

Random-effects Regression Modeling using Latent Class Methods

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Abstract

This workshop deals with the various random-effects modeling tools implemented in the Latent GOLD software package. The most important one is the latent class or mixture regression model that can be used for the analysis of two-level data sets consisting of multiple responses per case or multiple cases per group. Mixture regression analysis involves specifying a generalized linear model (GLM) in which regression coefficients may vary across latent classes (of higher-level units). This yields what is sometimes referred to as a nonparametric random-effects approach, which has various advantages over standard two-level modeling approaches, such as imposing less restrictive distributional assumptions and providing much faster and stable estimation with non-linear regression models. Depending on the scale type of the dependent variable, one will use a linear, a binary logistic, a multinomial logistic, an ordinal logistic, a conditional logistic, or a Poisson regression model, in which it is also possible to take into account censoring, truncation, and zero inflation.

The newest version of Latent GOLD contains two important additional multilevel modeling features that will be discussed in this workshop. The first is that it allows users to include normally distributed random effects in the model of interest. This not only makes it possible to specify standard parametric random-effects GLMs, but it can also be used to expand the mixture regression model, yielding models combining parametric and nonparametric random effects. Applications can be found in such fields as growth modeling, rating and choice-based conjoint analysis, and IRT modeling.

The second important new feature is that one cannot only have multiple responses per case (multiple level-1 units per level-2 unit), but also multiple cases per group (multiple level-2 units per level-3 unit). This yields a three-level extension of the (nonparametric) random-effects GLM regression model, as well as a two-level extension of the standard latent class model. As will be shown, this rather advanced modeling framework leads to several interesting application types, such as multilevel latent class analysis, multilevel IRT modeling, IRT modeling with locally dependent item sets, multiple indicator growth modeling, and three-level random-effects GLMs.

In the workshop, I will introduce the different types of random-effects and multilevel models using real life research problems and data sets. Since we will be working in a computer lab, you will also be able to run the models yourself.