



Variable selection for functional linear models with strong heredity constraint

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Abstract

In this paper, we consider the variable selection problem in functional linear regression with interactions. Our goal is to identify relevant main effects and corresponding interactions associated with the response variable. Heredity is a natural assumption in many statistical models involving two-way or higher-order interactions. Inspired by this, we propose an adaptive group Lasso method for the multiple functional linear model that adaptively selects important single functional predictors and pairwise interactions while obeying the strong heredity constraint. The proposed method is based on the functional principal components analysis with two adaptive group penalties, one for main effects and one for interaction effects. With appropriate selection of the tuning parameters, the rates of convergence of the proposed estimators and the consistency of the variable selection procedure are established. Simulation studies demonstrate the performance of the proposed procedure and a real example is analyzed to illustrate its practical usage.

Keywords Functional linear model · Main effect · Multiple functional predictors · Interaction effect · Heredity structure · Variable selection

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