Forecasting cross-sectional and temporal hierarchies through trace Minimization

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ΠΕΡΙΛΗΨΗ

In many applications, there are multiple time series that are hierarchically organised and can be aggregated at several different levels in groups based on products, geography or some other features. A common constraint is that forecasts of the disaggregated series need to add up to the forecasts of the aggregated series. This is known as "coherence". We develop a new reconciliation forecasting approach that incorporates the information from a full covariance matrix of forecast errors in obtaining a set of coherent forecasts. Our approach, which we refer to as MinT, minimises the mean squared error of coherent forecasts across the entire collection of time series. We evaluate the performance of MinT compared to alternative approaches using a series of simulation designs and an empirical application forecasting Australian domestic tourism. In the second part of this talk we will also discuss the application of MinT for forecasting a single time series by generating what we refer to as temporal hierarchies. A temporal hierarchy can be constructed for any time series by means of non-overlapping temporal aggregation. Our results from an extensive empirical evaluation show that forecasting using temporal hierarchies increases accuracy significantly over conventional forecasting. We will also discuss organisational implications of the temporally reconciled forecasts using a case study of Accident & Emergency departments.
ABSTRACT

In many applications, there are multiple time series that are hierarchically organised and can be aggregated at several different levels in groups based on products, geography or some other features. A common constraint is that forecasts of the disaggregated series need to add up to the forecasts of the aggregated series. This is known as "coherence". We develop a new reconciliation forecasting approach that incorporates the information from a full covariance matrix of forecast errors in obtaining a set of coherent forecasts. Our approach, which we refer to as MinT, minimises the mean squared error of coherent forecasts across the entire collection of time series. We evaluate the performance of MinT compared to alternative approaches using a series of simulation designs and an empirical application forecasting Australian domestic tourism. In the second part of this talk we will also discuss the application of MinT for forecasting a single time series by generating what we refer to as temporal hierarchies. A temporal hierarchy can be constructed for any time series by means of non-overlapping temporal aggregation. Our results from an extensive empirical evaluation show that forecasting using temporal hierarchies increases accuracy significantly over conventional forecasting. We will also discuss organisational implications of the temporally reconciled forecasts using a case study of Accident & Emergency departments.