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Dimension reduction in regressions through cumulative slicing estimation. (English)

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Summary: In this paper, we offer a complete methodology of cumulative slicing estimation to sufficient dimension reduction. In parallel to the classical slicing estimation, we develop three methods that are termed, respectively, as cumulative mean estimation, cumulative variance estimation, and cumulative directional regression. The strong consistency for $p = O(n^{1/2}/\log n)$ and the asymptotic normality for $p = o(n^{1/2})$ are established, where p is the dimension of the predictors and n is sample size. Such asymptotic results improve the rate $p = o(n^{1/3})$ in many existing contexts of semiparametric modeling. In addition, we propose a modified BIC-type criterion to estimate the structural dimension of the central subspace. Its consistency is established when $p = o(n^{1/2})$. Extensive simulations are carried out for comparison with existing methods and a real data example is presented for illustration.

MSC:

62G08 Nonparametric regression and quantile regression
62H12 Estimation in multivariate analysis
62H25 Factor analysis and principal components; correspondence analysis
62F12 Asymptotic properties of parametric estimators

Keywords:

inverse regression; ultrahigh dimensionality; semiparametric modeling

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