



THE UNIVERSITY OF CHICAGO

Department of Statistics

STATISTICS COLLOQUIUM

CANCELLED

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University of Wisconsin, Madison & Wisconsin Institute for Discovery

Algebraic Variety Models for High-Rank Matrix Completion

MONDAY, May 8, 2017, at 4:00 PM

Eckhart 133, 5734 S. University Avenue
Refreshments before the seminar at 3:30PM in Jones 111

ABSTRACT

Work in the last decade on matrix completion has shown it is possible to leverage linear structure to interpolate missing values in a low-rank matrix. However, the assumption that the data is low-rank is not always met in practice, and it is of great interest to extend matrix completion theory and algorithms to other low-complexity nonlinear structures. In this talk I will describe the problem of completing a matrix whose columns belong to an algebraic variety, i.e., the set of solutions to a system of polynomial equations. In this case the original matrix is possibly high-rank, but it becomes low-rank after mapping each column to a higher dimensional space of monomial features. Many well-studied extensions of linear models, including affine subspaces and their union, plus a rich class of nonlinear quadratic and higher degree curves and surfaces, are captured in a variety model. I will describe an efficient matrix completion algorithm that minimizes a convex or non-convex surrogate of the rank of the matrix of monomial features. Our algorithm uses the well-known “kernel trick” to avoid working directly with the high-dimensional monomial matrix. The proposed algorithm is able to recover synthetically generated data up to predicted sampling complexity bounds and outperforms standard low-rank matrix completion and subspace clustering techniques in experiments with real motion capture data. This is joint work with Greg Ongie, Robert Nowak, and Laura Balzano.

Rebecca Willett is an Associate Professor of Electrical and Computer Engineering, Harvey D. Spangler Faculty Scholar, and Fellow of the Wisconsin Institutes for Discovery at the University of Wisconsin-Madison. She completed her PhD in Electrical and Computer Engineering at Rice University in 2005 and was an Assistant then tenured Associate Professor of Electrical and Computer Engineering at Duke University from 2005 to 2013. Willett received the National Science Foundation CAREER Award in 2007, is a member of the DARPA Computer Science Study Group, and received an Air Force Office of Scientific Research Young Investigator Program award in 2010. Willett has also held visiting researcher or faculty positions at the University of Nice in 2015, the Institute for Pure and Applied Mathematics at UCLA in 2004, the University of Wisconsin-Madison 2003-2005, the French National Institute for Research in Computer Science and Control (INRIA) in 2003, and the Applied Science Research and Development Laboratory at GE Healthcare in 2002.

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