ARIMA?!

When a forecasting project is not one

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Outline

- The problem
- Is it a forecast problem?
- Weekly seasonality
- Multiseasonal time series
- Machine learning approach

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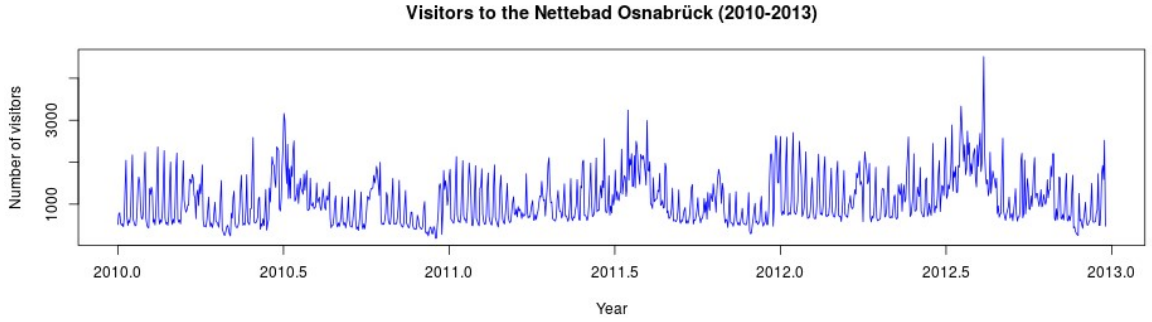
The problem

Forecasting the number of visitors to Nettebad Osnabrück. Using

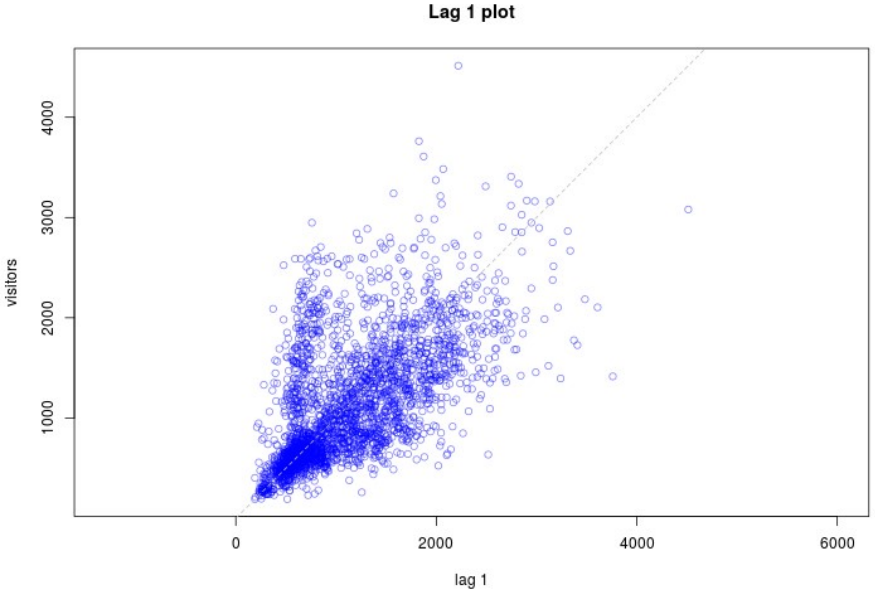
- Visitors to the pool from 2005-03-20
- Some variables about the pool such as events, classes, availability of certain facilities etc.
- Weather data

https://inclass.kaggle.com/c/swimming-pool-visitor-forecasting



Is it a forecast problem?

- It seems so, but looking at the lag plots ...



