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Seminar

Speaker: **Professor Robert Shumway**
University of California, Davis

Title: **Multivariate Time and Frequency Domain Approaches to Nuclear Monitoring**

Time: **3:20 – 4:20pm, *Wednesday*, October 2, 2013**

Place: **552 Hill Center**

Abstract

The use of nonlinear frequency domain regression models in statistical applications involving seismic time series is standard for cases where there may be difficulties due to correlations in time and space that interfere with effective signal detection and estimation. This is particularly evident in the case of seismic signals used for detection and identification of signals originating from earthquakes and explosive sources. Such signals are observed as multivariate time series on arrays of sensors, configured to monitor the velocities and azimuths of propagating input signals and noises. Regional arrays located near events of interest are particularly important.

Estimation of the velocity and azimuth parameters of the input signals in the presence of correlation in both the signals and noises can be used to design optimal filtering procedures that improve the quality of features used for detection, location and discrimination between earthquakes and explosions.

The verification research community has long depended on "beam-forming" or time delaying and averaging for optimal processing of locally stationary time-correlated signals from single vertical component seismometers. Recent interest involving close-in monitoring has focused on using the two horizontal components as well when they are available, making the statistical analysis of an overall array of possibly incomplete 3-component arrays of interest. We discuss optimal time and frequency domain statistical approaches to processing these locally stationary time vectors. The introduction of horizontal components should improve detection and estimation. The multivariate character of the response also introduces some intriguing possibilities for tracking the particle motion using the state-space model and MCMC.

Key Words: F-detector, stochastic regression, 3-component sub-arrays, ECM algorithm, particle filtering, polarization.

***** Refreshments will be served at @2:50pm in Room 502 Hill Center *****