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Unsupervised Shrinkage Estimation Methods for Mixture of Regression Models

In many applications (e.g., medical studies), the population of interest (e.g., disease status) comprises heterogeneous subpopulations. The mixture of probabilistic regression models is one of the most common model-based techniques to incorporate the information of covariates into learning of the population heterogeneity. Despite the flexibility, the model leads to misleading and unreliable estimates in the presence of a high multicollinearity problem. We developed two shrinkage methods through an unsupervised learning approach to estimate the model parameters even in the presence of multicollinearity issues. The performance of the developed methods is evaluated via classification and stochastic versions of EM algorithms. The numerical studies show the proposed methods outperform their maximum likelihood counterparts. Finally, the developed methods are applied to analyze the bone mineral data of women aged 50 and older.