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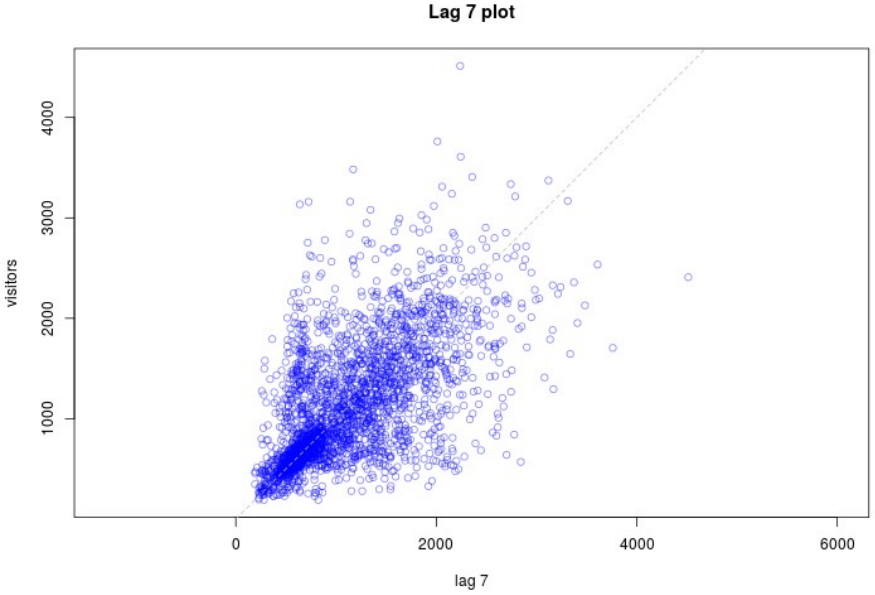

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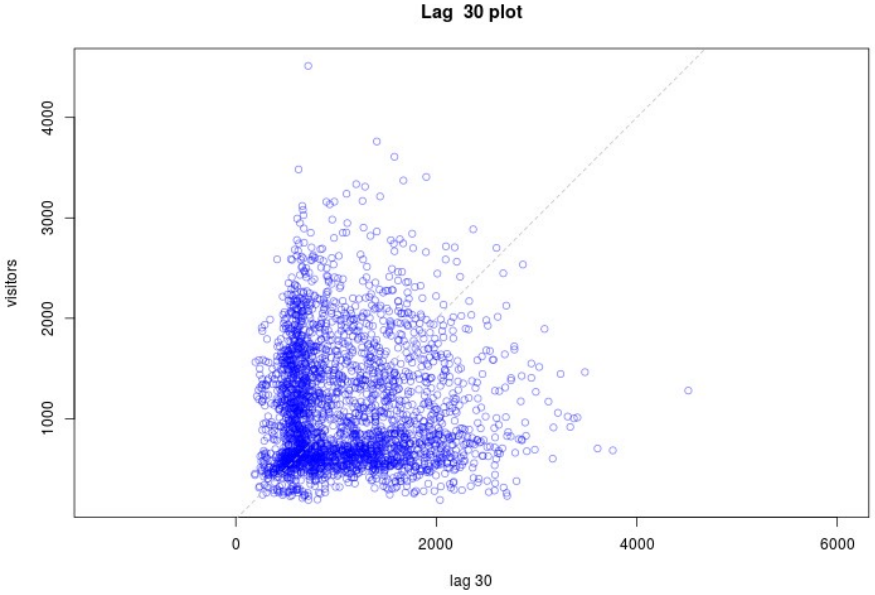

