WIND POWER GENERATION

Project ID   :   SPS_PRO_1530

Project Title :   Wind Power Generation

1. PROJECT DESCRIPTION:

Problem Statement:

Wind energy plays an increasing role in the supply of energy world-wide. The energy output of a wind farm is highly dependent on the wind conditions present at its site. If the output can be predicted more accurately, energy suppliers can coordinate the collaborative production of different energy sources more efficiently to avoid costly overproduction.

Solution:

To resolve this problem we'll develop a web application that shows the estimated wind energy that could be generated from the parameters like wind speed,wind direction and time of the day. The time series in the web app will monitor the estimated power generation for a time wind speed, wind direction. The training of the model will be done with Wind Turbine Scada Dataset 2018. The attributes in the dataset are [Date/Time, LV ActivePower (kW), Wind Speed (m/s), Theoretical_Power_Curve (KWh), Wind Direction (°)].User can use the time series of the web app to fetch the prime hours of production and hence can coordinate with the collaborators.

2. PROJECT SCOPE:

The project is developed keeping into mind how increasing energy demand can be fullfilled with a balance between renewable and non-renewable sources. The uncertainity associated with potential of renewable resources, makes it difficult to move towards them. The web application tries to bridge this gap between uncertainity in potential and increasing demand of energy. We present a detailed time series of expected production at the wind mills, which creates a scope for the energy suppliers to avoid the over consumption of non-renewable resources.

3. PROJECT SCHEDULE:

In this task, we discussed how to proceed for the project understanding all the required flow of the project .Assigned tasks to everyone.

4. TECHNOLOGIES USED:

1. IBM Cloud : **IBM Cloud** is a suite of **cloud** computing services from **IBM** that offers both platform as a service (PaaS) and infrastructure as a service (IaaS).

2.IBM Watson Studio: It is an integrated environment designed to make it easy to develop, train, manage models, and deploy AI-powered applications and is a SaaS solution delivered on the IBM Cloud.

3 . Node-RED : It is a flow-based development tool for visual programming developed originally by IBM for wiring together hardware devices, APIs and online services as part of the Internet of Things.

4 . IBM Machine Learning : **IBM Watson Machine Learning** is a full-service **IBM** Cloud offering that makes it easy for developers and data scientists to work together to integrate predictive capabilities with their applications.

5. Python : It is the heart of the entire project . **Python** is a high-level **programming** language designed to be easy to read and simple to implement. It is open source, which means it is free to use, even for commercial applications.
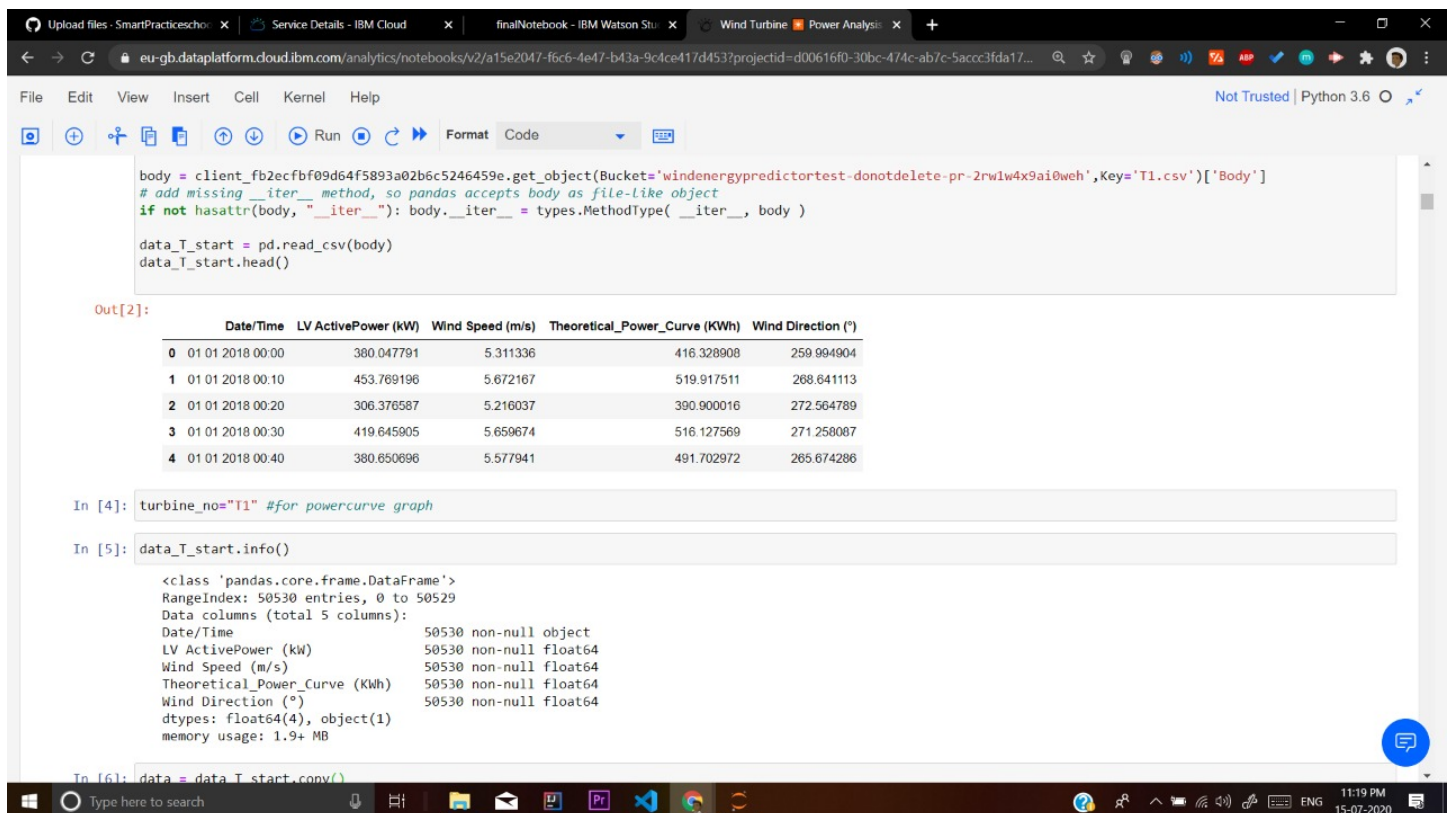
6. Weather Api : The Open weather api provide us the real time weather statistics in an JSON format.

