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MINIMUM L_1-PENALIZED DISTANCE ESTIMATORS OF A DENSITY AND ITS DERIVATIVES

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Abstract: Let F be an $(m+1)$-times differentiable distribution function (df) generating the data. Let f be the density of F. Let F_n denote the empirical df. The paper concerns fitting an $(m+1)$-times differentiable function G to the data by minimizing $d_n(G) = \|F_n - G\|_1 + \beta(n)\|G^{(m+1)}\|_1$, where $\|\cdot\|_p$, $p \geq 1$, denotes the L_p-norm and $\beta(n) > 0$ is a sequence of smoothing parameters. Let $\hat{F}_n$ be an (approximate) minimizer of the above problem. We establish an upper bound for $E\|\hat{F}_n^{(i)} - F^{(i)}\|_1$, $i = 1, \ldots, m$, with respect to the choice of β. In particular, the choice of $\beta \sim n^{-1/(m+1)}$ results in the optimal L_1-rate of convergence of $\hat{F}_n'$ to f. The estimation $E\|\hat{F}_n^{(i)} - F^{(i)}\|_2^2$ is also evaluated.

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