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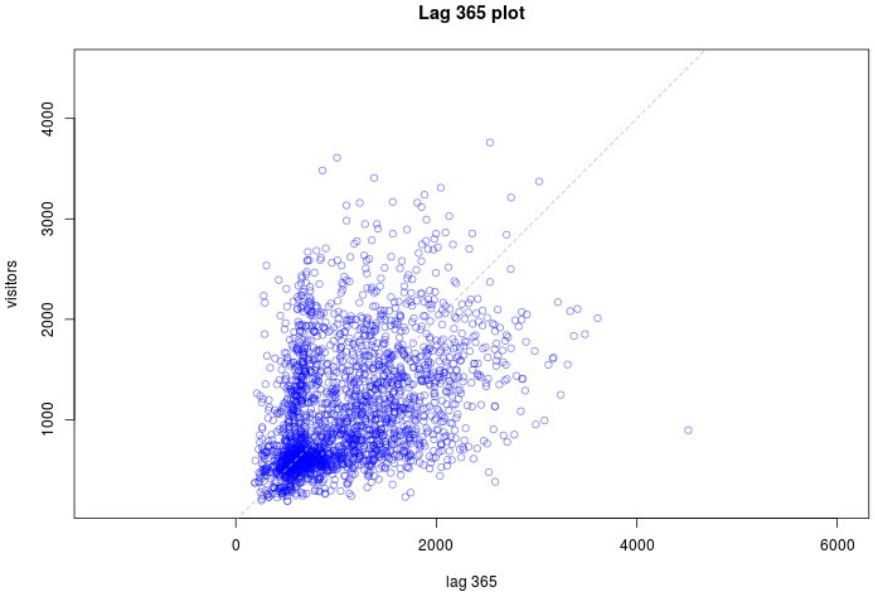
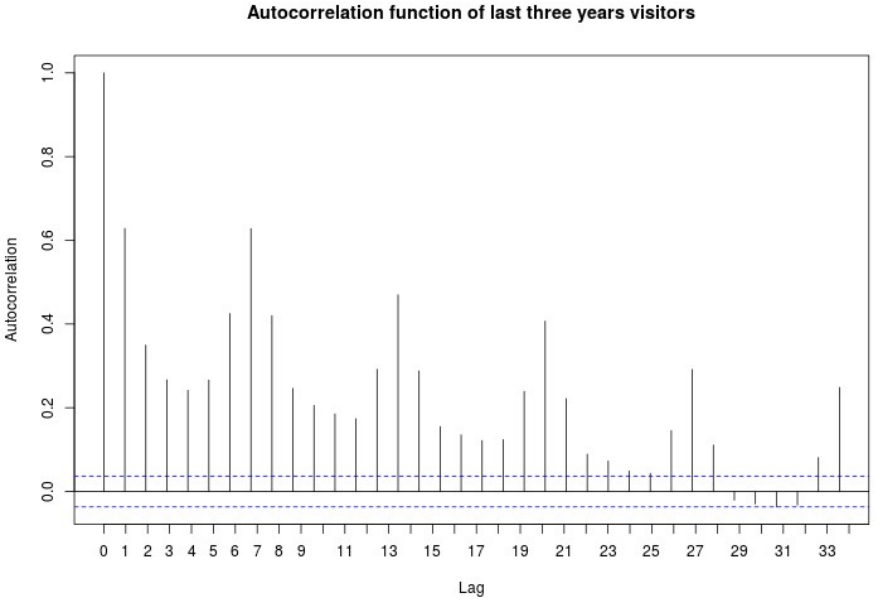


