Physics > Data Analysis, Statistics and Probability

Moving Taylor Bayesian Regression for nonparametric multidimensional function estimation with possibly correlated errors

Jobst Heitzig

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We present a nonparametric method for estimating the value and several derivatives of an unknown, sufficiently smooth real-valued function of real-valued arguments from a finite sample of points, where both the function arguments and the corresponding values are known only up to measurement errors having some assumed distribution and correlation structure. The method, Moving Taylor Bayesian Regression (MOTABAR), uses Bayesian updating to find the posterior mean of the coefficients of a Taylor polynomial of the function at a moving position of interest. When measurement errors are neglected, MOTABAR becomes a multivariate interpolation method. It contains several well-known regression and interpolation methods as special or limit cases. We demonstrate the performance of MOTABAR using the reconstruction of the Lorenz attractor from noisy observations as an example.

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