Fall 2016 Mathematical Sciences Colloquium

"Data Analysis: From Oscillatory Patterns to Geometric Structures"

Abstract: There are numerous and diverse challenges associated with analyzing data collected from different fields of science and engineering. This talk consists of two parts. First, time-dependent oscillatory signals occur in a wide range of fields, including geophysics, biology, medicine, finance and social dynamics. Of great interest are techniques that decompose the time-dependent signals into multiple oscillatory components, with time-varying amplitudes and instantaneous frequencies. Such decompositions can help us better describe and quantify the underlying dynamics that govern the system. I will present a new advance in time-frequency representations whose effectiveness is justified by both numerical experiments and theoretical analysis. Second, the high-dimensionality of point cloud data makes investigating such data difficult. Fortunately, these data often locally concentrate along a low-dimensional subspace and this makes the problem more tractable. I will talk about utilizing low-dimensional structures for various data analysis objectives, ranging from recovering the underlying data in the presence of complex noise including Gaussian additive noise and large sparse corruptions, to recognizing subspace-based patterns in data, from robust algorithm design to theoretical analysis. The techniques for learning subspaces have broad applications: image processing, computer vision, bioinformatics, medicine, etc. At the end, I will talk about some future directions where both fields are involved.

Dr. Yi Wang (Syracuse University)

Monday, December 12, 2016

4:00-5:00pm in Lally 104