Is it a forecast problem

- And the autocorrelation plot



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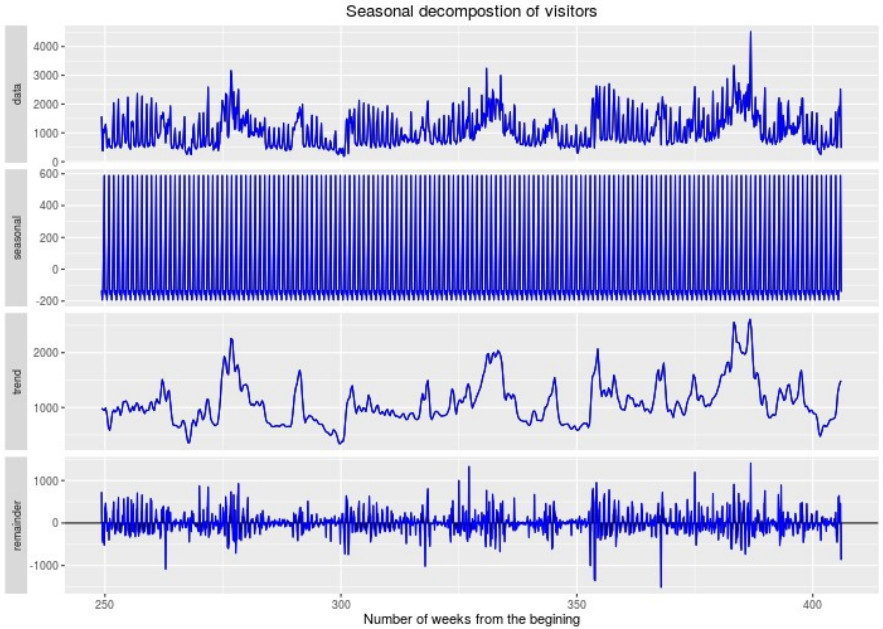
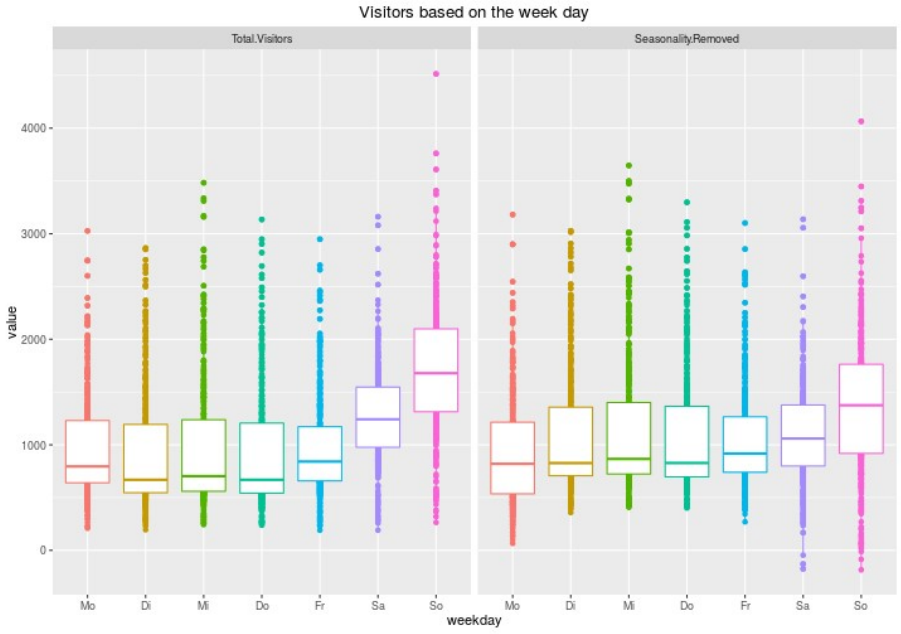
Weekly seasonality

- Autocorrelation plot suggested weekly seasonality in the data
- The missing days is imputed and the time series is decomposed



Accuracy of the seasonality



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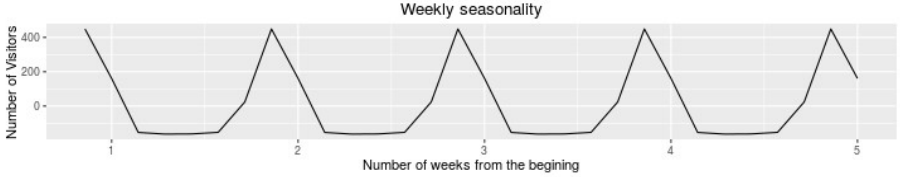
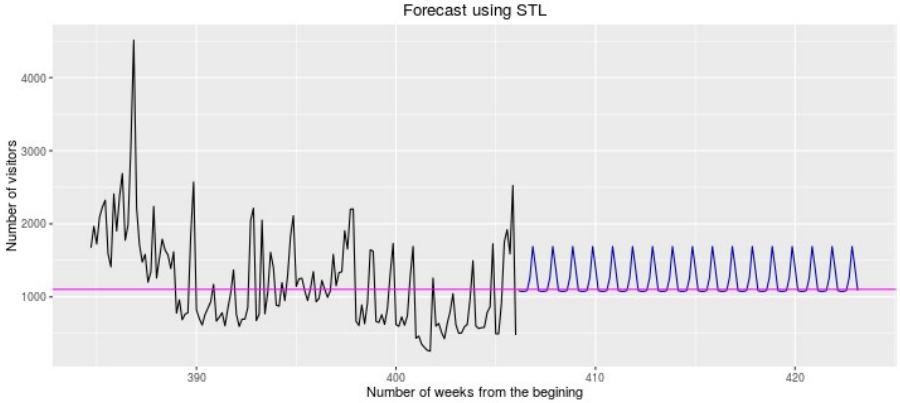
Forecasting via decomposition





