Robust Analysis of Mixed Models for Longitudinal Data

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Abstract

The method of quasi-likelihood (QL) is commonly used for fitting generalized linear mixed models (GLMM's) to longitudinal data. Although this classical approach is useful for estimating the parameters of GLMM's efficiently under strict model assumptions, it can be heavily influenced by the presence of potential outliers in the data. Here a robust quasi-likelihood (RQL) method is developed for analyzing the GLMM's in the framework of marginal quasi-likelihood. The computational issues of the robust method are described in an illustrative example. Simulations are carried out to study the behavior of the robust estimates in the presence of outliers, and these estimates are also compared to the ordinary quasi-likelihood estimates. The RQL method is applied to some real life data referred to as epilepsy data obtained from a clinical experiment. The data appear to have some influential observations, and the RQL method is found useful to identify and downweight the influential points when estimating the model parameters.