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Extending Bayesian Regularization Methods to Multiple-Group Mediation Analysis

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Extending Bayesian Regularization Methods to Multiple-Group Mediation Analysis

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Abstract

Partial measurement invariance testing is a crucial prerequisite for comparing structural relationships across multiple groups. Recently, frequentist regularization approaches, such as the lasso and elastic net, have been extended to the measurement invariance framework and involve applying a penalty function to differences across item intercepts and loadings to improve the detection of non-invariant items. Despite their promising performance, frequentist regularization approaches may produce biased estimates and pose challenges for inference due to the unavailability of standard errors in some conditions. To address these limitations, Bayesian regularization methods, such as spike-and-slab priors (SSP), have recently been extended to the differential item functioning framework. Bayesian regularization methods rely on shrinkage priors that peak at zero and contain heavy tails, pulling small parameter differences toward zero while leaving large effects unchanged. This study builds on previous work by evaluating the performance of Bayesian regularization approaches in terms of the bias, efficiency, and coverage of the indirect effect in a multiple-group mediation analysis model. We compare Bayesian regularization approaches –small-variance normal priors, Laplace priors, Bayesian adaptive lasso, SSP, and horseshoe priors –against multiple-group CFA and alignment. We vary the sample size (N = 200 and 500), proportion (1/3 and 2/3) and magnitude (small or large) of non-invariance, and the value of the indirect effect (ab = 0 or 0.144) for a single mediator latent variable model with six indicators per latent variable. Preliminary findings suggest that Laplace priors and the adaptive lasso provide low bias and adequate coverage of the indirect effect under large proportions and magnitudes of non-invariance, whereas small-variance priors experience more difficulty. Additionally, adaptive priors produce biased latent means and intercepts under some conditions. The study provides recommendations for researchers estimating indirect effects in the presence of measurement non-invariance.

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