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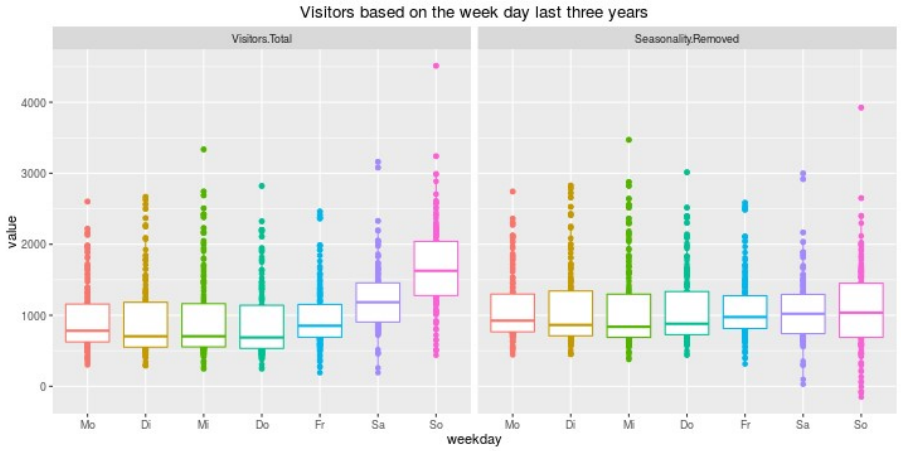
Last three years



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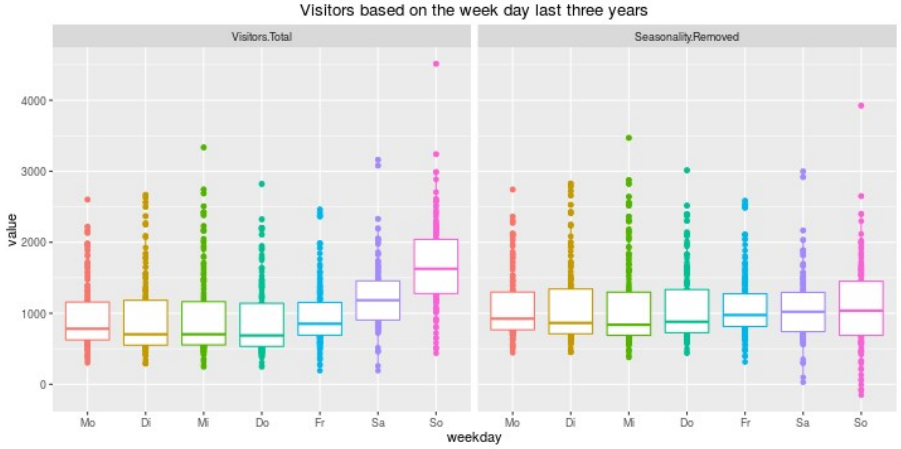
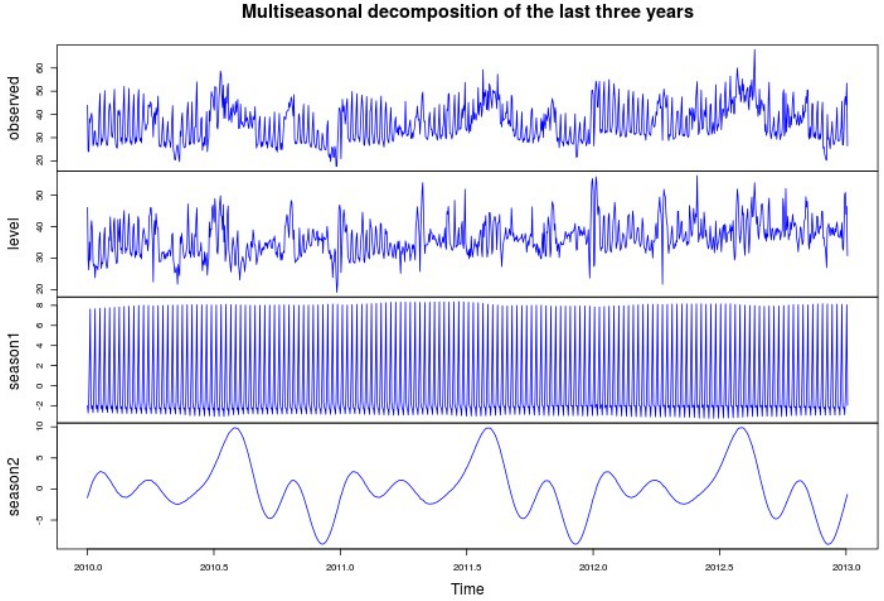


