

Multilevel Functional Principal Component Analysis for Unbalanced Data

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Functional principal component analysis (FPCA) is the key technique for dimensionality reduction and detection of main directions of variability present in functional data. However, it is not the most suitable tool for the situation when analyzed dataset contains repeated or multiple observations, because information about repeatability of measurements is not taken into account. Multilevel functional principal component analysis (MFPCA) is the modified version of FPCA developed for data observed at multiple visits. The original MFPCA method was designed for balanced data only, where for each subject the same number of measurements is available. In this article we propose the modified MFPCA algorithm which can be applied for unbalanced functional data; that is, in the situation where a different number of observations can be present for every subject. The modified algorithm is validated and tested on real-world sleep data.

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