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Georgia Southern University

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Georgia Southern Examines Markov Chain Monte-Carlo Methods for Missing Data Under Ignorability Assumptions

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Missing observations are a common occurrence in public health, clinical studies and social science research. Consequences of discarding missing observations, sometimes called complete case analysis, are low statistical power and potentially biased estimates. Fully Bayesian methods using Markov Chain Monte-Carlo (MCMC) provide an alternative model-based solution to complete case analysis by treating missing values as unknown parameters. Fully Bayesian paradigms are naturally equipped to handle this situation by augmenting MCMC routines with additional layers and sampling from the full conditional distributions of the missing data, in the case of Gibbs sampling. Here we detail ideas behind the Bayesian treatment of missing data and conduct simulations to illustrate the methodology. We consider specifically Bayesian multivariate regression with missing responses and the missing covariate setting under an ignorability assumption. Applications to real datasets are provided.

Dr. Haresh Rochani, Assistant Professor of Biostatistics and Director of the Karl E. Peace Center for Biostatistics, co-authored the chapter titled “Markov Chain Monte-Carlo Methods for Missing Data Under Ignorability Assumptions” in the ICOSA Book Series in Statistics titled *Monte-Carlo Simulation-Based Statistical Modeling*.

Georgia Southern Explores Improving the Efficiency of the Monte-Carlo Methods for Missing Using Ranked Simulated Approach

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This chapter explores the concept of using ranked simulated sampling approach (RSIS) to improve the well-known Monte-Carlo methods, introduced by Samawi (1999), and extended to steady-state ranked simulated sampling (SRSIS) by Al-Saleh and Samawi (2000). Both simulation sampling approaches are then extended to multivariate ranked simulated sampling (MVR SIS) and multivariate steady-state ranked simulated sampling approach (MVSRSIS) by Samawi and Al-Saleh (2007) and Samawi and Vogel (2013). These approaches have been demonstrated as providing unbiased estimators and improving the performance of some of the Monte-Carlo methods of single and multiple integrals approximation. Additionally, the MVSRSIS approach has been shown to improve the performance and efficiency of Gibbs sampling (Samawi et al. 2012). Samawi and colleagues showed that their approach resulted in a large savings in cost and time needed to attain a specified level of accuracy.

Dr. Hani Samawi, Professor of Biostatistics, authored the chapter titled “Improving the Efficiency of the Monte-Carlo Methods for Missing Using Ranked Simulated Approach” in the ICSA Book Series in Statistics titled *Monte-Carlo Simulation-Based Statistical Modeling*.