PROJECT BASED EXPERIENTIAL LEARNING

PROGRAM (NALAIYA THIRAN)

Predicting the energy output of wind turbine based on weather condition

A PROJECT REPORT

Submitted By

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in par al fulfilment for the requirement of award of the degree of

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1. INTRODUCTION

1.1. Project 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. In this guided project, 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:

You will be able to analyse or get insights into data through visualization. Applying different algorithms according to the dataset and based on visualization. You will be able to know how to build a web application using the Flask framework. Wind utility companies will be able to make more money if they can increase energy output. Wind energy is a trusted source since we can predict the total power output at any given time. The data collected from the weather stations can be accessed in real time easily. The weather features can be easily obtained through the sensors installed that helps in predicting energy output.

2. LITERATURE SURVEY

2.1. Existing Problem:

There are many renewable energy sources that can be used to obtain electrical energy from natural sources in the world. Especially, wind energy plays an increasing role thanks to its feasibility and efficiency. Due to the source of wind energy, efficiency of wind farm is highly depending on the weather conditions. The main issue to obtain maximum performance is to predict the output. This situation provides collaborative production of different energy sources more efficiently with avoiding over-cost and overproduction. In this paper, there are three different wind models are modelled and simulated with choosing the complete and correct models. A safe and environment-friendly alternative for the generation of electric energy, wind energy receives high levels of popular acceptance.

2.2. References:

- Energy Modeling Output of Wind System based on Wind Speed
    - Harrouz Abdelkader, Ilhami Colak, Korhan Kayisli
- The Use of Machine Learning and Performance Concept to Monitor and Predict Wind Power Output
    - Kelvin Palhares Bastos Sathler, Athanasios Kolios
- Predicting the Wind Turbine Power Generation based on Weather Conditions
    - P. R. Anisha, C. Kishor Kumar Reddy & Nuzhat Yasmeen
- Forecasting of Hour-Ahead Wind Farm Power Outputs
    - Mingzhe Zou, Ninoslav Holjevac, Josip Đaković, Igor Kuzle

2.3. Problem Statement Definition:

As wind is stochastic, wind power generation is different from traditional thermal generation. Given the unpredictability associated to the output of the wind farms, wind power forecasting is crucial in addressing the difficulties of balancing supply and demand in any electrical system. Using a technique that combines physical models with statistical models, a prediction system is created. The auto regressive model in this system predicts the wind farm's inlet state. The energy outputs from the previous year are considered in this model, which also correlates them with the weather and other important factors. To obtain the energy output, we can input the weather conditions into this model. The algorithm is also adjusted dynamically based on the expected value and actual output value.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas:

3.2 Ideation & Brainstorming:

The three best ideas, based on feasibility and importance:

Using K-Nearest Neighbours Algorithm: It is an algorithm which is used widely for classification and regression problems. Due to its simplicity and effectiveness, it is easy to implement and understand. Distance is calculated between the unseen data sample and the all-other data samples already present in the dataset. Depending on the value of K, that many nearest neighbours are selected and their class is identified. Multiple values of K should be tried and tested, and the value of K at which best performance is observed must be selected for the model.

This will help find the best university op on.

Using Logis c Regression: Logis c regression algorithm is used to identify the probability of occurrence of an event based on single predictor variable. Mul variate Logis c regression can be used to determine the probability of the occurrence of an event based on multiple predictor variables. Logis c Regression is also a supervised machine learning algorithm which used data with predetermined classes to create a model and perform predictive analysis on unseen data.

Using Decision Tree: It is a supervised machine learning algorithm. Due to its simple logic, effectiveness, and interoperability it the most widely used classification algorithm. The model works by creating a tree-like structure by dividing the data-set into several smaller subsets based on different conditional logic. The main components of the decision tree are the decision nodes, leaf nodes and the branches. Different university choices can be different nodes and one can be picked.

3.3 Proposed Solution:

Solution description: We examine the impact of different weather conditions on the energy output of wind farms. By accurately forecasting the wind-power, we reduce the need for additional balancing energy and reserve power to integrate wind power. A prediction system is developed with a method of combining statistical models and physical models. In this model, the inlet condition of the wind farm is forecasted by the auto regressive model.

Novelty: Currently, wind energy is not a primary source of electricity. Implementing our solution makes it possible to maximise energy output. This solution would make renewable energy sources more widely used. The user can upload their own data in real-time for forecasting.

