

Adapting Robust Estimators to Iterative Parameter Estimation and Model Selection in Linear Mixed Models

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Linear mixed models (LMM) are extended regression types models and several methods are used to estimate parameters for longitudinal data, clustered data and cross-sectional data. The existence of outliers and the complication of the detection of these outliers for multi-dimensional data are required to use robust methods for parameter estimations in LMM. Mixed effect models are robustified with two different methods: One is to use heavy-tailed distributions as alternatives to the normal distribution, and the other is to use robust estimation methods. Peng and Lu (2012) introduce a simple iterative procedure for estimating parameters as an alternative to the optimization required methods such as Expectation Maximization and Newton-Raphson for LMM. However, their method is based on the classical LS estimator so that the resulting estimators for the parameters of LMM will be sensitive to the outliers. In this study, we extend Peng and Lu (2012)'s iterative methods with robust initial parameters as a contribution to the field of model selection in LMM. In addition to parameter estimations, LMM is required to implement model selection procedures. The smoothly clipped absolute deviation penalty function (SCAD), which is a non-concave penalized likelihood used to shrinkage the coefficients of unimportant variables to 0, is preferred to implement parameter estimation and model selection simultaneously for this study. Procedure adaptation results are tested with simulation studies.

References

Peng, H. & Lu, Y. (2012). Model selection in linear mixed effect models. *Journal of Multivariate Analysis*, **109**, 109–129.