Title: Multilevel Measurement Models

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Abstract:

This workshop will focus on the use of latent variable measurement models for research designs with multiple levels of sampling, as estimated by Bayesian Markov Chain Monte Carlo (MCMC) methods. Although our examples will feature outcomes from persons nested within clusters, these models are applicable to other multilevel designs (e.g., occasions nested in persons). Course time will be allocated to traditional lectures along with curated examples demonstrating how to estimate models using R software. All instructional sessions (i.e., instructor screen plus audio) will be recorded for future participant use.

We do not expect participants to have extensive familiarity with latent variable measurement models, multilevel models, or Bayesian MCMC estimation, and thus the first workshop sessions will cover these topics in isolation. Day 1 will introduce single-level latent variable measurement models (all in slope–intercept form), which include confirmatory factor analysis for continuous responses and item response theory models for binary and ordinal responses. Day 1 will also introduce MCMC estimation. Day 2 will introduce multilevel models (i.e., hierarchical linear models, mixed-effects models) for predicting continuous observed outcomes for persons nested in clusters, along with three-level models for predicting categorical item responses from persons nested in clusters. Days 3 and 4 will then extend multilevel models to include latent variable measurement models with level-specific discrimination parameters.

Prerequisites:

The course will use Stan software as run through R (using CMDStanR), but no prior experience with Stan is assumed. Participants who wish to follow along live with examples in Stan are requested to install the cmdstanr interface to Stan by following the "Getting Started with CmdStanR" vignette at https://mc-stan.org/cmdstanr/articles/cmdstanr.html. Please note that following along by running Stan during the workshop is optional, given that complete examples of syntax and output will be provided as part of the course materials. No readings will be required ahead of time.

Assignment: Active participation

Credits: 4 workshop days