Social Impact: Local employment, better health, consumer choice, improvement of life standard, social bonds creation, income development, demographic impacts, and community development can be achieved by the proper usage of renewable energy system. Renewable energy improves human well-being and overall welfare well beyond GDP. Switching to clean sources of energy, thus helps address not only climate change but also air pollution and health.

Business Model: Wind farm owners need a prediction model to predict the wind energy so they can provide a steady energy source. A subscription model would be efficient here, as the model will improve with time as it is used for forecasting using more and more data.

Scalability of the Solution: This solution can be applied on a larger scale, to windfarms across the world. The model obtained for energy prediction gives a very reliable prediction of the energy output for supplied weather data.

3.4 Problem Solution fit:

4. REQUIREMENT ANALYSIS

4.1 Functional requirement:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail Registration through form
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User login into website	Login using credentials Forgot password/change password for updating user credentials
FR-4	Displaying further information about the site	To know more about the site, user can click on the about button

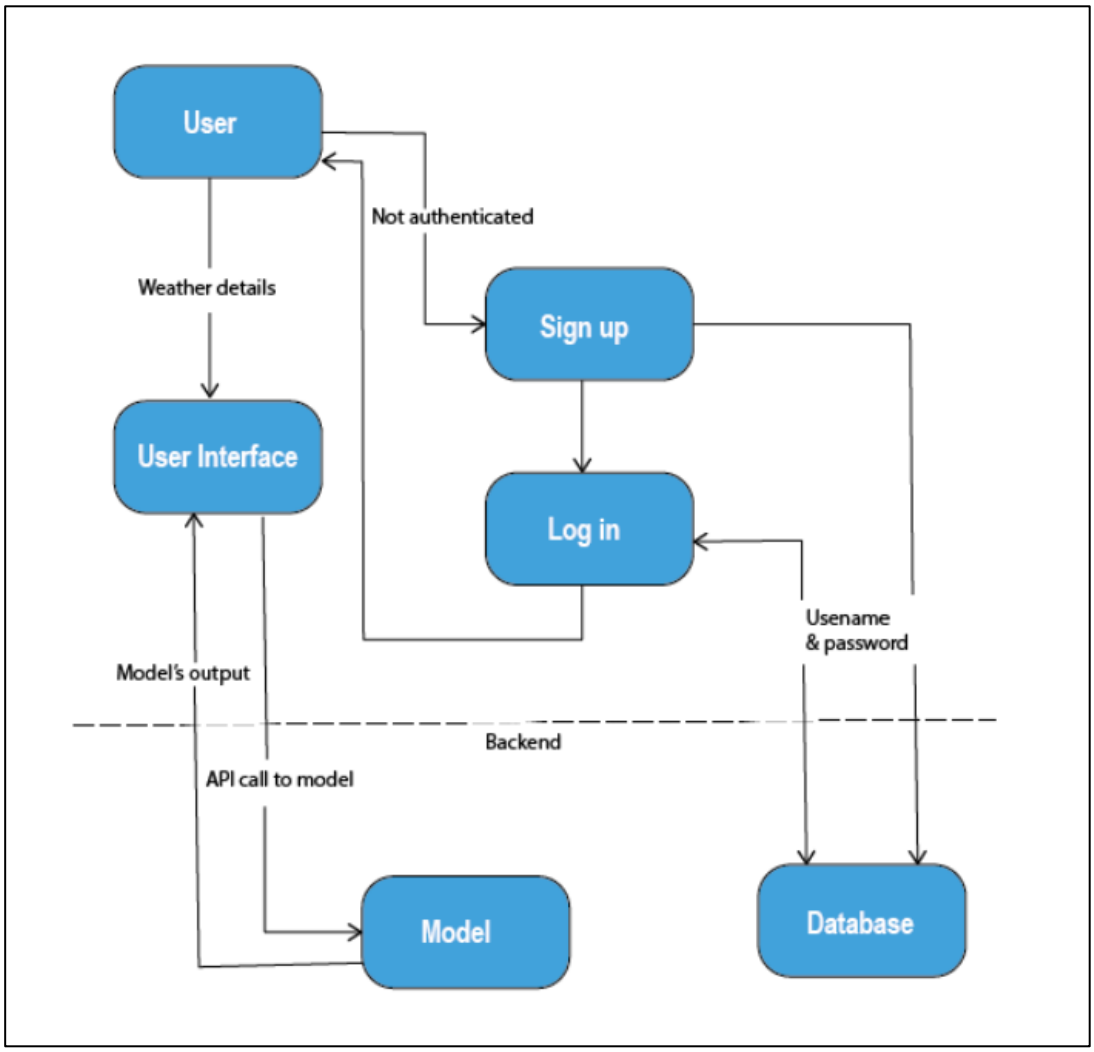
FR-5	Enter required parameters	Inputs like city name, area and more
FR-6	Validating all required fields	System checks whether all the required fields are filled and those values are correct
FR-7	Displays weather conditions of entered city	Climatic conditions of the entered city will be displayed to the user
FR-8	Displays prediction results	User can view the results predicted
FR-9	Download prediction results	Download as jpg/png, download as pdf
FR-10	Logout from the site	User can log out from the site using the option provided

