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Abstract

In regression analysis, there are two typical approaches, parametric methods and nonparametric methods. If the prior information of the structure of the regression function is obtained, a parametric method is preferred since they are efficient and easily interpreted. When the model is misspecified, on the other hand, parametric estimators do not work well. Therefore, it is important to check whether the parametric model assumption is valid. To simultaneously discover the model structure and estimate the regression function in additive regression models, a new semiparametric method is proposed. First, a parametric model is prepared and its estimator is obtained for all additive components. Next, for the residual data associated with the parametric estimator, a nonparametric method is applied. The final estimator is constructed by summing the parametric estimator and the nonparametric estimator of the residual data. In the second-step estimation, the B-spline method with an adaptive group lasso penalty is utilized. For each additive component, if the nonparametric estimator becomes the zero function, the final estimator is reduced to a parametric estimator. In other words, the model structure can then be discovered. The asymptotic properties of the proposed estimator are shown. A numerical study via a Monte Carlo simulation and a real data application are presented. Keywords: , Adaptive group lasso, Additive model, Parametric guided estimation, Parametric model discovery, Spline smoothing 2010 MSC: 62G08, 62J07

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