Unlinked monotone regression

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Abstract:

We consider so-called univariate unlinked regression when the unknown regression curve is monotone. In standard monotone regression, one observes a pair (X,Y) where a response Y is linked to a covariate X through the model $Y = m_0(X) + epsilon$, with m_0 the (unknown) monotone regression function and epsilon the unobserved error (assumed to be independent of X). In the unlinked regression setting one gets only to observe a vector of realizations from both the response Y and from the covariate X where now Y + epsilon + epsilon. There is no (observed) pairing of X and Y. Despite this, it is actually still possible to derive a consistent non-parametric estimator of m_0 under the assumption of monotonicity of m_0 and knowledge of the distribution of the noise epsilon. We establish an upper bound on the rate of convergence of such an estimator under minimal assumption on the distribution of the covariate X. We discuss a gradient-descent-based algorithm for its computation, and we demonstrate its use on synthetic data.

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