Time Series Analysis with Unsupervised Learning

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Abstract: We consider the prediction problem for time series with unknown clusters. Unsupervised learning methods, such as hierarchical and K-means clustering techniques are applied to pre-cluster the time series trend. Non-parametric approaches are adopted to estimate the trends of the clusters. We use conventional time series models and long short-terms memory network (LSTM) models to fit the original and de-trended time series data and compare their prediction performance. In the empirical study, we analyze daily/intra-daily mass transit vehicle capacity time series data of Kaohsiung city. The results show that the conventional time series models have better prediction performance than the LSTM model for stationary case, yet the LSTM models perform better for non-stationary case including change point.