5. OUR FLOW:

1. Dataset :

To create the web app, we first went into the search of a data-set. Our search stopped at 2018 Scada Data of a Wind Turbine in Turkey. As all machine learning algorithms, we also started with pre-processing of available data to overcome redundant features and overfitting.

RAW DATA :

CLEANED DATA :

2. Creation Of Watson Studio Project :

We then created the watson studio project in IBM Cloud .

3. Creation Of Machine Learning Service :

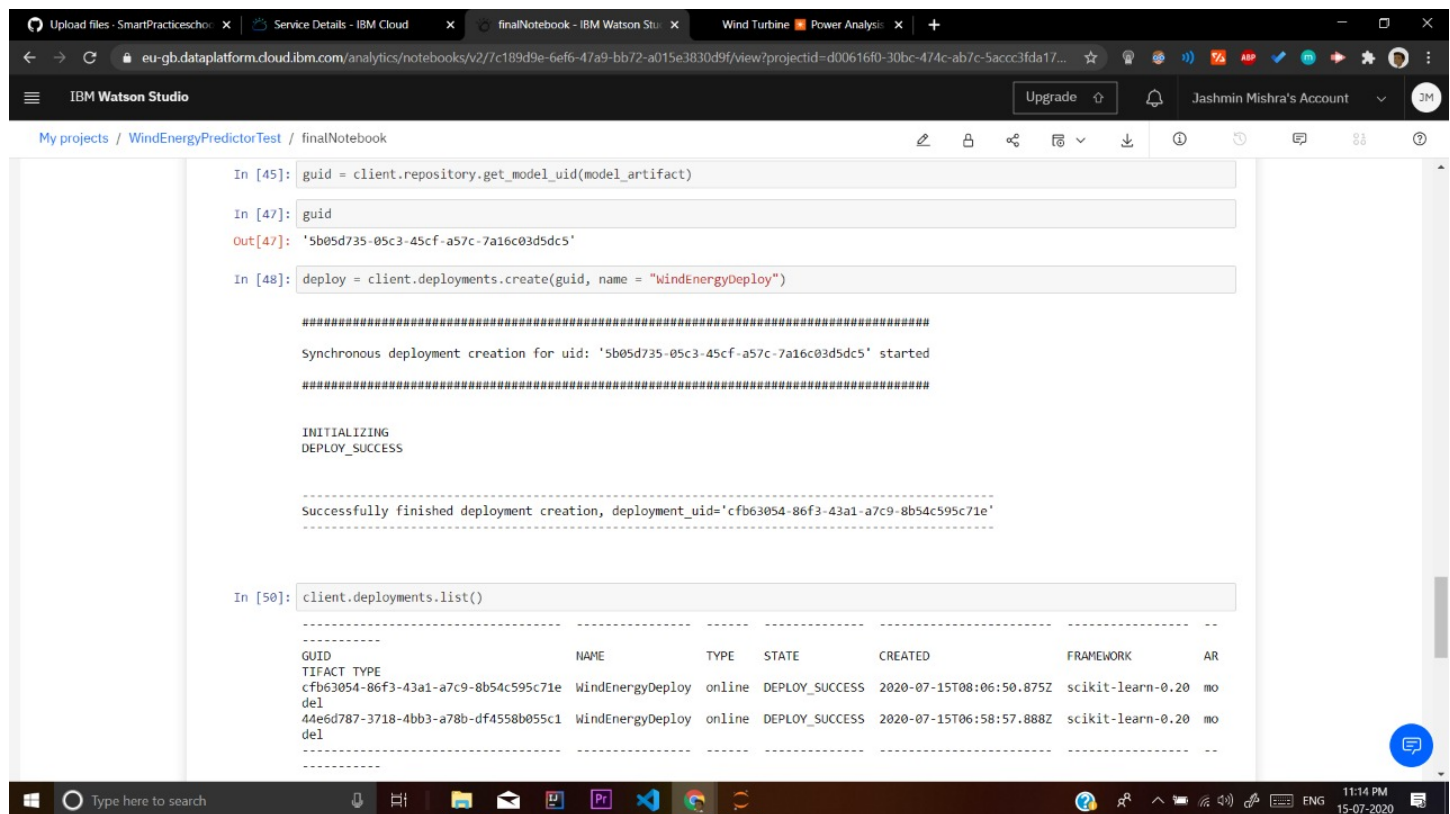Then we created the machine learning service and integrated it .
