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Title: Mixture-based clustering with covariates for ordinal responses

Abstract:

Existing methods can perform likelihood-based clustering on a multivariate data matrix of ordinal data, using finite mixtures to cluster the rows (observations) of the matrix. These models can incorporate the main effects of individual rows and columns, as well as cluster effects, to model the matrix of responses. However, many real-world applications also include available covariates, which can provide insights into the main characteristics of the clusters. In our research, we have extended the mixture-based models to include covariates directly, to allow the clustering structures to be determined both by the individuals' similar patterns of responses and the effects of the covariates on the individuals' responses. We focus on clustering the rows of the data matrix, using the proportional odds cumulative logit model for ordinal data. We fit the models using the Expectation-Maximization algorithm and assess performance through a comprehensive simulation study. We also illustrate an application of the models to the well-known arthritis clinical trial data set.