4.2 Non-Functional requirements:

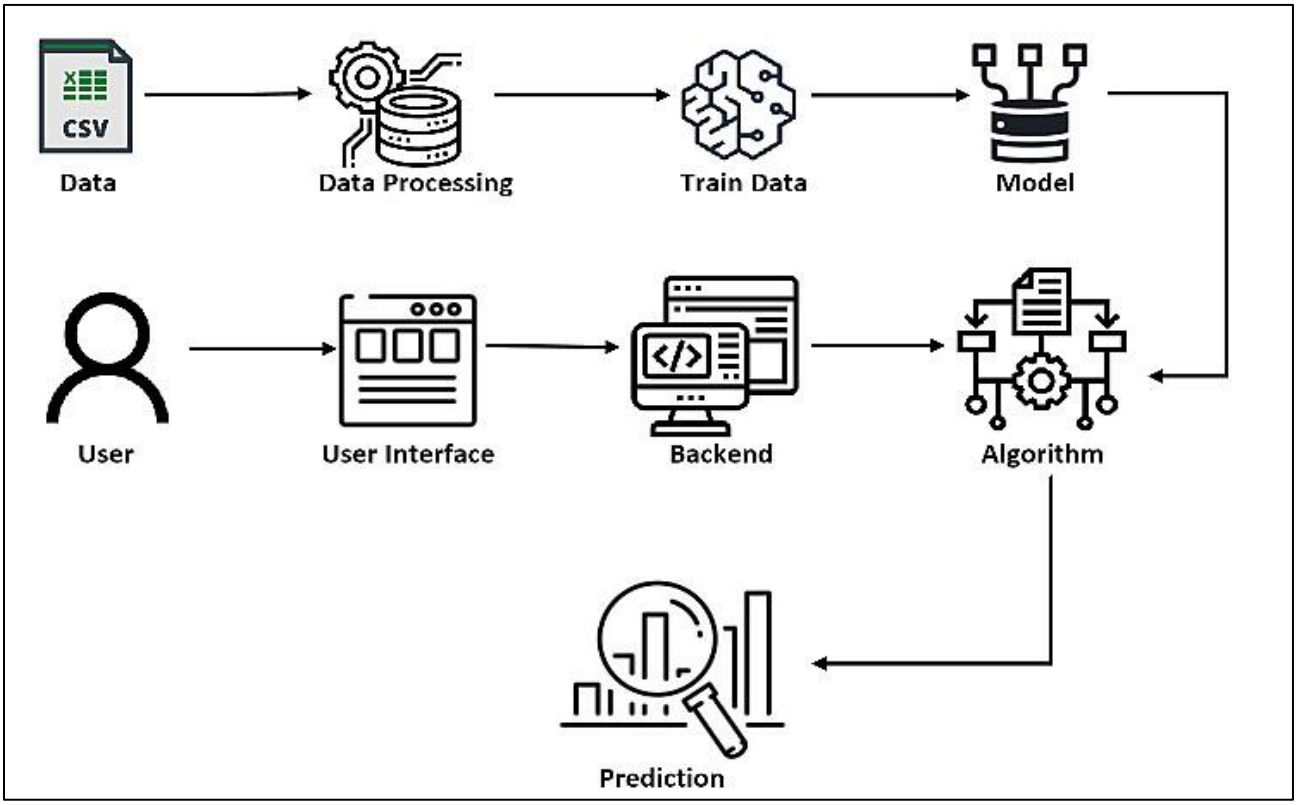
FR No.	**Non-Functional Requirement**	**Description**
NFR-1	**Usability**	The responsive website satisfies the user needs and is easy to use.
NFR-2	**Security**	Login credentials will be protected from attacks and of single use only. If it does not match the existing one, it shows error message. Number of attempts to login to the site is limited
NFR-3	**Reliability**	User interface to guide the users throughout the website.
NFR-4	**Performance**	Site evaluates the user queries quickly
NFR-5	**Scalability**	With sufficient internet access, the system can be used as a web application to handle users from multiple users.