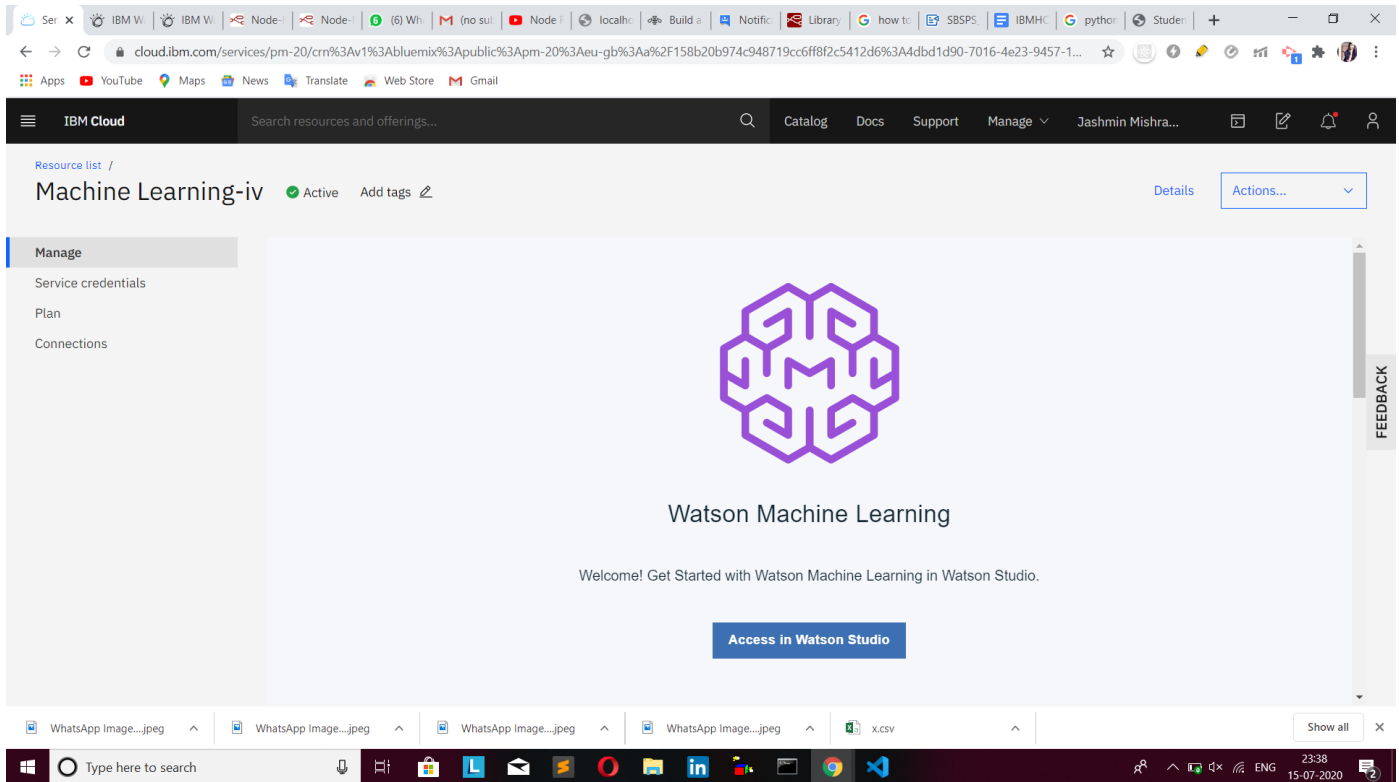
4. Model Creation :

For our prediction we moved ahead with XGB Regressor model.

In Watson Assistant Studio we went on with a notebook containing all the required codes.We then split our dataset into train-test and trained our XGBRegressor model. In the notebook, using Watson Machine Learning client module we created an API and a scoring url so that prediction can be made in real time using our UI.

MODEL DEPLOYMENT :

XGB REGRESSOR MODEL :

