



An optimal test for the additive model with discrete or categorical predictors

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Abstract

In multivariate nonparametric regression, the additive models are very useful when a suitable parametric model is difficult to find. The backfitting algorithm is a powerful tool to estimate the additive components. However, due to complexity of the estimators, the asymptotic p value of the associated test is difficult to calculate without a Monte Carlo simulation. Moreover, the conventional tests assume that the predictor variables are strictly continuous. In this paper, a new test is introduced for the additive components with discrete or categorical predictors, where the model may contain continuous covariates. This method is also applied to the semiparametric regression to test the goodness of fit of the model. These tests are asymptotically optimal in terms of the rate of convergence, as they can detect a specific class of contiguous alternatives at a rate of $n^{-1/2}$. An extensive simulation study and a real data example are presented to support the theoretical results.

Keywords Additive model · Categorical data analysis · Backfitting algorithm · Generalized likelihood ratio test · Semiparametric model · Local polynomial regression

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