Forecast support system for South Tees Hospitals NHS Foundation Trust

The aim of the project is to develop an R Shiny application that would allow analyse data downloaded from SQL and produce point and interval forecasts for specified temporal and cross-sectional level of data for specific forecast horizon. The Forecast Support System (FSS) is focused on working with the admittance of patients in the hospital, but can be extended to work with other data.

The FSS based on R Shiny should consist of two parts:

1. The R functions used for analysis and forecasting (called “Core” in this document);
2. The user interface, accessible via the local area network by users that have necessary rights (called “Interface” in this document);

The Core of the FSS should include the following features:

1. Data analysis:
   1. Seasonal plots for selected time series;
   2. Aggregation of data into different cross-sectional groups;
   3. Aggregation of data into different frequencies (such as daily, weekly, monthly, yearly);
   4. Decomposition of time series (for the analysis of the residuals);
2. Forecasts evaluation:
   1. Selection of forecasting models for specific level of aggregation;
   2. Rolling origin for the selected models;
   3. Error measures for the point and interval forecasts on different levels of the hierarchy;
   4. Comparison of different models, including the models with the judgmentally adjusted forecasts;
3. Forecasting:
   1. Application of selected continuous forecasting models;
   2. Application of selected intermittent demand forecasting models;
   3. Automatic selection of forecasting models;
   4. Automatic selection of explanatory variables;
   5. Generation of point and interval forecasts;
   6. Grouped time series reconciliation of point and interval forecasts;

The Interface of the FSS should include the following features:

1. Dashboard with the forecasts for the most important level and summary of the recent performance of models (i.e. have any outliers happened recently?);
2. Graphical presentation of the Core functions;
3. Temporal and cross-sectional aggregation level selection;
4. Start and end dates selection;
5. Selection of forecast horizon;
6. Selection of the prediction intervals width;
7. Manual override of the variables included in the model;
8. Creation of explanatory variables using judgment (i.e. football match and other events, not tractable by the system);
9. Judgmental modifications of the point and interval forecasts;
10. Creation of notes, motivating the judgmental adjustments;

Given the potential size of the project, it is proposed to do it in two stages:

1. The development of the data analysis and forecasting modules from the Core of the FSS and the related Interface features (1 – 6);
2. The development of the forecasts evaluation module for the Core of the FSS and the rest of the features for the Interface (7 – 10);