GRAPH SHOWING WIND SPEED VS WIND DIRECTION VS POWER:
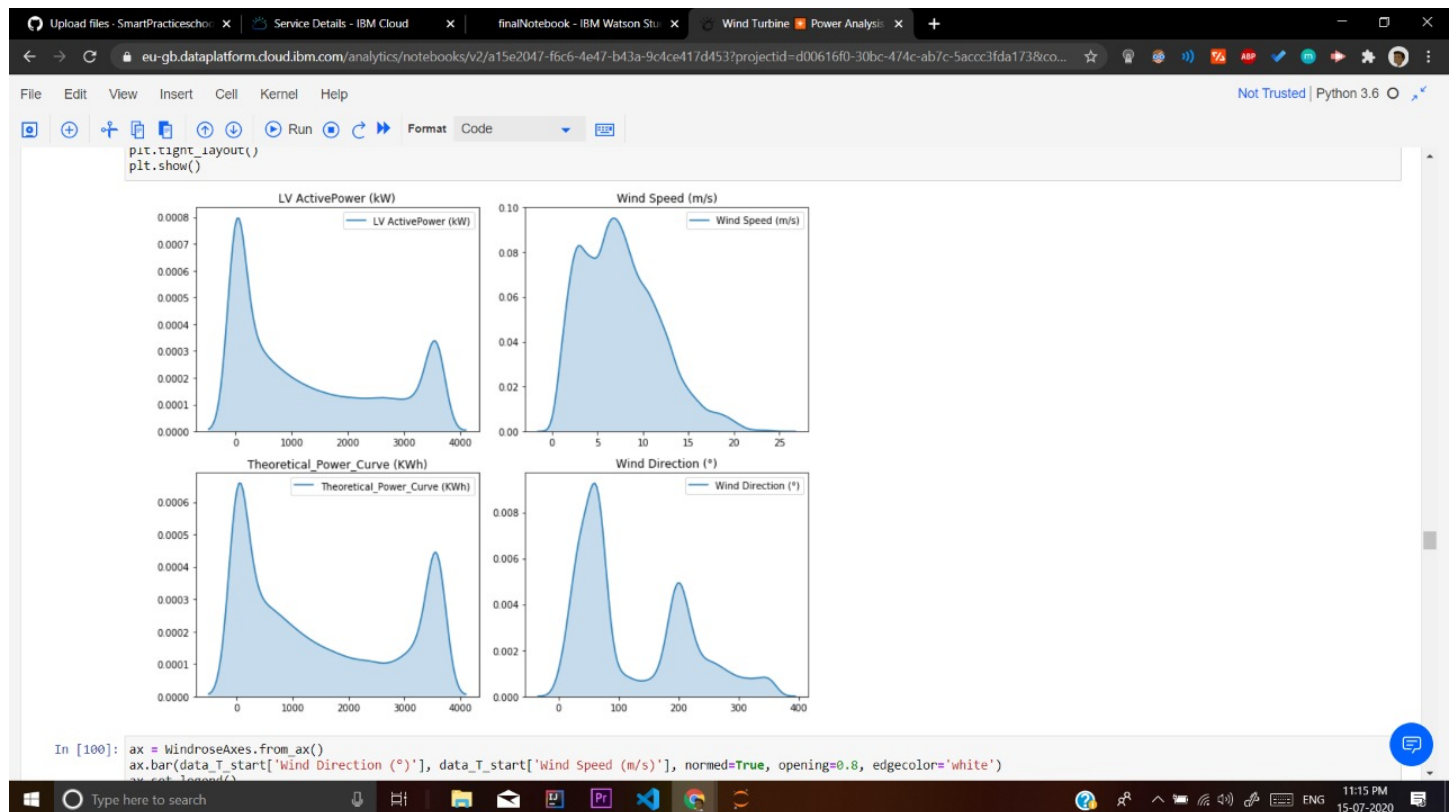