- One could remove seasonality and do the prediction on the remainder, then add seasonality
- The best RMSE I could get with this approach was 330.15

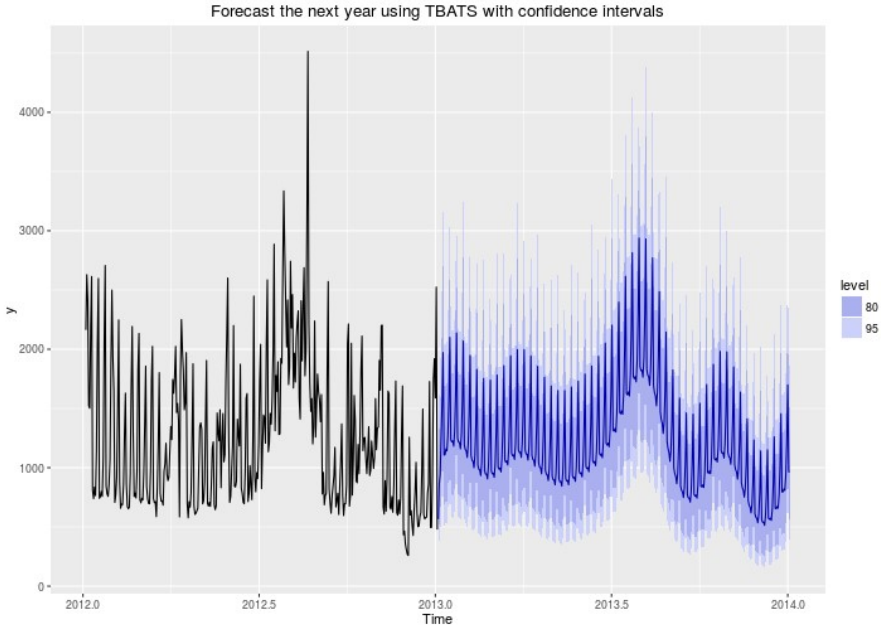
Multiseasonality approach

- As there are two kinds of sesonality, one can use multiseasonal time series and TBATS



Forecast by TBATS

- Reached RMSE of 376



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Machine learning approach

- School and bank holidays
- Weekday and month name to consider seasonality
- Weather data (temprature, wind, preception,...)
- New features
  - Monthly average temprature
  - Warmer than monthly average
  - Warmer than the previous day
  - Heat index
- Adjust prices by consumer price index (CPI)

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Machine learning approach

- Train a random forest to get feature importance
- Use the most important feature (99% cumulative importance)
- Use gradient boosting (XGboost) for the final prediction
- Adjust christmas and new years manually to the previous year value
- The final rmse is 247.33 (269.89 without manuall adjusment)