5. PROJECT DESIGN

5.1 Data Flow Diagrams:



5.2 Solution & Technical Architecture:



6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation:

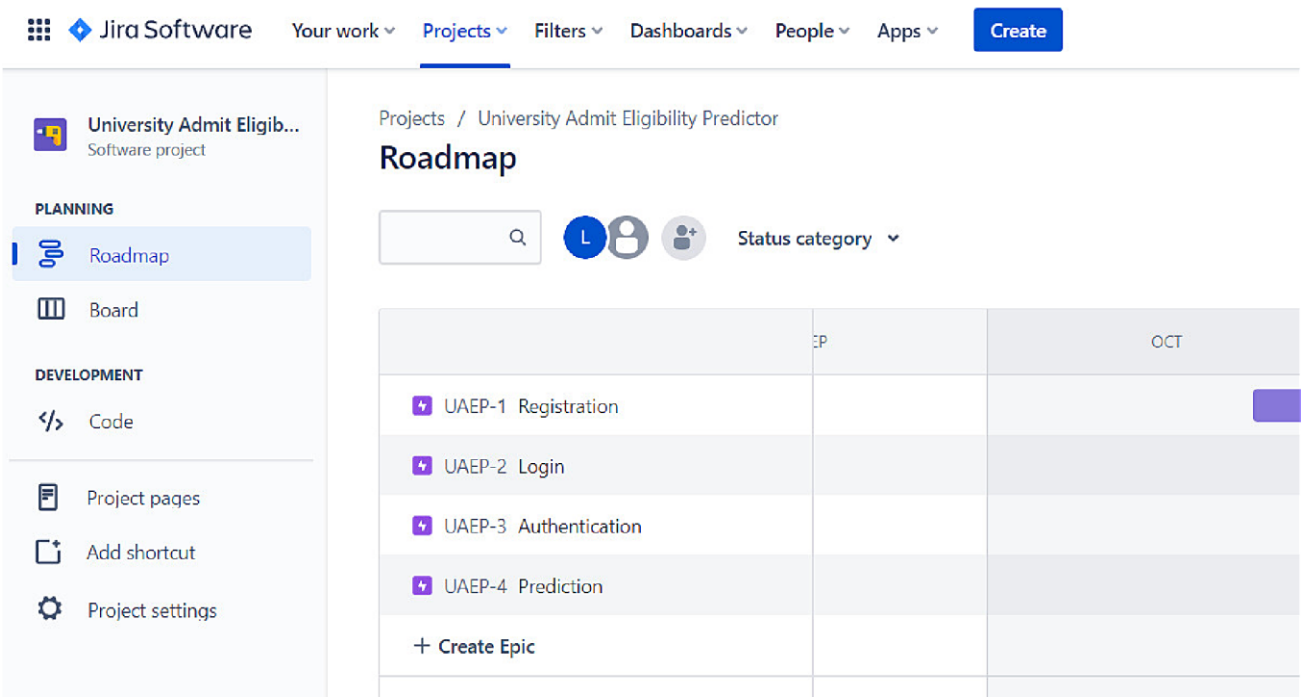
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Madan Kumar P Lokesh V
Sprint-1	Confirmation	USN-2	As a user, I will receive confirmation	1	High	

			email once I have registered for the application			Richie Rosario S
Sprint-1	Information about wind energy	USN-3	Find wind dataset or Create a New Dataset	2	Low	Richie Rosario S Madan Kumar P
Sprint-1	Alternative registration method	USN-4	As a user, I can register for the application through mobile number	2	Medium	Manoj L
Sprint-2	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	Lokesh V
Sprint-3	Dashboard	USN-6	In the dashboard you can search the location with longitude , latitude or by name	1	Low	Lokesh V Manoj L
Sprint-4	Check Weather	USN-7		1	Medium	Manoj L Richie Rosario S

