Abstract:
Low-dimensional linear subspace approximations to high-dimensional data are powerful enough to capture a great deal of structure in the signals arising from complex systems, and yet they also offer simplicity and ease of analysis. Because of this they have provided a powerful tool to many areas of engineering and science: problems of estimation, detection and prediction, with applications such as network monitoring, collaborative filtering, object tracking in computer vision, and environmental sensing. Corrupt and missing data are the norm in many massive datasets, not only because of errors and failures in data collection, but because it may be impossible to collect and process all the desired measurements.

In this talk, I will describe my recent results on estimating subspace projections from incomplete data and a fundamental theorem that provides a powerful tool for developing algorithms for subspace estimation and tracking with incomplete data. I will focus on the algorithm GROUSE (Grassmannian Rank-One Update Subspace Estimation), a subspace tracking algorithm that performs gradient descent on the Grassmannian (the manifold of all fixed-dimensional subspaces). I will also discuss the robust version, GRASTA (Grassmannian Robust Adaptive Subspace Tracking Algorithm), which is based on the analogous l1 cost function and has been applied very successfully to realtime separation of background and foreground in video. I will end by showing how this work can be a springboard to analyzing several interesting questions about measurements taken in complex systems.

Biography:
Laura Balzano is a Ph.D. candidate in Electrical and Computer Engineering, working with Professor Robert Nowak at the University of Wisconsin, Madison, degree expected May 2012. Laura received her BS and MS in Electrical Engineering from Rice University 2002 and the University of California in Los Angeles 2007 respectively. She received the Outstanding MS Degree of the year award from UCLA. She has worked as a software engineer at Applied Signal Technology, Inc. Her Ph.D. is being supported by a 3M fellowship. Her main research focus is on low-rank modeling for inference and learning with highly incomplete or corrupt data, and its applications to communications, biological, and sensor networks, and collaborative filtering.