

A Posteriori Trading-Inspired Model-Free Time Series Segmentation

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Abstract : Within the context of multivariate time series segmentation, this paper proposes a method inspired by a posteriori optimal trading. After a normalization step, time series are treated channelwise as surrogate stock prices that can be traded optimally a posteriori in a virtual portfolio holding either stock or cash. Linear transaction costs are interpreted as hyperparameters for noise filtering. Trading signals, as well as trading signals obtained on the reversed time series, are used for unsupervised channelwise labeling before a consensus over all channels is reached that determines the final segmentation time instants. The method is model-free such that no model prescriptions for segments are made. Benefits of proposed approach include simplicity, computational efficiency, and adaptability to a wide range of different shapes of time series. Performance is demonstrated on synthetic and real-world data, including a large-scale dataset comprising a multivariate time series of dimension 1000 and length 2709. Proposed method is compared to a popular model-based bottom-up approach fitting piecewise affine models and to a recent model-based top-down approach fitting Gaussian models and found to be consistently faster while producing more intuitive results in the sense of segmenting time series at peaks and valleys.

Keywords : time series segmentation, model-free, trading-inspired, multivariate data

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