Hourly time-series prediction of power suppliesor for next week

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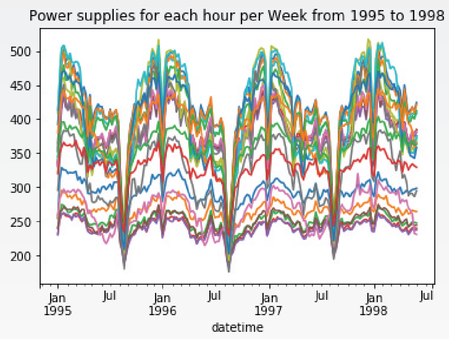
Overview

Project Scope

Project aims to predict future values of how much power supply is needed to be provided by plant, based on values in the past.

Approach

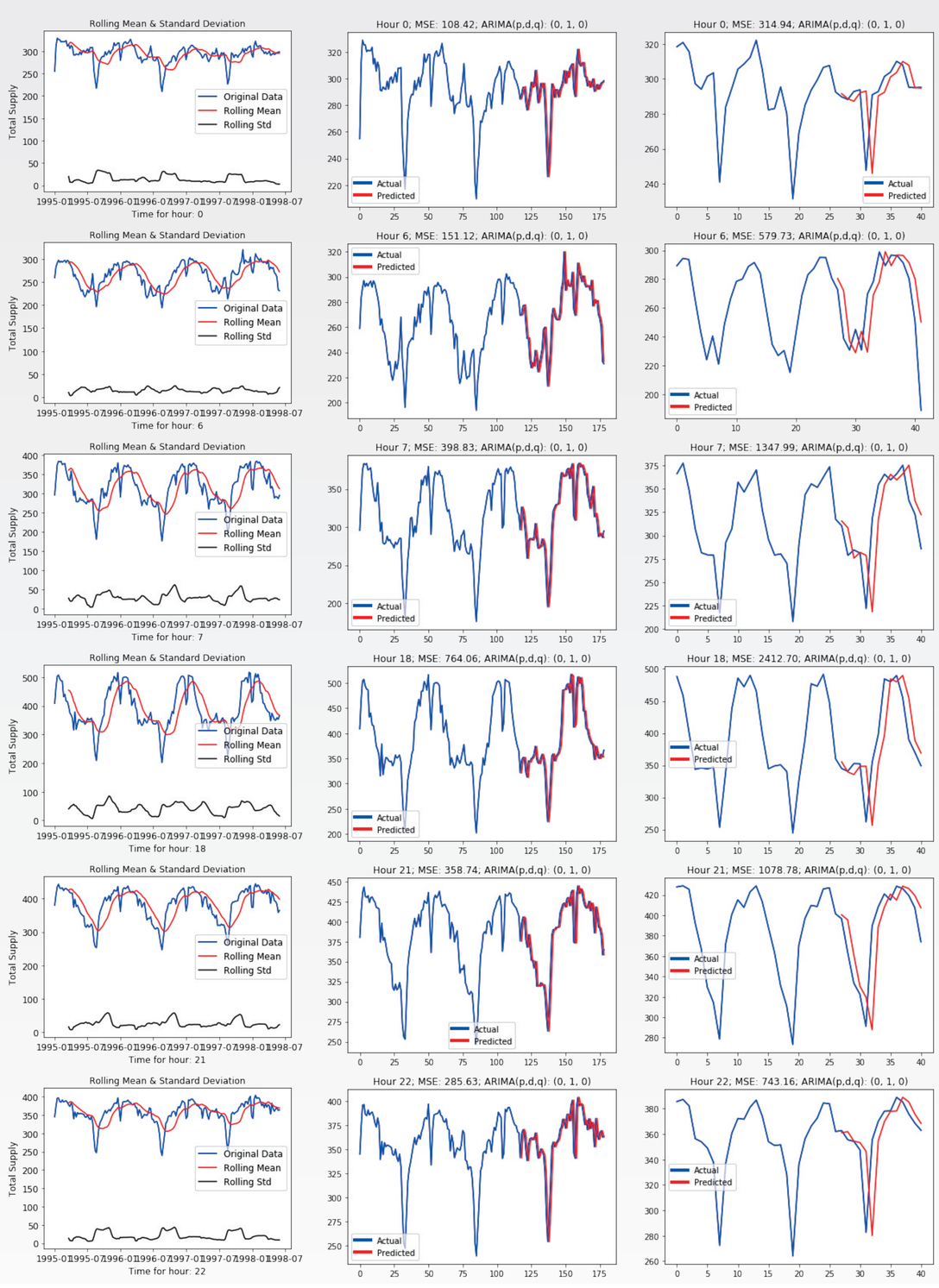
- One-step forecasting values for monthly, weekly and daily time-frames with ARIMA.



