Mathematics > Statistics Theory

Uniform Convergence and Rate Adaptive Estimation of a Convex Function

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This paper addresses the problem of estimating a convex regression function under both the sup-norm risk and the pointwise risk using B-splines. The presence of the convex constraint complicates various issues in asymptotic analysis, particularly uniform convergence analysis. To overcome this difficulty, we establish the uniform Lipschitz property of optimal spline coefficients in the ℓ_∞-norm by exploiting piecewise linear and polyhedral theory. Based upon this property, it is shown that this estimator attains optimal rates of convergence on the entire interval of interest over the H\"older class under both the risks. In addition, adaptive estimates are constructed under both the sup-norm risk and the pointwise risk when the exponent of the H\"older class is between one and two. These estimates achieve a maximal risk within a constant factor of the minimax risk over the H\"older class.

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