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Limit theorems for kernel density estimators under dependent samples

Yuexu Zhao, Zhengyan Lin

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In this paper, we construct a moment inequality for mixing dependent random variables, it is of independent interest. As applications, the consistency of the kernel density estimation is investigated. Several limit theorems are established: First, the central limit theorems for the kernel density estimator $f_{n,K}(x)$ and its distribution function are constructed. Also, the convergence rates of $\|f_{n,K}(x)-Ef_{n,K}(x)\|_{p}$ in sup-norm loss and integral L^{p}-norm loss are proved. Moreover, the a.s. convergence rates of the supremum of $|f_{n,K}(x)-Ef_{n,K}(x)|$ over a compact set and the whole real line are obtained. It is showed, under suitable conditions on the mixing rates, the kernel function and the bandwidths, that the optimal rates for i.i.d. random variables are also optimal for dependent ones.

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