Forecasting of Hourly Demand

Problem Statement

ABC is a car rental company based out of Bangalore. It rents cars for both in and out stations at affordable prices. The users can rent different types of cars like Sedans, Hatchbacks, SUVs and MUVs, Minivans and so on.

In recent times, the demand for cars is on the rise. As a result, the company would like to tackle the problem of supply and demand. The ultimate goal of the company is to strike the balance between the supply and demand in order to meet the user expectations.

The company has collected the details of each rental. Based on the past data, the company would like to forecast the demand of car rentals on an hourly basis.

Approach:

Initially my intuition was to work with SARIMA model, but upon investigation of data I found out that it didn't have 24 hour values were for each date for which I would have to do a lot of imputation. So, I went with fbprophet but the performance desirable even with adding regressors. Finally, I opted for LGBM Regressor and the model worked quite well, the rmse obtained was 33.496 on leader board.

Feature Engineering:

Upon decomposing the time-series I found out the presence of multiple seasonalities and it was quite hard to capture with the hour feature alone, so I went on creating month, day of week, week of month, weekend, month start, month end, year start and year end features from the date feature. These really helped in regressing the demand.

Final Model:

The model I have used is LGBMRegressor with the following parameters,
n_estimators=3500, num_leaves=125, max_depth=10, min_child_samples=3,

learning_rate=0.01, colsample_bytree=0.5, reg_alpha=0.5, reg_lambda=2.

The parameters were chosen iteratively by verifying that the lowest rsme is achieved.