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Modeling Qualitative Heterogeneity and Covariates with Bayesian Hierarchical Latent-Mixtures

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Traditional approaches in cognitive psychology typically describe effects using group-level means, implicitly assuming that individual differences are quantitative. Such averages can obscure meaningful qualitative heterogeneity, for example when positive, null, and negative effects coexist within a population. Recent cognitive modeling approaches address this using Bayesian hierarchical latent-mixture models to probabilistically classify individuals into latent classes. We extend this framework by including covariates as a predictor of individual class membership probabilities. We demonstrate the validity and robustness of the approach through extensive simulations and illustrate its utility in empirical data: Applying the model to two datasets on the truth effect, we find that individuals higher in Need for Cognition are more likely to belong to the positive (vs. null) truth-effect class, even where traditional analyses fail to detect a relationship. This framework enables researchers to link person-level or contextual variables to latent classes of cognitive effects.