MICHIGAN STATE UNIVERSITY
Department of Statistics and Probability

COLLOQUIUM

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A Markov Chain Monte Carlo Approach to Empirical Bayes Inference and Bayesian Sensitivity Analysis via Empirical Processes

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Refreshments 10:00am
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Abstract

Consider a Bayesian set up where an Euclidean parameter space Θ is endowed with a parametric family of priors $\{\nu_h,\, h \in \mathcal{H}\}$, and where given $\theta \in \Theta$, one observes Y from a density p_θ. In this talk we shall discuss the procedures for selecting a particular value of h, and for estimating the family of posterior expectations $\big\{I_g(h),\, h \in \mathcal{H}\big\}$ of a real valued function $g(\theta)$, given $Y = y$. The empirical Bayes estimate of h is, by definition, the value of h that maximizes the marginal likelihood $m_y(h)$ of the hyperparameter h. It turns out that it is typically possible to form point estimates and confidence intervals for $m_y(h)$ and $I_g(h)$ for each individual h, using Markov chain Monte Carlo. However, we are interested in estimating the entire families of integrals $\big\{m_y(h),\, h \in \mathcal{H}\big\}$ and $\big\{I_g(h),\, h \in \mathcal{H}\big\}$: we need to estimate the first family in order to carry out empirical Bayes inference, and we need to estimate the second family in order to do Bayesian sensitivity analysis. We establish strong consistency and functional central limit theorems for estimates of these families by using tools from the theory of empirical processes. As an application, we consider the robit model in binary regression, an extension of the probit regression model, in which the normal distribution is replaced by a t distribution with d degrees of freedom, with d determining the extent of the robustness of the model against outliers. We show how our methodology can be used for making inference about d, and give an illustration on a real data set.

This is joint work with Yeonhee Park, University of Florida.

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