Project:

Predicting the Energy output of wind Turbine Based on Weather condition

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1 INTRODUCTION:

1.1 OVERVIEW:

Wind power generation differs from conventional thermal generation due to the stochastic nature of wind. Thus wind power forecasting plays a key role in dealing with the challenges of balancing supply and demand in any electricity system, given the uncertainty associated with the wind farm power output. Accurate wind power forecasting reduces the need for additional balancing energy and reserve power to integrate wind power. For a wind farm that converts wind energy into electricity power, a real-time prediction system of the output power is significant. a prediction system is developed with a method of combining statistical models and physical models. In this system, the inlet condition of the wind farm is forecasted by the auto regressive model.

1.2 Purpose:

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 weather condition present at the wind farm.

If the output can be predicted more accurately, energy suppliers can coordinate the collaborative production of different energy sources more efficiently to avoid costly overproductions.

Predicting full load electrical power output of a base load power is important in order to maximize the profit from the available megawatt hour.

2 ABSTRACT

2.1 Exis ng Problem:

Accurate wind power forecasting reduces the need for additional balancing energy and reserve power to integrate wind power.

For a wind farm that converts wind energy into electricity power, a real-time prediction system of the output power is significant.

Wind power generation differs from conventional thermal generation due to the stochastic nature of wind.

Thus wind power forecasting plays a key role in dealing with the challenges of balancing supply and demand in any electricity system, given the uncertainty associated with the wind farm power output.

2.2 Proposed solution:

This Project examines and compares machine learning regression methods to develop a predictive model, which can predict hourly full load electrical power output of a combined cycle power plant. The base load operation of a power plant is influenced by 3 main parameters, which are used as input variables in the dataset.
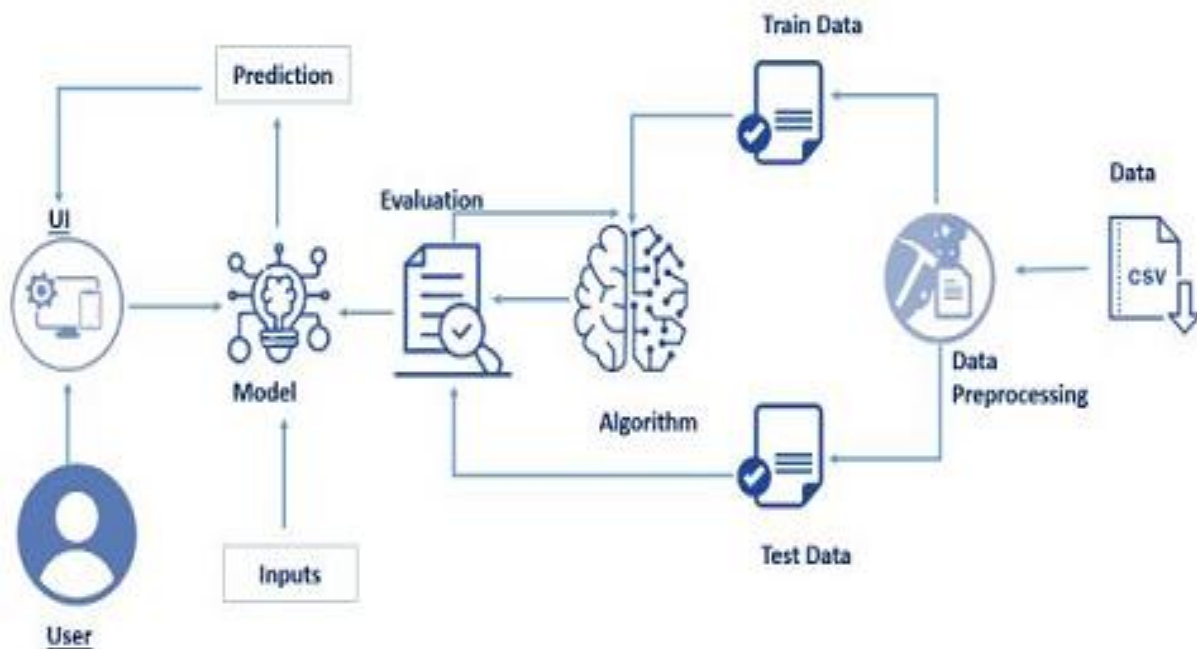
Such as **Active power sensor(kw)**

wind speed(m/s)

wind Direction(Â°)

These parameters affect electrical power output, which is considered as the target variable. For this we are building web application to enter the inputs and view the result.