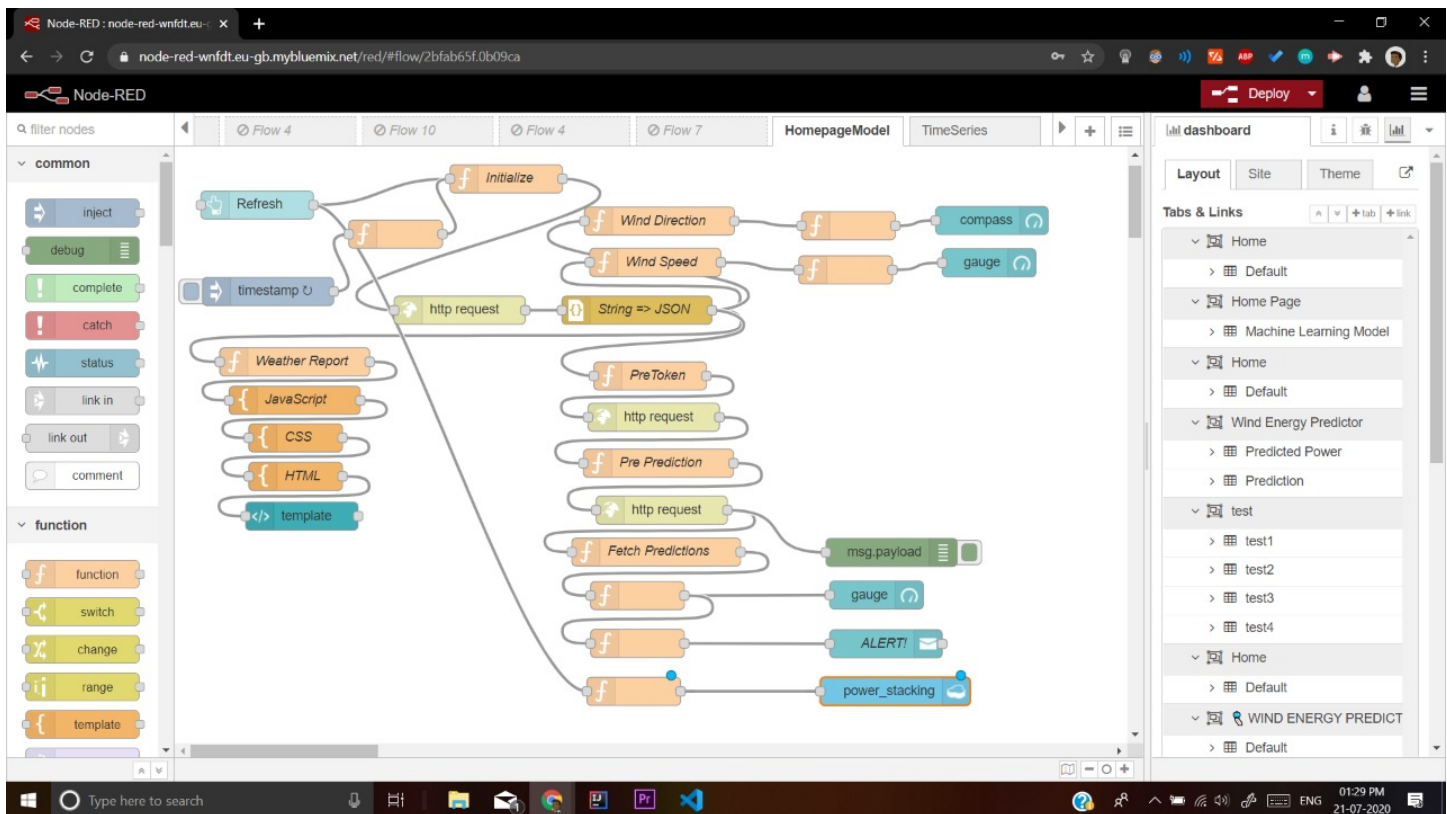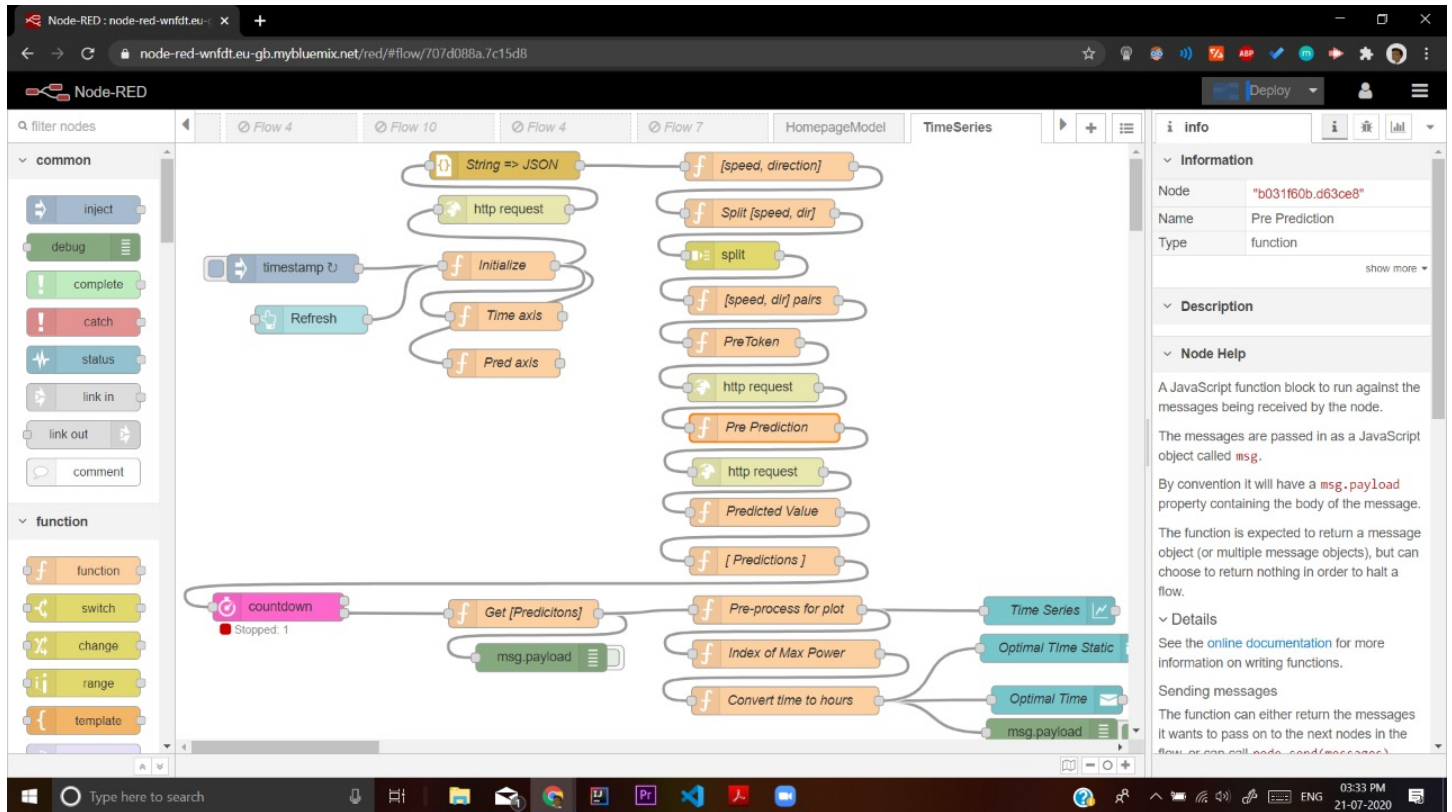## GRAPH