Contribution ID: **12** Type: **Oral Presentation**

Estimating Context Effects in Small Samples while Controlling for Covariates: An Optimally Regularized Bayesian Estimator for Multilevel Latent Variable Models

Friday 25 July 2025 09:00 (15 minutes)

Oral presentation

Estimating Context Effects in Small Samples while Controlling for Covariates: An Optimally Regularized Bayesian Estimator for Multilevel Latent Variable Models

Author

Dr. Valerii Dashuk

Affiliation

MSH Medical School Hamburg

Abstract

We introduce a novel approach for estimating between-group effects in two-level latent variable models, specifically designed to address challenges associated with small sample sizes and low Intraclass Correlation Coefficients (ICCs). At the core of this method is a regularized Bayesian estimator, developed to minimize the Mean Squared Error (MSE) in estimating between-group effects by optimally balancing bias and variance. This approach is further extended to incorporate covariates, enabling a more generalized and robust estimator.
To facilitate the adoption of the regularized Bayesian estimator, we developed the MultiLevelOptimalBayes R package, tailored for researchers in the social sciences. The package offers extensive tools for implementing the proposed approach, including flexible model specifications. Key features include precise estimation of between-group effects, evaluation of covariate effects, and a novel balancing approach to create optimally balanced datasets from unbalanced data. Additionally, the package supports the use of a delete-d jackknife technique for obtaining standard errors.
This estimation approach not only advances statistical methodology but also equips researchers with practical tools for achieving more accurate results, especially in scenarios with limited data availability.

Keywords

regularized Bayesian estimation, multilevel model

Primary authors: Dr DASHUK, Valerii (MSH Medical School Hamburg); Prof. HECHT, Martin (Helmut Schmidt University); Prof. LÜDTKE, Oliver (Leibniz Institute for Science and Mathematics Education); Dr ROBITZSCH, Alexander (Leibniz Institute for Science and Mathematics Education); Prof. ZITZMANN, Steffen (MSH Medical School Hamburg)

Presenters: Dr DASHUK, Valerii (MSH Medical School Hamburg); Prof. HECHT, Martin (Helmut Schmidt University); Prof. LÜDTKE, Oliver (Leibniz Institute for Science and Mathematics Education); Dr ROBITZSCH,

Alexander (Leibniz Institute for Science and Mathematics Education); Prof. ZITZMANN, Steffen (MSH Medical School Hamburg)

Session Classification: Session 5 : ”Bayesian methods in Psychology and Statistics”

Track Classification: Design/Research methods: Design/Research methods