

# SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

## **Double Alternating Minimization (DAM) for Phase Retrieval in the Presence of Poisson Noise and Pixelation**

MS Dissertation Defense

By

**Weimin Zhou**

MS Candidate

Department of Electrical and Systems Engineering  
Washington University in St. Louis

**Abstract:** Optical detectors, such as photodiodes and CMOS cameras, can only read intensity information, and thus phase information of wavefronts is lost. Phase retrieval algorithms are used to estimate the lost phase and reconstruct an accurate effective pupil function, where the squared modulus of its Fourier transform is detected by a camera. However, current algorithms such as the Gerchberg-Saxton algorithm and Fienup-style algorithm do not consider the detector sampling rate and shot noise introduced by photon detection. If the sampling rate is low, we must interpolate the detected image in order to accurately reconstruct its pupil function. Here, we develop an appropriate estimation method for interpolating the detected image by using penalized I-divergence and then use the interpolated image for phase retrieval. In our simulation, after 300 iterations of our DAM algorithm, the phase-retrieved pupil function has a root-mean-squared error of about  $43\pm 3\%$  less than Fienup-style algorithm with nearest neighbor interpolation when one hundred million photons are collected.

DATE: Tuesday, April 26, 2016  
TIME: 4:00 p.m.  
PLACE: Green Hall. Room 0120

**Research Advisor:**  
Dr. Joseph O'Sullivan

This seminar is in partial fulfillment  
of the Masters Degree