SHOWING WINDSPEED VS POWER :
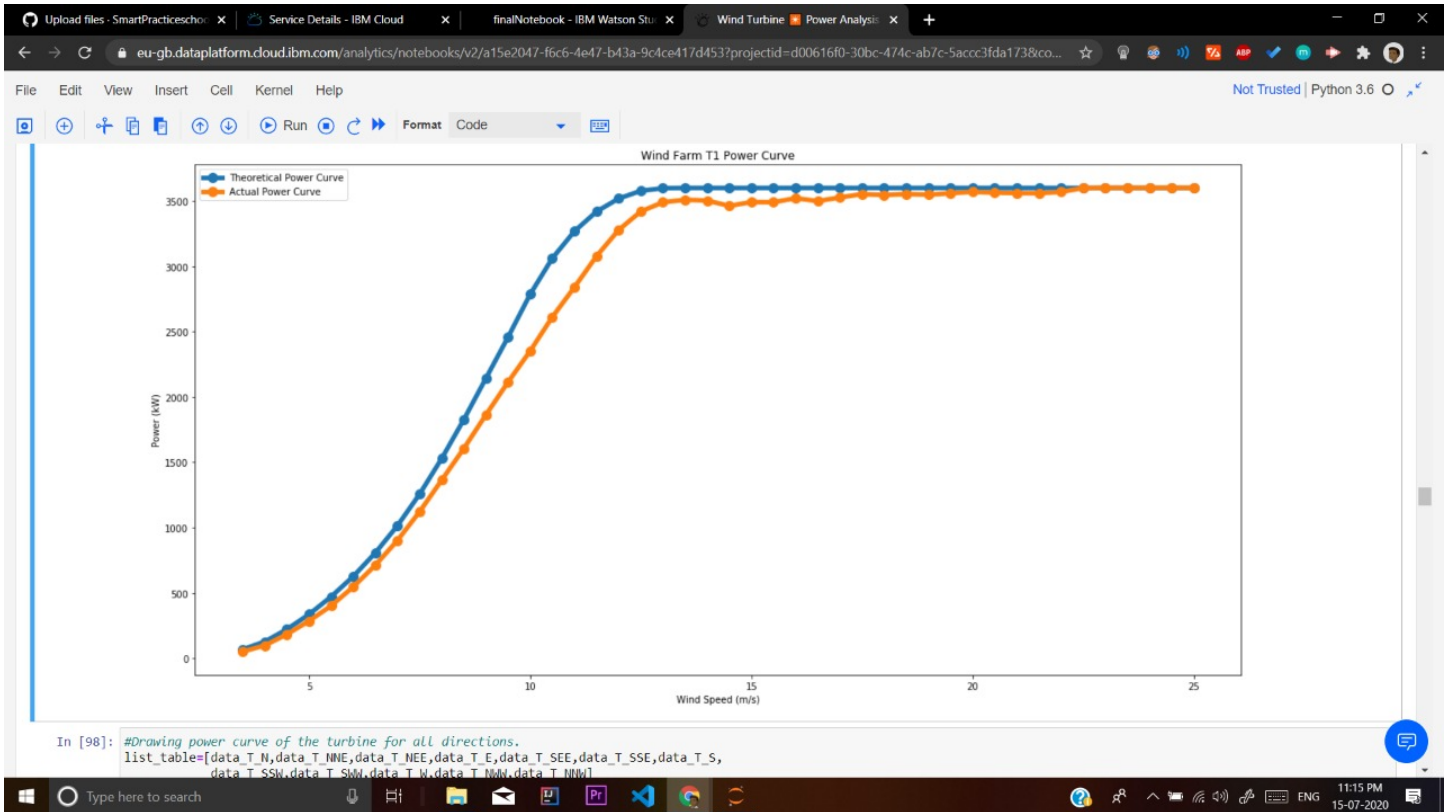
5. NODE RED APPLICATION :

