

M-based simultaneous inference for the mean function of functional data

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Abstract Estimating and constructing a simultaneous confidence band for the mean function in the presence of outliers is an important problem in the framework of functional data analysis. In this paper, we propose a robust estimator and a robust simultaneous confidence band for the mean function of functional data using M-estimation and B-splines. The robust simultaneous confidence band is also extended to the difference of mean functions of two populations. Further, the asymptotic properties of the M-based mean function estimator, such as the asymptotic consistency and asymptotic normality, are studied. The performance of the proposed robust methods and their robustness are demonstrated with an extensive simulation study and two real data examples.

Keywords Confidence band · Functional data analysis · Robust statistics · Spline smoothing · M-estimator · Pseudo-data

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