Preprocessing functional data by a factor model approach

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Abstract

We consider functional data which are measured on a discrete set of observation points. Often such data are measured with noise, and then the target is to recover the underlying signal. Commonly this is done with some smoothing approach, e.g. kernel smoothing or spline fitting. While such methods act function by function, we argue that it is more accurate to take into account the entire sample for the data preprocessing. To this end we propose to fit factor models to the raw data. We show that the common component of the factor model corresponds to the signal which we are interested in, whereas the idiosyncratic component is the noise. Under mild technical assumptions we demonstrate that our estimation scheme is uniformly consistent. Moreover, we provide a tailor-made testing framework for the assumption of iid noise. From a theoretical standpoint our approach is elegant, because it is not based on smoothness assumptions and generally permits a realistic framework. The practical implementation is easy because we can resort to existing tools for factor models. Our empirical investigations provide convincing results.

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