Variable Selection in Linear Mixed Effects Models

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Abstract

This paper is concerned with the selection and estimation of fixed and random effects in linear mixed effects models. We propose a class of nonconcave penalized profile likelihood methods for selecting and estimating significant fixed effects parameters simultaneously. We further demonstrate that the proposed procedure enjoys the model selection consistency. We then propose a group variable selection strategy to simultaneously select and estimate the significant random effects. The resulting random effects estimator is compared with the oracle-assisted Bayes estimator. We prove that, with probability tending to one, the proposed procedure identifies all true random effects, and furthermore, that the resulting estimates are close to the oracle-assisted Bayes estimates for the selected random effects. In both the fixed and random effects selection and estimation, the dimensions are allowed to increase exponentially with sample size. A Monte Carlo simulation study is conducted to examine the finite sample performances of the proposed procedures. We further illustrate the proposed procedure via a real data example. This is a joint work with Professor Runze Li.