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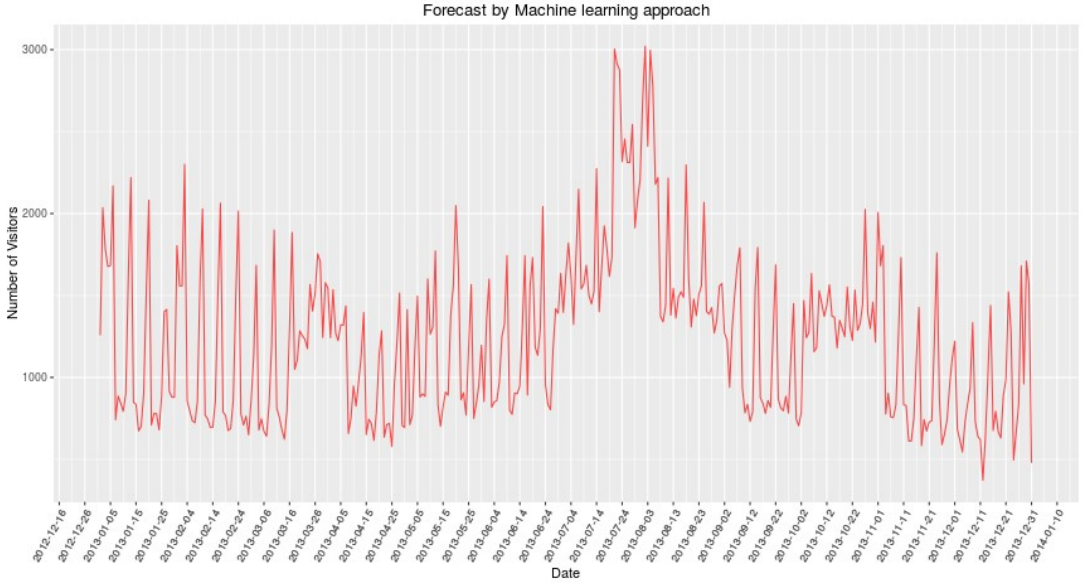
Machine learning approach



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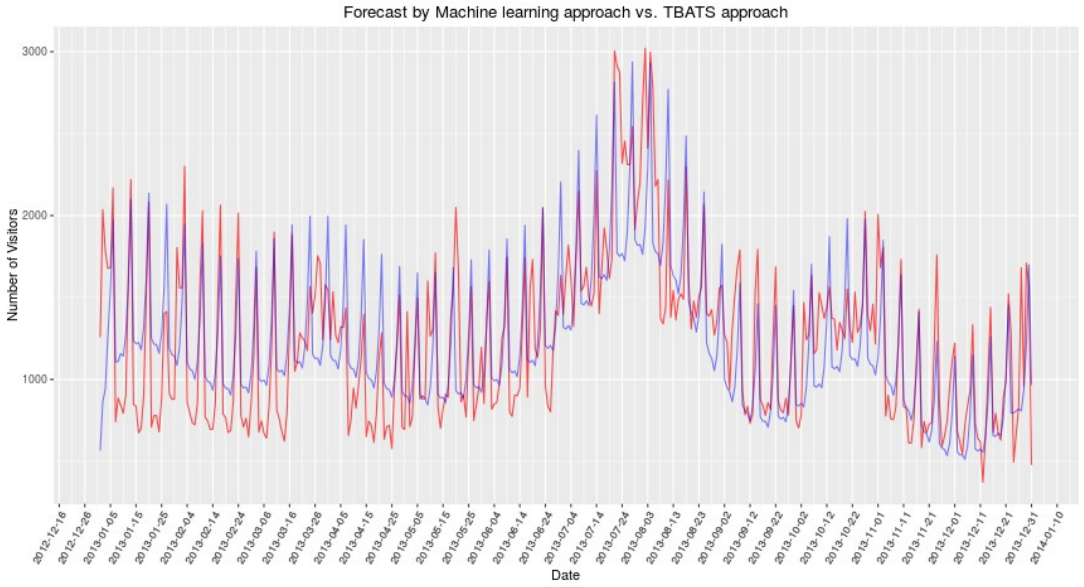

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Thank you for your patience

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With confidence interval