We started our UI through creating flows in Node-RED. To provide real time weather report to our model, we looked forward to a weather API, which actually returns a json object containing required weather information to our node-RED flow.
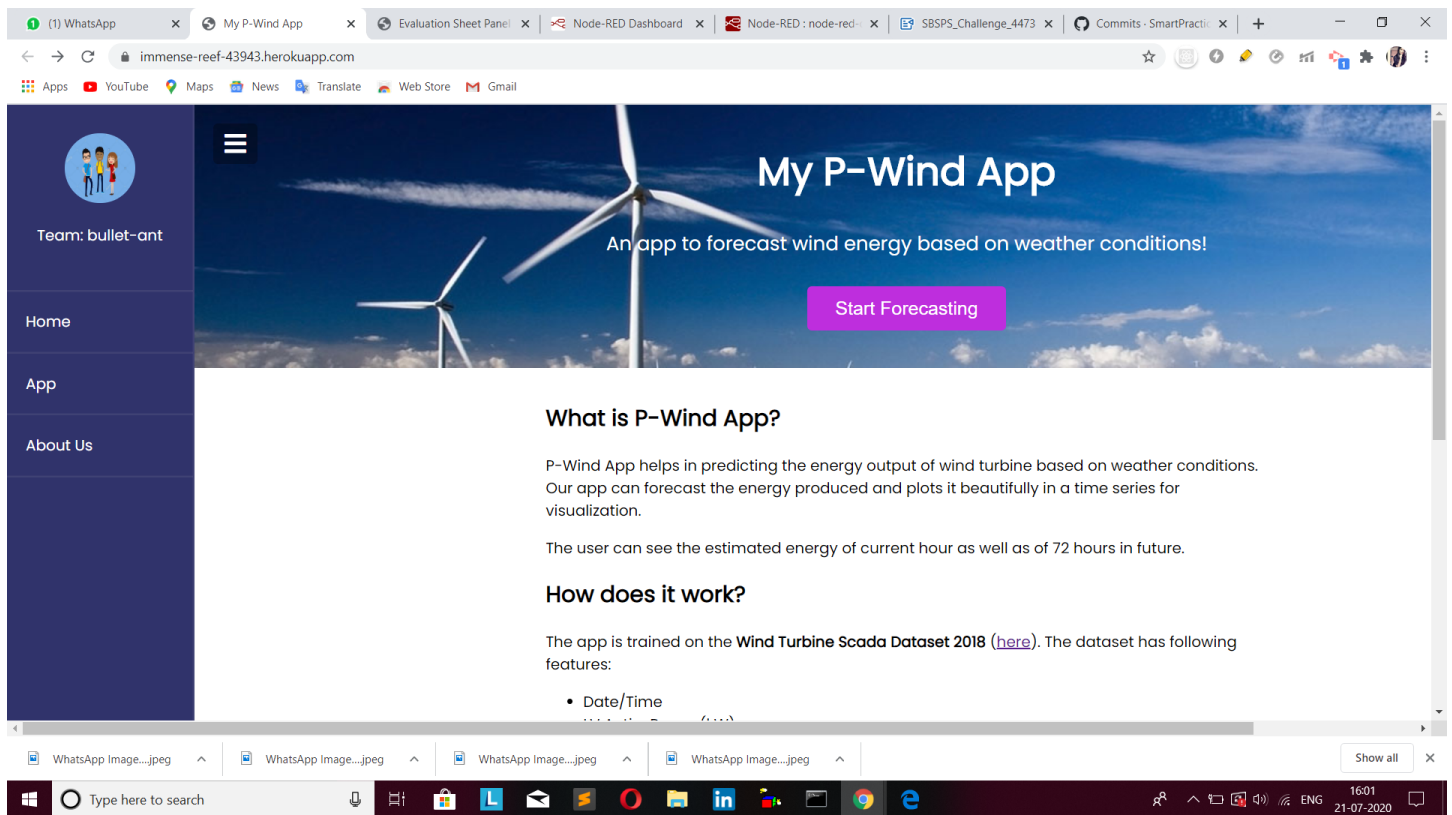
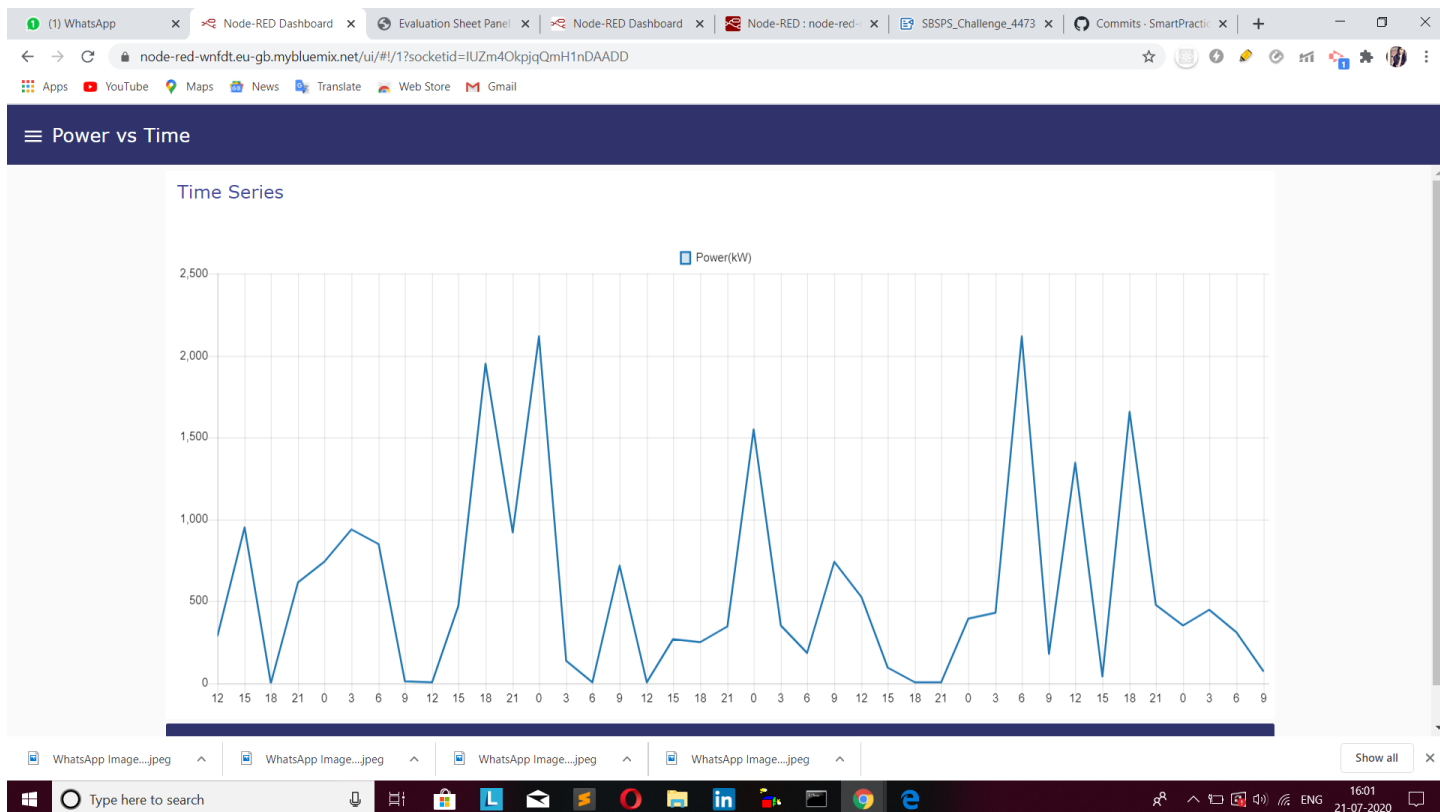### CURRENT ANALYSIS FLOW:
