CrossMark

Estimation and inference in functional single-index models

Shujie Ma

Abstract We propose a functional single-index model (FSiM) to study the link between a scalar response variable and multiple functional predictors, in which the mean of the response is related to the linear predictors via an unknown link function. The FSiM serves as a good tool for dimension reduction in regression with multiple predictors and it is more flexible than functional linear models. Assuming that the functional predictors are observed at discrete points, we use B-spline basis functions to estimate the slope functions and the link function based on the least-squares criterion, and propose an iterative estimating procedure. Moreover, we provide uniform convergence rates of the proposed spline estimators in the FSiM, and construct asymptotic simultaneous confidence bands for the slope functions for inference. Our proposed method is illustrated by simulation studies and by an analysis of a diffusion tensor imaging data application.

Keywords Single-index models · Functional data analysis · Functional linear models · B splines · Confidence bands · Simultaneous inference