6.2 Sprint Delivery Schedule:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 Reports from JIRA:



7. CODING & SOLUTIONING

7.1: Code:

app.py

```
import flask
from flask import request, render_template
from flask_cors import CORS
import joblib
import pandas as pd
from xgboost import XGBRegressor
```

```
app = flask.Flask(__name__, static_url_path='')
CORS(app)

@app.route('/', methods=['GET'])
def sendHomePage():
    return render_template('index.html')

@app.route('/predict', methods=['POST'])
def predictSpecies():
    ws = float(request.form['ws'])
    wd = float(request.form['wd'])

    X = [[ws,wd]]
    xgr=XGBRegressor()
    df = pd.DataFrame(X, columns=['WindSpeed(m/s)','WindDirection'])
    xgr.load_model('static/model/test_model.bin')
    result = xgr.predict(df)[0]
    print(result)
    return render_template('predict.html',predict=result)

if __name__ == '__main__':
    app.run()
```

index.html

```
<html>

<head>
    <title>Wind Energy Prediction</title>
    <style>


        .second {

            position: fixed;
            padding: 0px;
            width: 100%;
            height: 100%;
            background-image: url("image1.png");
            background-repeat: no-repeat;
            background-size: cover;
        }

        .inside {
            top: 10%;
```

```
    bottom: 0px;
    margin: 0px;
    left: 0%;
    right: 0%;
    position: center;
    padding-left: 5%;
    padding-top: 5%;
    padding-right: 5%;

    opacity: 100%;
    font-family: 'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;
    color: white;
    font-size: 20px;
    text-align: justify;

}

.myButton {
    background-color: #4CAF50; /* Green */
    border: none;
    color: rgb(252, 248, 248);
    padding: 15px 32px;
    text-align: center;
    text-decoration: none;
    display: inline-block;
    font-size: 16px;
    position: absolute;
    top: 45%;
    margin-left: 40%;
    cursor: pointer;
    font-family: 'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;

}

.heading{
    text-align: center;
    font-size: 50px;
    font-family: 'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;

}

 form {
border: 5px solid #f1f1f1;
color: rgb(56, 53, 53);
width: 70%;
```

```
    height: 40%;
    opacity: 60%;
    background-color: black;
    border-color: black;
    margin: auto;
    top: 20%;
    bottom: 50px;

     }

  </style>
</head>

<body>


  <div class="second">
    <h1 class="heading">Predicting The Energy Output Of Wind Turbine Based On Weather Condition</h1>
    <form>
    <div class="inside">Wind energy currently supplies over 3 % of global electricity consumption and this is expected to exceed 5 % by 2020. In
    the longer term (by 2040), the International Energy Agency forecasts that wind energy could meet 9 % of global electricity demand and more than 20 % of demand in Europe. <br><br>
       The global market installed 51.3 GW of wind turbines in 2018 and is expected to install 64.9 GW in 2023. The Asia Pacific is expected to lead the wind turbine market reaching annual installation capacity of 33.14 GW by 2023, largely driven by onshore deployment; followed by Europe, the Middle East and Africa (EMEA) and Americas installing 19.9 GW and
       11.7 GW, respectively, according to GlobalData.
       <br><br><br>

    </div></form>

</div>
  </div>

  <a href=predict.html><button type="button" class="myButton">Click Here To Predict The wind Energy!</button></a>
</body>

</html>
```

