Optimal testing for additivity in multiple nonparametric regression

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Abstract   We consider the problem of testing for additivity in the standard multiple nonparametric regression model. We derive optimal (in the minimax sense) non-adaptive and adaptive hypothesis testing procedures for additivity against the composite nonparametric alternative that the response function involves interactions of second or higher orders separated away from zero in $L^2([0, 1]^d)$-norm and also possesses some smoothness properties. In order to shed some light on the theoretical results obtained, we carry out a wide simulation study to examine the finite sample performance of the proposed hypothesis testing procedures and compare them with a series of other tests for additivity available in the literature.

Keywords   Additive models · Functional hypothesis testing · Minimax testing · Nonparametric regression · Wavelets