COSI Seminar Series
Monday December 6th, 4:00 pm
Engineering Building - Room ECCR 1B55

Prof. Shannon Hughes
Department of Electrical, Computer, and Energy Engineering - University of Colorado at Boulder

“Using the Kernel Trick in Compressive Sensing: Accurate Signal Recovery from Fewer Measurements”

Since their development in the mid-1990s, kernel methods have dramatically enhanced the capabilities of machine learning and signal processing. In these methods, a clever strategy termed “the kernel trick” is employed to easily extend standard algorithms to perform more complex tasks with little to no increase in computational complexity. In this talk, we show how the kernel trick can be used in a new domain: compressive sensing. Using the kernel trick, we are no longer constrained to model our signal as a sum of many Fourier or wavelet components as in typical compressive sensing. Instead, our signal can be modeled as a complex, nonlinear function of several underlying parameters if we wish. Signals, including sections of natural images, can often be described very efficiently in this way. This more efficient signal description then pays off, allowing us to reconstruct the signal based on very few measurements, sometimes an order of magnitude fewer measurements than that required by typical compressive sensing.

Shannon Hughes is an assistant professor in the Department of Electrical, Computer, and Energy Engineering, and also an affiliated faculty member of the Applied Mathematics Department, at the University of Colorado at Boulder. Her research interests are in modern signal processing and data analysis, specifically in efficiently acquiring large amounts of data from few measurements, learning the inherent organization of very high-dimensional datasets via manifold learning, and effective classification of complex signals. She also regularly collaborates on applications of these issues in the fields of neuroscience and art history. Previously, she completed her PhD in 2008 at Princeton University as an NSF Graduate Fellow and Gordon Wu Fellow under the guidance of Ingrid Daubechies and Peter Ramadge.

More information on Professor Shannon Hughes and his research can be found at: http://ecee.colorado.edu/~smhughes