

# Auburn Montgomery

## Department of Mathematics

### Colloquium/*MAMS*

**Time:** Friday, March 20, 2015, 2:00pm–3:00pm

**Place:** Auburn Montgomery, Goodwyn Hall, Room 202

**Speaker:** Dr. Yuejie Chi, Ohio State University

**Title:** Sparse Parameter Estimation via Structured Matrix Completion

**Abstract:** The problem of recovering a spectrally-sparse object from a small number of time domain samples bears great importance in practical sensing and imaging applications. Traditional methods of parametric spectrum estimation enforce constraints on solutions that are consistent with the physics of a problem. For example, a returned complex spectrum must be co-variant to time delay and complex modulation of the data. Conversely, in compressed sensing, the essential objective is to return a sparse solution from an a priori determined dictionary. Traditional methods enforce physically-meaningful constraints, but overlook sparsity. Compressed sensing enforces sparsity, but overlooks physically-meaningful constraints.

In this talk, I'll present a novel algorithm, called Enhanced Matrix Completion (EMaC), that capitalizes on both sparsity and physically-meaningful constraints to recover a spectrally-sparse object. The algorithm starts by arranging the data into a low-rank enhanced matrix with a multi-fold Hankel structure whose rank is upper bounded by the sparsity level, and then attempts recovery via nuclear norm minimization. Under mild physically-meaningful incoherence conditions, EMaC allows perfect recovery as soon as the number of samples exceeds the sparsity level within logarithm factors, and is robust against bounded and sparse noise. This approach can be further extended to recover multi-fold Toeplitz covariance matrices when multiple snapshots are available. Numerical examples are provided to corroborate the theoretical findings.

There is also a Math Club and Engineering Club social gathering starting at 1:30pm.

\*\*\*\*Refreshments will be served at 1:30pm\*\*\*\*

This event is supported by the AUM Lecturer's Program.