Sparse Estimation Strategies in Linear Mixed Effect Models for High-Dimensional Data Application

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Abstract

In a host of business applications, biomedical and epidemiological studies, the problem of multicollinearity among predictor variables is a frequent issue in longitudinal data analysis for linear mixed models (LMM). We consider efficient prediction strategies for high-dimensional data application.

Specifically, I discussed improved estimation of the fixed effects parameters of the LMM when it is Judiciously assumed that model is sparse. We propose the pretest and shrinkage low and high dimensional estimation strategies using the ridge full model as the base estimator. We establish the asymptotic distributional bias and risks of the suggested estimators and investigate their relative performance with respect to the ridge full model estimator in low dimensional case. Furthermore, we compare the numerical performance of the penalized estimators with the pretest and shrinkage ridge estimators. The methodology is investigated using simulation studies and then demonstrated on an application exploring how effective brain connectivity in the default mode network (DMN) may be related to genetics within the context of Alzheimer's disease.