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Editorial: Special Issue on Modern Bayesian Statistics (Part I)

Due to recent advances in Bayesian computation, research in Bayesian statistics is rapidly expanding and diversifying, making it increasingly popular and widely used in many fields including medicine, biology, public health, epidemiology, engineering, finance, economics, environmental sciences, and social sciences. This special issue reflects a variety of current research at the frontier of this vital and rapidly developing area. This is the first part of this special issue, which features 12 interesting original research articles.

Diagnostic testing in human and animal health can be quite costly. To address this important problem, **Norris, Johnson, and Gardner** developed a class of semiparametric statistical models for analyzing longitudinal biomarker data with the purpose of quantifying their diagnostic capabilities. One important feature of their model is its nonparametric part, which allows for distinct biomarker responses to the insult of infection/disease. In clinical trials, treatments often affect many aspects of disease. In joint modeling of longitudinal and survival data, **Hatfield, Hodges, and Carlin** addressed an important clinical question: when are treatment estimates improved? Their investigation suggests that joint models are most useful when an information imbalance allows abundant information in one outcome to compensate for a paucity of information in another. **Chen and Hanson** focused on the Bayesian nonparametric estimation of densities in the presence of doubly-truncated data. They developed a Bayesian nonparametric density estimator based on a finite Pólya tree prior, which nicely blends the merits of both nonparametric and parametric modeling.

The process convolution framework for constructing a Gaussian Process (GP) model is a computationally efficient approach for larger datasets in lower dimensions. **Liang and Lee** developed an efficient sequential inference method for the process convolution GP model based on a Sequential Monte Carlo method called Particle Learning. The proposed method was applied for solving a 2-D optimization pump-and-treat problem. There is a long history and rich literature on how to handle outliers in a data set. **Lee and MacEachern** provided an in-depth discussion of three Bayesian approaches to handling outliers with a focus on the nonparametric Bayesian approach based on the Dirichlet process. They investigated the sensitivity of Bayes decision problems to the inference function when the parameter space is high-dimensional. **Abanto-Valle et al.** proposed a new stochastic volatility model based on a generalized skew-Student-t distribution for stock returns. This new model allows a parsimonious and flexible treatment of the skewness and heavy tails in the conditional distribution of the returns. They demonstrated that the generalized skew-Student-t tail behavior is important in modeling stock returns data.

An exploitation of prior knowledge in parameter estimation becomes vital whenever there is no sufficient information in measured data. **Kárný et al.** developed a facilitator-free approach based on an advanced knowledge-sharing methodology. They illustrated the approach on commonly available types of knowledge and applied the methodology to a normal controlled autoregressive model. **Gao, He, and Sun** addressed an important issue of how to adjust nonresponse bias in small area estimation without covariates. They proposed a bivariate Bayesian hierarchical spatial model to estimate satisfaction rates via modeling phase-specific response rates and conditional satisfaction rates given response statuses. Their approach utilized information from multiple response phases and neighboring small subdomains in adjusting nonresponse bias. **Zhu, Ibrahim, and Chen** established a connection between Bayesian case influence measures for assessing the influence of individual observations and Bayesian predictive methods for evaluating the predictive performance of a model and comparing different models fit to the same dataset. They further proposed a new set of Bayesian case-deletion model complexity measures for quantifying the effective number of parameters in a given statistical model and a Bayesian case-deletion information criterion (BCIC) for comparing models. They showed that BCIC is a valuable tool for Bayesian model assessment.

Time-course microarray experiments track gene expression levels across several time points and provide valuable insights into genome-wide dynamic aspects of gene regulations. **Wei and Kuo** focused on gene clustering based on a nonparametric Bayesian method. They modeled each gene profile using a B-spline basis and then placed a Dirichlet process prior on the basis coefficients to determine clusters of the genes. In ecology, count responses on species abundance are observed over several time periods at several locations, and the covariates that influence the abundance may be location-specific and/or time-varying. **Ravishanker, Serhiyenko, and Willig** developed a Bayesian framework for estimation and prediction by assuming a multivariate Poisson sampling distribution for the count responses and by fitting a hierarchical dynamic model. The first part of this special issue concludes with an interesting article by **Mallick and Yi** on a new Bayesian Lasso. For the lasso problem, they developed a new hierarchical formulation of the Bayesian lasso by utilizing the scale mixture of uniform (SMU) representation of the Laplace density.

Bayesian statistics is still a growing research field. We hope that this special issue helps further stimulate interdisciplinary research and promote interface between statistical methodology and applications. We also hope that this special issue makes *Statistics and Its Inference* (SII) a friendly home to many more exciting developments and innovations in the field of Bayesian statistics.

Ming-Hui Chen (Guest Editor), University of Connecticut
Heping Zhang (Editor-in-Chief), Yale University