Abstract:
We consider hypothesis testing in nonparametric additive models estimated via simplified smooth backfitting (Huang and Yu 2019). Simplified smooth backfitting achieves oracle properties under regularity conditions and provides closed-form expressions of the estimators that are convenient for de- riving asymptotic properties. For inference, we propose generalized likelihood ratio (Fan et al 2001, GLR) and loss function (Hong and Lee 2013, LF) based testing frameworks. We find that both the GLR and LF tests follow asymptotically rescaled chi-squared distributions under the null model, and both achieve Wilks phenomenon– which means the scaling constants and the degrees of freedom are independent of nuisance parameters. These tests are asymptotically optimal in terms of rates of convergence for nonparametric hypothesis testing. Moreover, with the proposed tests, the bandwidths that are well-suited for model estimation might be useful for testing. Additionally, we show that the LF test is asymptotically more powerful than the GLR test in additive models. We use simulations to demonstrate the Wilks phenomenon and the power of these proposed GLR and LF tests, and a real example to illustrate their usefulness.