

ASYMPTOTIC NONPARAMETRIC SPLINE DENSITY ESTIMATION

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Abstract: In [5] we have announced a linear spline method for nonparametric density and distribution estimation on the real line. In this paper, asymptotic properties of a large family of such estimators are discussed. It is interesting that the results do not require the existence of derivatives of the density in question. For the asymptotic results on distribution functions, knowledge of the behavior of the second modulus of smoothness in the L^∞ -norm is sufficient, and in the case of density estimation-knowledge of the behavior of the second modulus of smoothness in the L^1 -norm and of the tail function is needed. The method of estimation is a kernel method which is not of convolution type. In the case of densities and of the L^1 -norm it is as good as the optimal kernel methods (of convolution type) in an essentially larger class of density functions. Moreover, at the same time we get for free the estimator for the distribution function corresponding to the density in question. At the end we have derived, for a given sample, an explicit function of the window parameter. It is called a window function and it makes possible in each case to determine the size of the optimal window parameter. In obtaining the results the techniques of approximation theory, in particular by splines, are used following the same guidelines as presented in [7], [6] and [8].

2000 AMS Mathematics Subject Classification: Primary: -; Secondary: -;

Key words and phrases: -

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