Mixture Modelling for Longitudinal Data

Xiwei Tang
University of Illinois at Urbana-Champaign, Champaign, IL, USA – anniequ@illinois.edu

Annie Qu*
University of Illinois at Urbana-Champaign, Champaign, IL, USA – anniequ@illinois.edu

In this paper, we propose an unbiased estimating equation approach for a two-component mixture model with correlated response data. We adapt the mixture-of-experts model and a generalized linear model for component distribution and mixing proportion, respectively. The new approach only requires marginal distributions of both component densities and latent variables. We utilize serial correlations from subjects' subgroup memberships, which improves estimation efficiency and classification accuracy, and show that estimation consistency does not depend on the choice of the working correlation matrix. The proposed estimating equation is solved by an Expectation-Solving estimating equation (ES) algorithm. In the E-step of the ES algorithm, we propose a joint imputation based on the conditional linear property for the multivariate Bernoulli distribution. In addition, we establish asymptotic properties for the proposed estimators and the convergence property using the ES algorithm. Our method is compared to an existing competitive mixture model approach in both simulation studies and an election data application.

Keywords: Expectation-Solving estimating equation algorithm; latent variable; model-based clustering; unbiased estimating equation; multivariate Bernoulli distribution.