• Friday April 10, 2015

Dr. Xinghe Wang
Professor, Department of Economics
The University of Missouri—Columbia

A Model of Partial Sequential Search

ABSTRACT
In many familiar shopping situations, it is often up to the consumers to decide how many attributes to evaluate among the products they consider. However, many conventional search models assume that search is a discrete process in which consumers either acquire all relevant information of a product or acquire no information. This paper relaxes this conventional assumption by allowing the possibility of partial product evaluation and provides a boundary of the conventional search models. We explore partial product evaluation in a sequential search model and our results show that consumers optimally choose to evaluate products at partial depth when search costs are sufficiently large. In addition, due to partial product evaluation, firms’ prices and search costs have a non-monotonic relationship. Our findings also show a non-monotonic relationship between consumer surplus and search costs.

• Friday April 3, 2015

Dr. Xianyang Zhang
Assistant Professor, Department of Statistics
The University of Missouri—Columbia

White Noise Testing and Model Diagnostic Checking for Functional Time Series

ABSTRACT
In this talk, we consider white noise testing and model diagnostic checking for stationary functional time series. To test for the functional white noise null hypothesis, we propose a Cramer-von Mises type test based on the functional periodogram introduced by Panaretos and Tavakolithe (2013). Using the Hilbert space approach, we derive the asymptotic distribution of the test statistic under suitable assumptions. A new block bootstrap procedure is introduced to obtain the critical values from the non-pivotal limiting distribution. Compared to existing methods, our approach is robust to the dependence within white noise and it does not involve the choices of functional principal components and lag truncation number. We employ the proposed method to check the adequacy of functional linear models and functional autoregressive models of order one by testing the uncorrelatedness of the residuals. Monte Carlo simulations are provided to demonstrate the empirical advantages of the proposed
method over existing alternatives. Our method is illustrated via an application to cumulative intraday returns.

- **Friday, March 20, 2015**

**Dr. Paul Rulis**  
Assistant Professor, Department of Physics  
The University of Missouri—Kansas City

**Can Artificial Neural Networks Be Used to Supplant Self-Consistent Field Calculations within Density Functional Theory?**

**ABSTRACT**  
*Ab initio* electronic structure calculations based on quantum mechanics have become essential tools for materials scientists that need to access wave function-based material properties. Although advanced methods and advanced computers have increased the size of the material systems that can be studied with these methods, it has proved difficult to scale beyond a few thousand atoms. This is a point of frustration because many of the more interesting material systems at the nano-scale require on the order of ten to twenty thousand atoms to model. Similarly, if a problem requires the use of *ab initio* molecular dynamics it will be severely restricted in its duration because of the computational cost. In this presentation we explore an alternative method for calculating accurate total energies of complex defect containing solids that is based on machine learning instead of traditional self-consistent field (SCF) calculations. Progress of the method as applied to a passive defect model in silicon, a self-interstitial model in silicon, and a model of amorphous silica will be presented.

- **Friday, March 13**

**Dr. Yumou Qiu**  
Assistant Professor, Department of Statistics  
The University of Nebraska—Lincoln

**Thresholding Tests for Signal Detection on High-Dimensional Count Distributions**

**ABSTRACT**  
Motivated by the analysis of RNA sequencing (RNA-seq) data for genes differentially expressed across multiple conditions, we consider detecting rare and faint linear combinations of the regression coefficients (which we call signals) in high-dimensional response variables which are usually count data. More generally, we address the signal detection problem under generalized linear models. We propose a test statistic that carries out a multi-level thresholding on maximum likelihood estimators (MLEs) of the signals, which allows removal of the dimensions with no signals. A Cramer type moderate deviation result for multi-dimensional MLEs is derived,
which is needed to obtain the asymptotic distribution of the thresholding test statistic. Extensions to generalized linear mixed models are made, where Gauss-Hermite quadrature is used to approximate the MLEs of such models. Numerical simulations and a case study on maize RNA-seq data are conducted to confirm and demonstrate the proposed testing approaches.

- **Friday, February 27, 2015**

  **Dr. Yong Zeng**  
  Professor and Chair, Department of Mathematics and Statistics  
  The University of Missouri—Kansas City

  **Bayesian Inference via Filtering Equations for Financial Ultra-High Frequency Data**

  **ABSTRACT**

  We propose a general partially-observed framework of Markov processes with marked point process observations for ultra-high frequency (UHF) transaction price data, allowing other observable economic or market factors. We develop the corresponding Bayesian inference via filtering equations to quantify parameter and model uncertainty. Specifically, we derive filtering equations to characterize the evolution of the statistical foundation such as likelihoods, posteriors, Bayes factors and posterior model probabilities. Given the computational challenge, we provide a convergence theorem, enabling us to employ the Markov chain approximation method to construct consistent, easily-parallelizable, recursive algorithms. The algorithms calculate the fundamental statistical characteristics and are capable of implementing the Bayesian inference in real-time for streaming UHF data, via parallel computing for sophisticated models. The general theory is illustrated by specific models built for U.S. Treasury Notes transactions data from GovPX and by Heston stochastic volatility model for stock transactions data. This talk consists joint works with B. Bundick, X. Hu, D. Kuipers and J. Yin.

- **Friday, February 13, 2015**

  **Dr. Weishi Liu**  
  Professor, Department of Mathematics  
  University of Kansas

  **Analysis of Poisson-Nernst-Planck Systems and Applications to Ion Channel Problems**

  **ABSTRACT**

  In this talk, I will start with a brief background of ion channel problems and some central topics of biological interests. Poisson-Nernst-Planck (PNP) type systems, a class of primitive models for ionic flows, will then be described. A dynamical system framework for analyzing PNP will be reviewed. As an illustration, a number of concrete applications to ion channel problems will be discussed.