Data Set

Extended Problem Statement

- Images in the first column describe how for each group of models rolling mean and rolling std. deviation is moving. From the pictures can be seen that they dont have trend hence they are most likely stationary.
- 2nd and 3rd column represent comparison of test values with predicted values where one-step ahead approach was used for weekly and monthly time-frame.

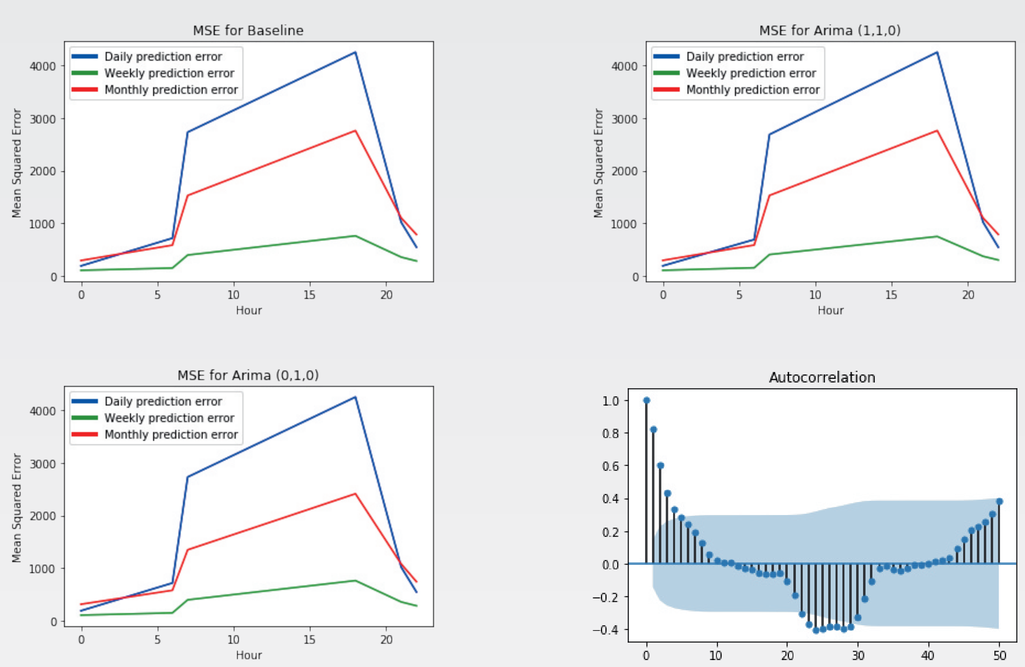


Details on the Approach

Detail level

- Data separation was done in 24 different models because it contained data for each hour for each day from 1995 to 1998. We wanted to forecast on hourly basis because it was more likely that the data has pattern in repeating itself throughout the time for certain hour.
- After that, each model was tested if it contains stationarity or not. The reason for that is because if the data is non-stationary that means that we need to do some kind of transformation to make it stationary to be able to have lower error.
- The stationarity test was done via visualizations and statistical test called Dickey-Fuller test.
- Visual representation was used to check visually if rolling mean and rolling standard deviation had some trend and Dickey-Fuller test was to confirm what was seen on plot.
- Dickey-fuller test showed us that the most of the models have stationarity with 99% confidence interval.
- After realizing that some hours hold identical values over the time, 6 models were extracted to represent 6 different types.
- To each model ARIMA was applied with parameters (0,1,0) and (1,0,0)
- To compare how good ARIMA was working three time frames were used: daily, weekly and monthly.
- Each model fitting was evaulated by comparing one-step ahead prediction with the actual value and at the end computing the total mean squared error
- Additionally, baseline prediction was computed in order to perform comparation to our model and how it well performs against the baseline approach.

Results



Discussion

- From images above, comparison between ARIMA(0,1,0) and ARIMA(1,1,0) in comparison have the same error.
- Autocorrelation plot shows us that data is highly correlated hence it is not random.
- Additionally, what comes to a surprise is that daily prediction have the highest error rate comparing to monthly and weekly predicition.
- Weekly predicitions were shown as the optimal time-frame for predicting one-step ahead predicitions for given data.
- For future work what could be done is two compute the average for given hours that have almost equal values.
- When we compare our results to the baseline approach we can conclude that our solution performs with 60% accuracy rate

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