3 THEORITICAL ANALYSIS

3.1 Block diagram

3.2 Hardware/Software designing

1. Importing Data Set

2. Evaluating Any Null Values

1. Training and Testing Dataset by applying Multi linear regression method.

2. Model Building :

1. Import Model Building Libraries

2. Initializing the model

3. Loading Pre-processing Data

4. Configure Learning Process

5. Train and Test Model

6. Optimize and save the Model

1. Application Building

1. Create HTML file

2. Build Python Code

4 EXPERIMENTAL INVESTIGATIONS

The label for the data set is PE which is a continuous variable.

Data Visualization is one of the powerful parts of Data Science to infer logic form data and find some patterns.

The factors affecting PE are also continuous. So, in order to analyse the dataset using graphs we use the plots like heatmap
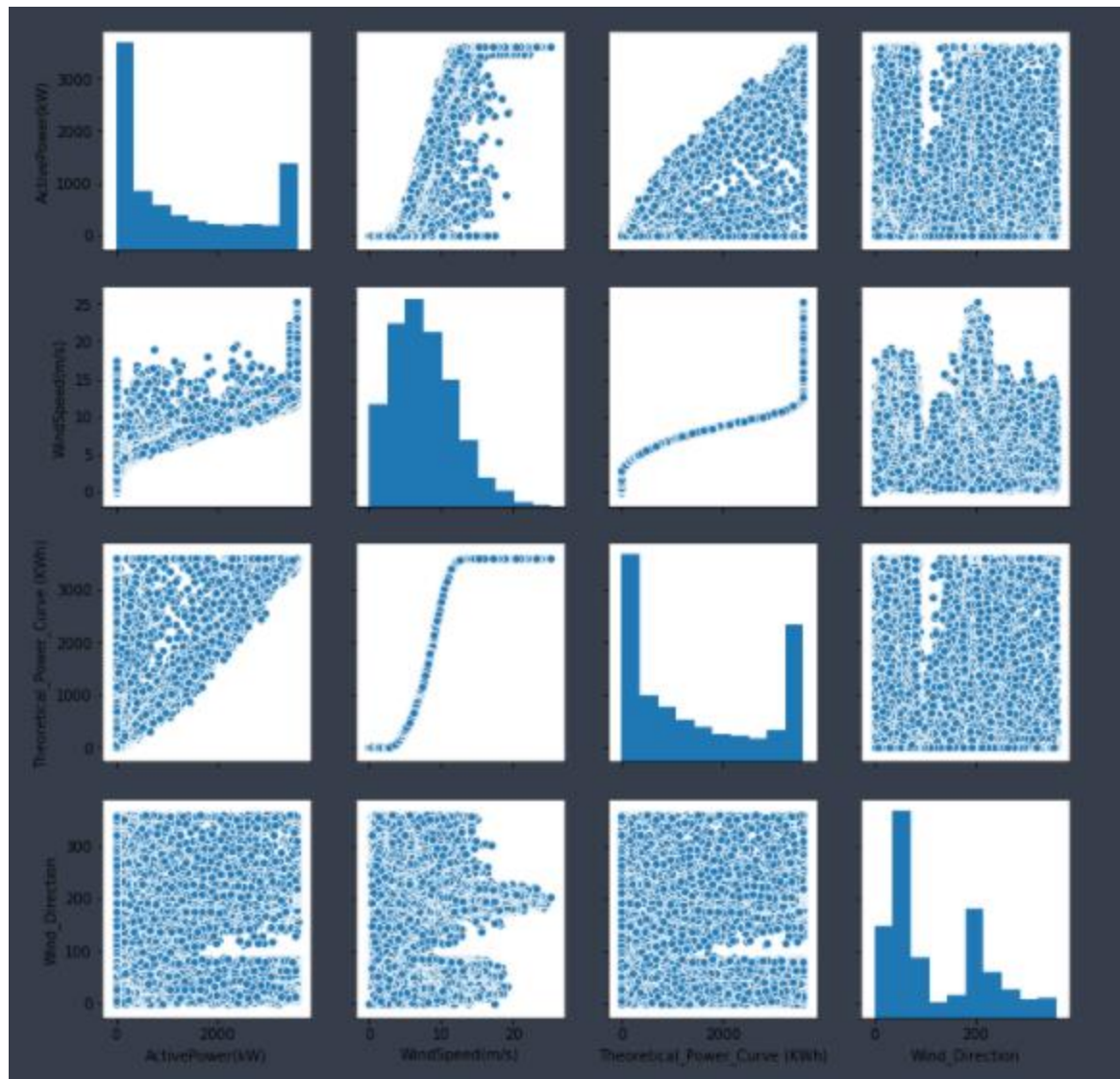
Heatmap is the plot of values of correlation between the variables in data set. The correlation values are plotted using heatmap.

5 FLOW

Data Collection.
- Collect the dataset or Create the dataset
- Data Pre-processing.
    - Import the Libraries.
    - Importing the dataset.
    - Checking for Null Values.

