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Functional analysis of variance in presence of outliers: the RoFANOVA approach

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New data acquisition technologies facilitate the acquisition of data that may be described as functional data. The detection of significant changes in group functional means determined by shifting experimental settings, which is known as functional analysis of variance (FANOVA), is of great interest in a lot of applications. When working with real data, it's typical to find outliers in the sample, which might significantly bias the results. We present the novel robust nonparametric functional ANOVA approach (RoFANOVA) proposed by Centofanti et al. (2021) that decreases the weights of outlying functional data on the analysis outcomes. It is implemented using a permutation test based on a test statistic calculated using a functional extension of the traditional robust M-estimator. The RoFANOVA method is compared to several alternatives already present in the literature, using a large Monte Carlo simulation analysis, in both one-way and two-way designs. The RoFANOVA's performance is proven in the context of a stimulating real-world case study in additive manufacturing that involves the analysis of spatter ejections. The **R** package **rofanova**, which is available on CRAN, implements the RoFANOVA technique.

References:

Centofanti, F., Colosimo, B. M., Grasso, M. L., Menafoglio, A., Palumbo, B., & Vantini, S. (2021). Robust Functional ANOVA with Application to Additive Manufacturing. arXiv preprint arXiv:2112.10643.

Keywords

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