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Nonparametric estimates of regression quantiles and their local Bahadur representation.

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Summary: Let (X,Y) be a random vector such that X is d-dimensional, Y is real valued and $Y = \theta(X) + \epsilon$, where X and ϵ are independent and the α th quantile of ϵ is 0 (α is fixed such that $0 < \alpha < 1$). Assume that θ is a smooth function with order of smoothness $p > 0$, and set

$$r = (p - m)/(2p + d),$$

where m is a nonnegative integer smaller than p. Let $T(\theta)$ denote a derivative of θ of order m.

It is proved that there exists a pointwise estimate $\hat{T}_n$ of $T(\theta)$, based on a set of i.i.d. observations $(X_1, Y_1), ..., (X_n, Y_n)$, that achieves the optimal nonparametric rate of convergence n^{-r} under appropriate regularity conditions. Further, a local Bahadur type representation is shown to hold for the estimate $\hat{T}_n$ and this is used to obtain some useful asymptotic results.

MSC:

62G07 Density estimation
62G20 Asymptotic properties of nonparametric inference
62G35 Nonparametric robustness
62E20 Asymptotic distribution theory in statistics

Keywords:

regression quantiles; optimal nonparametric rate of convergence; Bahadur type representation

Full Text: DOI