Mathematics > Statistics Theory

Local Polynomial Regression Based on Functional Data

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Suppose that n statistical units are observed, each following the model $Y(x_j)=m(x_j)+ \epsilon(x_j),\, j=1,...,N,$ where m is a regression function, $0 \leq x_1 <...<x_N \leq 1$ are observation times spaced according to a sampling density f, and ϵ is a continuous-time error process having mean zero and regular covariance function. Considering the local polynomial estimation of m and its derivatives, we derive asymptotic expressions for the bias and variance as $n,N\to\infty$. Such results are particularly relevant in the context of functional data where essential information is contained in the derivatives. Based on these results, we deduce optimal sampling densities, optimal bandwidths and asymptotic normality of the estimator. Simulations are conducted in order to compare the performances of local polynomial estimators based on exact optimal bandwidths, asymptotic optimal bandwidths, and cross-validated bandwidths.

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