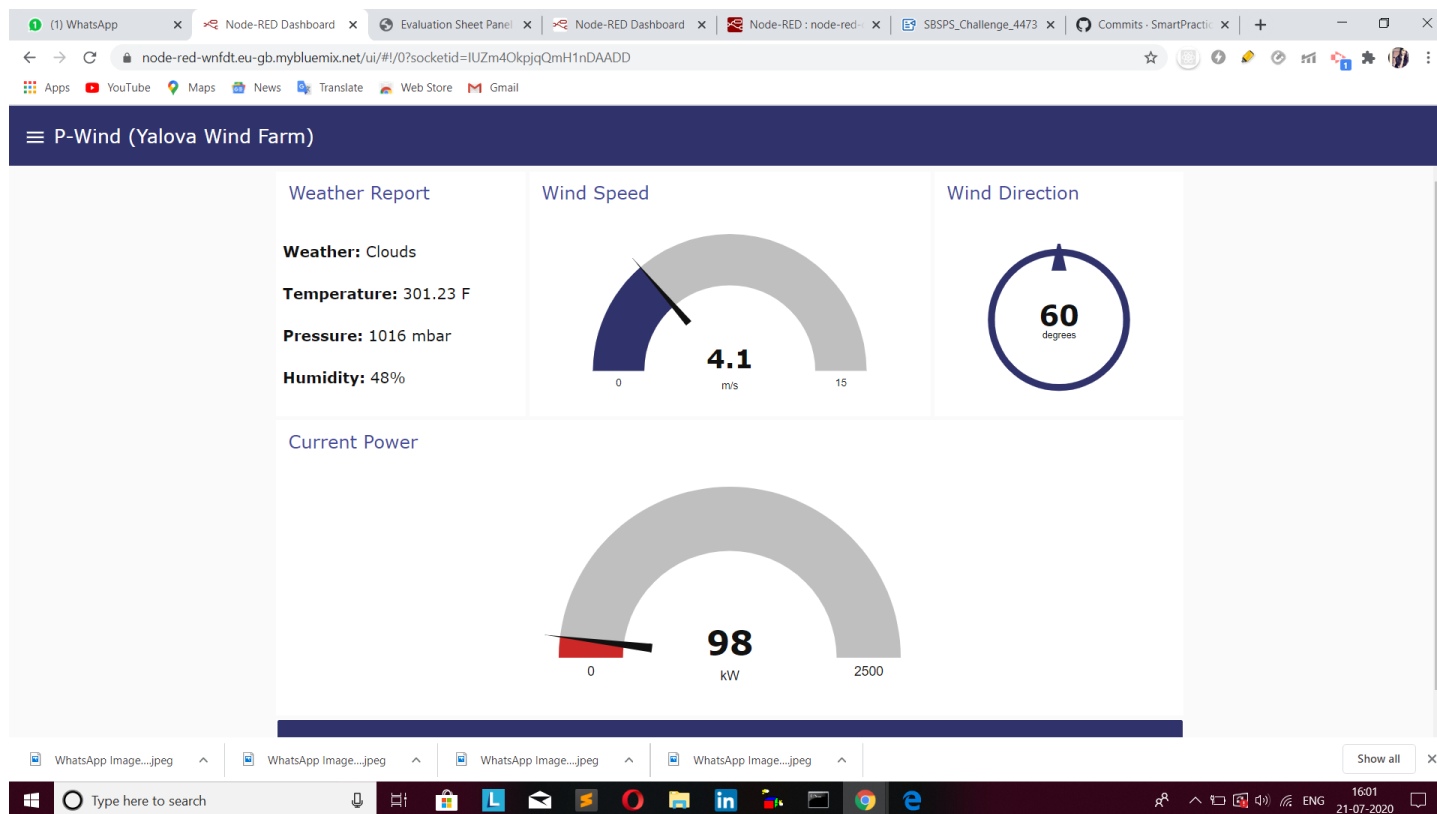
TIME SERIES FLOW :

5. WEB APP :

Finally the entire web application was deployed using herokuapp.

TIME SERIES PAGE :

CURRENT ANALYSIS :

LINK TO OUR NODE RED APP FOR WIND POWER PREDICTOR :

https://immense-reef-43943.herokuapp.com/

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