**WIND TURBINE POWER PREDICTION**

**# \*\*1. Introduction\*\***

**### Company Introduction - Energy Limited**

**### Your client for this project is a Renewable energy institution.**

- 1) They are going to provide an amount of power generated from a wind turbine in KW/hr by using the real time data.

- 2) Factors such as temperature, wind direction, turbine status, weather, blade length, etc. influence the amount of power generated.

- 3) We have to select the most important features which help us to generate more power in an efficient way.

**### Current Scenario**

- 1) The company rolled out this service to several areas and they will monitor which features can increase the power generated by the turbines. Using this they can map those areas for future investments.

**# \*\*2. Problem Statement\*\***

- This section is emphasized on providing some generic introduction to the problem that most companies confront.

Moving from traditional energy plans powered by fossil fuels to unlimited renewable energy subscriptions allows for instant access to clean energy without heavy investment in infrastructure like Wind Turbines.

**### The current process suffers from the following problems:**

- 1) One issue is that \*\*spinning turbine\*\* blades can pose a threat to flying wildlife like birds and bats.

- 2) Wind energy can have adverse environmental impacts, including the potential to reduce, fragment, or degrade habitat for wildlife, fish, and plants.

- 3) The company wants to figure out how they can manage these challenges to produce wind energy in an efficient manner.

The energy department has hired you as data science consultants.

**### Your Role**

- You are given datasets of wind turbines and the power generated by them.

- Your task is to build a regression model using the datasets.

- Because there was no machine learning model for this problem in the company, you don’t have a quantifiable win condition. You need to build the best possible model.

**### Project Deliverable**

- Deliverable: \*\*Deliverable: Predict the power that is generated (in KW/h) based on the various features provided in the dataset.\*\*

- Machine Learning Task: \*\***Regression**\*\*

- Target Variable: \*\***windmill\_generated\_power(kW/h)**\*\*

- Win Condition: \*\*N/A (best possible model)\*\*

**### Evaluation Metric**

- The model evaluation will be based on the **\*\*r2\*\*** Score.

**# 4. Data Description**

- We are provided with a dataset containing all the necessary information about the customers like their \*\*wind\_speed(m/s),atmospheric\_temperature(°C),shaft\_temperature(°C),wind\_direction(°) etc.\*\*

- Also included in the dataset is the column \*\*windmill\_generated\_power(kW/h)\*\* which contains continuous value .This is the data that we have to predict for how much power is generated (in KW/h).

**#### The dataset is divided into two parts: Train and Test sets.**

**#### Training Set:**

- The train set contains \*\***19740 rows**\*\* and \*\***22 columns**\*\*

- The last column \*\***windmill\_generated\_power(kW/h)\*\*** is the \*\***target variable**\*\*.

**#### Testing Set:**

- The test set contains \*\***8460 rows**\*\* and \*\***21 columns**\*\*.

- The test set **\*\*doesn’t contain**\*\* the \*\***windmill\_generated\_power(kW/h)\*\*** column.

- It needs to be predicted for the test set.

**\*\*Train Set:\*\***

| Records |Features|Target Variable|

|:--|:--|:--|

|\*\*19740\*\*|\*\*22\*\*|\*\*windmill\_generated\_power(kW/h)\*\*|

**\*\*Test Set:\*\***

|Records|Features|Predicted Variable|

|:--|:--|:--|

|\*\*8460\*\*|\*\*21\*\*|\*\*windmill\_generated\_power(kW/h)\*\*|

|\*\*\*ID\*\*\*|\*\*\*\*Feature\*\*\*\*|\*\*\*\*Description\*\*\*\*|

|:--|:--|:--|

|01| tracking\_id | Represents a unique identification number of a windmill.|

|02| datetime | Represents the date and time of a record.|

|03| wind\_speed(m/s) | Represents the speed of wind (in meter per second).|

|04| atmospheric\_temperature(°C) | Represents the temperature (in degree Celsius) of a town or village that the windmill is present in.|

|05| shaft\_temperature(°C) | Represents the temperature of the shaft (in degree Celsius). |

|06| blades\_angle(°) | Represents the angle of the blades of a wind turbine (in degrees).|

|07| gearbox\_temperature(°C) | Represents the temperature of a gearbox (in degree Celsius).|

|08| engine\_temperature(°C) | Represents the temperature of an engine (in degree Celsius).|

|09| motor\_torque(N-m) | Represents the torque of a motor (in Newton meter).|

|10| generator\_temperature(°C) | Represents the temperature of a generator (in degree Celsius).|

|11| atmospheric\_pressure(Pascal) | Represents the atmospheric pressure (in Pascals) in that area.|

|12| area\_temperature(°C) | Represents the temperature (in degree Celsius) of the area within a 100 m radius of the windmill.|

|13| windmill\_body\_temperature(°C) | Represents the temperature of the body of a windmill (in degree Celsius).|

|14| wind\_direction(°) | Represents the direction of the wind (in degrees).|

|15| resistance(ohm) | Represents the resistance against the wind.|

|16| rotor\_torque(N-m) | Represents the torque of a rotor (in Newton meter).|

|17| turbine\_status | Represents the torque of a rotor (in Newton meter).|

|18| cloud\_level | Represents the following levels of the cloud in the sky on a particular day:

Extremely low

Low

Medium.|

|19| blade\_length(m) | Represents the length of the blades of a windmill (in meter)|

|20| blade\_breadth(m) | Represents the breadth of the blades of a windmill (in meter).|

|21| windmill\_height(m) | Represents the height of the blades of a windmill (in meter).|

|22| windmill\_generated\_power(kW/h)| Represents the power generated (in Kilowatt per hour)|