



A new method for estimating spectral clustering change points for multivariate time series

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Spectral clustering is a computationally feasible and model-free method widely used in the identification of communities in networks. We introduce a data-driven method, namely Network Change Points Detection (NCPD), which detects change points in the network structure of a multivariate time series, with each component of the time series represented by a node in the network. Spectral clustering allows us to consider high dimensional time series where the number of time series is greater than the number of time points ($n < p$). NCPD allows for estimation of both the time of change in the network structure and the graph between each pair of change points, without prior knowledge of the number or location of the change points. Permutation and bootstrapping methods are used to perform inference on the change points. NCPD is applied to various simulated high dimensional data sets as well as to a resting state functional magnetic resonance imaging (fMRI) data set. The new methodology also allows us to identify common functional states across subjects and groups. Finally, the method promises to offer a deep insight into the large-scale characterisations and dynamics of the brain.