

Plug-in smoothing parameters in nonparametric regression

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Nonparametric regression estimation has become quite popular in recent years. A commonly used nonparametric method for estimating the regression curve is the kernel estimator, exemplified by the Nadaraya-Watson estimator, introduced by Nadaraya (1964) and Watson (1964). The application of this estimator requires a crucial choice of smoothing parameter. A number of methods have been developed for choosing the smoothing parameter, for example, cross-validation and plug-in method. In this work we aim to evaluate alternative plug-in smoothing parameters for the estimates of the numerator and the denominator of the Nadaraya-Watson estimator separately when the data has a bivariate normal distribution. We give an expression for the integrated mean squared error (IMSE) and minimization of the IMSE leads to an explicit formula for an optimal smoothing parameter. A simulation study compares the performance of cross-validation and plug-in smoothing parameter over various setting of sample size and correlation coefficient. The plug-in smoothing parameter outperforms the one from cross-validation for samples which have low and moderate correlation.

Keywords: Cross-validation; Nadaraya-Watson estimator; Plug-in method; Smoothing parameter.