motifs from networks, we propose a novel framework of Network Dictionary Learning that extracts 'network dictionary patches' from a given network in an online manner that encodes main features of the network. We demonstrate this technique on real-world data and discuss recent extensions and variations.

For more information, contact : Chrysoula Tsogka
ctsogka@ucmerced.edu