THE UNIVERSITY OF CHICAGO | DEPARTMENT OF STATISTICS

Master's Thesis Presentation

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"Comparing Bayesian Software Platforms for Three-Level Mixed Effects Location Scale Models"

February 18, 2025, at 1:30 PM
Jones 111, 5747 S. Ellis Avenue

Abstract

Mixed effects location scale (MELS) models allow researchers to simultaneously model the mean and within-subject variance of longitudinal outcomes, making them well-suited for ecological momentary assessment (EMA) research. However, practical guidance on Bayesian software choice for these complex hierarchical models remains limited. This thesis systematically compares two widely-used Bayesian platforms, Stan and JAGS, for fitting a three-level MELS model. Using an iterative convergence framework, we evaluate sampling efficiency, convergence behavior, and computational requirements on an adolescent smoking EMA dataset. Our findings reveal substantial differences between the two platforms: Stan achieves convergence with far fewer iterations and significantly less computation time, while JAGS requires extensive iteration counts due to high autocorrelation in the Markov chains. The results demonstrate that Hamiltonian Monte Carlo, as implemented in Stan, offers considerable computational advantages over Gibbs sampling for models with multiple correlated random effects. These findings inform software selection for researchers fitting location scale models to intensive longitudinal data.