- Data Visualization.
- Taking care of Missing Data.
- Label encoding.
- One Hot Encoding.
- Feature Scaling.
- Splitting Data into Train and Test.
- Model Building
  - Training and testing the model
  - Evaluation of Model
- Application Building
  - Create an HTML file
  - Build a Python Code

6 RESULT

Therefore By analysing the given data, we can say that PE is increasing with AT and V. While PE is decreasing with the increment of AP.

So, in order to increase energy production of power plant (PE), we need to operate the combined cycle power plant at low AT, low V, high RH, and high AP. There can be some more Data Science Techniques which can be applied to find some more patterns form the given dataset.

7 ADVANTAGES
1. There are two advantages to analysis data using multiple regression model has ability to determine the relative influence of one or more predictor variables to criterion the value
2. It has the ability to identify the outliers or anomalies.

3. Each independent variable model has its own slope relative to independent variable for the given set of independent variables

DISADVANTAGES:
1. The disadvantages of using multiple regression usually the outcomes are come downs to the dataset the data being used.

8 APPLICATIONS
2. The model develops to predict the electrical power output in the easy way for the peoples.
3. The involvement of this peoples will clearly predicts the every month of the how much power can produce by the Predicting The Energy Output Of Wind Turbine Based On Weather Condition can easily see in this electrical power output.

9 CONCLUSION

This project presents a technical application of the recent progress of We will be considering the Random Forest ,Regression model based processing. It will predicting full load electrical power output, in order to maximize the profit from the available megawatt hour. Furthermore, the finding from the model building to the pros and cons of the model are also specified .In addition, applications, future focus, and solutions are provided. At present, the design and use of this Random Forest ,Regression model .our ultimate goal is to using Machine Learning through algorithm of Random Forest ,Regression model tools to predicting the energy output.

10 Future Scope

1. The interpretation of the learned Random Forest ,Regression model with mathematical formalization and clear explanation, is quite poor. One way to tackle this issue is from qualitative understanding based on visualization.

2. The scope of Machine Learning is not limited to the investment sector. Rather, it is expanding across all fields such as banking and finance, information technology, media & entertainment, gaming, and the automotive industry.

3. Machine learning is merely based on predictions made based on experience. It enables machines to make data-driven decisions, which is more efficient than explicitly programming to carry out certain tasks.

Model Building

1. Dataset
2. Jupiter Notebook

Application Building

1. HTML file
2. CSS file
3. Flask
4. anaconda

Screen snaps:

```
(base) C:\Users\Mallikharjuna Rao\Desktop\Flask>python windApp.py
 * Serving Flask app "windApp" (lazy loading)
 * Environment: production
   WARNING: This is a development server. Do not use it in a production deployment.
   Use a production WSGI server instead.
 * Debug mode: on
 * Restarting with windowsapi reloader
 * Debugger is active!
 * Debugger PIN: 266-236-884
 * Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
127.0.0.1 - - [30/Mar/2021 16:55:35] "[37mGET / HTTP/1.1[0m" 200 -
127.0.0.1 - - [30/Mar/2021 16:56:34] "[37mGET /predict HTTP/1.1[0m" 200 -
```

Wind Turbine Energy Prediction Based on Weather Conditions

Renewable energy, such as wind and solar energy, plays an increasing role in the supply of energy worldwide. This trend will continue because global energy demand is increasing, and the use of nuclear power and traditional sources of energy such as coal and oil is unsafe and leads to a large amount of CO_2 emission. Wind energy is a key player in the field of renewable energy. In Europe, the capacity of wind energy production has doubled from 2009 to 2010.

However, levels of production of wind energy are hard to predict as they rely on potentially unstable weather conditions present at the wind farm. In particular, wind speed is crucial for energy production based on wind, and it may vary drastically over time. Energy suppliers are interested in accurate predictions, as they can avoid overproduction by coordinating the collaborative production of traditional power plants and weather-dependent energy sources. The energy can be predicted based on the power curve and the windspeed.

WANT TO PREDICT THE ENERGY??

Wind Turbine Energy Prediction Based on Weather Conditions

Give your city name to know the weather conditions..

Agartala ⌄

CHECK THE WEATHER CONDITIONS

The weather conditions of the city are

Temperature
Humidity
Pressure
Wind Speed

Predict the Wind Energy!!

Theoretical Power in KWh

Wind Speed in m/s

PREDICT

Give your city name to know the weather conditions..

Hyderabad ⌄

CHECK THE WEATHER CONDITIONS

The weather conditions of the city are

Temperature	309.79 °C
Humidity	21 %
Pressure	1007 mmHG
Wind Speed	1.54 m/s

Predict the Wind Energy!!

Theoretical Power in KWh

Wind Speed in m/s

PREDICT

The energy predicted is 1081.52 KWh