Nonparametric Estimation of Conditional Expectation

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Abstract: Denote the integer lattice points in the N dimensional Euclidean space by $\mathcal{Z}^N$ and assume that $(X_i, Y_i), i \in \mathcal{Z}^N$ is a mixing random field. Estimators of the conditional expectation $r(x) = E[Y_i | X_i = x]$ by nearest neighbor methods are established and investigated. The main analytical result of this study is that, under general mixing assumptions, the estimators considered are asymptotically normal. Many difficulties arise since points in higher dimensional space $N \geq 2$ cannot be linearly ordered. Our result applies to many situations where parametric methods cannot be adopted with confidence.