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Outlier detection in sensor networks

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Emerging technologies ease the recording and collection of high frequency data produced by sensor networks. From a statistical point of view, these data can be view as discrete observations of random functions. Our industrial goal is to detect abnormal measurement. Statistically, it consists in detecting outliers in a multivariate functional data set.
We propose a robust procedure based on contaminated mixture model for both clustering and detecting outliers in multivariate functional data. For each measurement, our algorithm either classify it into one of the normal clusters (identifying typical normal behaviours of the sensors) or as an outlier.
An Expectation-Conditional Maximization algorithm is proposed for model inference, and its efficiency is numerically proven through numerical experiments on simulated datasets.
The model is then applied on the industrial data set which motivated this study, and allowed us to correctly detect abnormal behaviours.

Keywords

outlier detection, contaminated normal mixture, multivariate functional data

Special/invited session

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