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Consistency and asymptotic normality for a nonparametric prediction under measurement errors[1]

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Abstract. Nonparametric prediction of a random variable Y conditional on the value of an explanatory variable X is a classical and important problem in Statistics. The problem is significantly complicated if there are heterogeneously distributed measurement errors on the observed values of X used in estimation and prediction. Carroll et al. (2009) have recently proposed a kernel deconvolution estimator and obtained its consistency. In this paper we use the kernels proposed in Mynbaev and Martins-Filho (2010) to define a class of deconvolution estimators for prediction that contains their estimator as one of its elements. First, we obtain consistency of the estimators under much less restrictive conditions. Specifically, contrary to what is routinely assumed in the extant literature, the Fourier transform of the underlying kernels is not required to have compact support, higher-order restrictions on the kernel can be avoided and fractional smoothness of the involved densities is allowed. Second, we obtain asymptotic normality of the estimators under the assumption that there are two types of measurement errors on the observed values of X. It is apparent from our study that even in this simplified setting there are multiple cases exhibiting different asymptotic behavior. Our proof focuses on the case where measurement errors are super-smooth and we use it to discuss other possibilities. The results of a Monte Carlo simulation are provided to compare the performance of the estimator using traditional kernels and those proposed in Mynbaev and Martins-Filho (2010).

Keywords and phrases. Measurement errors, nonparametric prediction, asymptotic normality, Lipschitz conditions.

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