NONPARAMETRIC DENSITY ESTIMATION IN HIGH-DIMENSIONS

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Abstract

Penalized likelihood density estimation provides an effective approach to the nonparametric fitting of graphical models, with conditional independence structures characterized via the selective term elimination in functional ANOVA decompositions of the log density. A major numerical burden in the approach was the numerical integration involved, which limited its application to low-dimensional problems. In Jeon and Lin (2006), a reformulation was proposed to replace multi-dimensional integrals by sums of products of univariate integrals, greatly reducing the numerical burden in high-dimensional problems. In this article, we derive a cross-validation score for use with the reformulation that delivers effective smoothing parameter selection at a manageable computational cost, introduce a geometric inference tool for the “testing” of model terms, and calculate the asymptotic convergence rates of the estimates. An assortment of practical issues are investigated through empirical studies, and open-source software is illustrated using real-data examples.