predict.html

```
<html>

<head>
```

```
  <meta charset="UTF-8" />
  <meta name="viewport" content="width=device-width, initial-scale=1.0" />
  <meta http-equiv="X-UA-Compatible" content="ie=edge" />
  <link rel="stylesheet" href="https://use.fontawesome.com/releases/v5.7.2/css/all.css"
    integrity="sha384-fnmOCqbTlWIlj8LyTjo7mOUStjsKC4pOpQbqyi7RrhN7udi9RwhKkMHpvLbHG9Sr"
crossorigin="anonymous" />
  <link href="https://fonts.googleapis.com/css?family=Dosis" rel="stylesheet" />
  <link rel="stylesheet" href="static/css/main.css" />
  <link rel="stylesheet" href="static/css/media.css" />
  <link rel="stylesheet" href="static/css/items_grid.css" />



  <title>Wind Energy Prediction</title>
  <style>
    #page {
      max-width: 80%;
      margin: auto;
    }



  #child {
    background-image: url("image1sub.png");
    width: 100%;
    height: 80%;
    position: relative;
    top: 200px;


  }

    table {
      width: 100%;
      border-collapse: collapse;
    }

    .card {
      margin-right: auto;
      margin-left: 15%;
      width: 300px;
      box-shadow: 0 15px 25px rgba(129, 124, 124, 0.2);

      border-radius: 5px;
      backdrop-filter: blur(14px);
```

```
    background-color: rgb(180, 180, 180);
    padding: 15px;
    text-align: center;
}



.second {
    top: 80px;
    bottom: 0px;
    margin: 0px;
    left: 0px;
    right: 0px;
    position: absolute;
    padding: 0px;
    width: 100%;

    font-family: Georgia, serif;
    color: black;
    font-size: 20px;
}

.inside {
    top: 80px;
    bottom: 0px;
    margin: 0px;
    left: 51%;
    right: 0%;
    position: absolute;
    padding-left: 18%;
    padding-top: 6.1%;
    padding-right: 40px;

    font-family:'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;
    color: #ffffff;
    font-size: 25px;
    text-align: justify;

}

.myButton {
    border: none;
    text-align: center;
    cursor: pointer;
    text-transform: uppercase;
```

```
    outline: none;
    overflow: hidden;
    color: #fff;
    font-weight: 700;
    font-size: 12px;
    background-color: #09ad21;
    padding: 10px 15px;
    margin: 0 auto;
    box-shadow: 0 5px 15px rgba(0, 0, 0, 0.20);
    margin-left: 20%;
}

input {
    width: 50%;
    margin-bottom: 30px;
    margin-left: 3%;
    margin-top: -3%;
    background: #e1eedd;
    border: none;
    outline: none;
    padding: 10px;
    font-size: 13px;
    color: #0c0c0c;
    text-shadow: white;
    border: #6c493a;
    border-radius: 4px;
    box-shadow: white;
}

::placeholder {
    color: black;
    opacity: 1;
}

.left {
    top: 80px;
    bottom: 0px;
    margin: 0px;
    left: 0%;
    right: 45.5%;
    position: absolute;
    padding-left: 10%;
    padding-top: 7px;
    padding-right: 40px;
```

```
    font-family: 'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;
    color: rgb(253, 253, 253);
    ;
    font-size: 25px;

}

select {
    width: 50%;
    margin-bottom: 10px;
    background: white;
    border: none;
    outline: none;
    padding: 10px;
    font-size: 13px;
    color: #183a1d;
    text-shadow: white;
    border: #6c493a;
    border-radius: 40px;
    box-shadow: white;
}

input:focus {
    box-shadow: inset 0 -5px 45px rgba(100, 100, 100, 0.4), 0 1px 1px rgba(255, 255, 255, 0.2);
}



table,
th,
td {
    border: 1px solid rgb(86, 72, 128);
    border-collapse: collapse;
    color: #3f00ff;
}

@media screen and (max-width: 500px) {

    .left,
    .second,
    .third {
        width: 70%;
    }
}
```

```css
.leftsection{
    border: 5px solid #f1f1f1;
    color: rgb(56, 53, 53);
    width: 40%;
    height: 50%;
    opacity: 60%;
    background-color: black;
    margin: auto;
    top: 20%;
    bottom: 50px;
    margin-left: 100px;
    margin-top: 3%;
}

.rightside{
    border: 5px solid #f1f1f1;
    color: rgb(56, 53, 53);
    width: 40%;
    height: 46%;
    opacity: 60%;
    background-color: black;
    margin: auto;
    top: 20%;
    margin-left: 1060px;
    margin-top: -35%;
}


.center{
    border: 5px solid #f1f1f1;
    position: relative;
    border: 5px;
    width: 20%;
    height: 20%;
    opacity: 100%;
    margin: auto;
    margin-top: -13%;
    margin-left: 40%;

}

.heading{
    text-align: center;
    font-size: 50px;
    font-family: 'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;
```

```
    }
  </style>
</head>

<body>
<h1 class="heading">Predicting The Energy Output Of Wind Turbine Based On Weather Condition</h1>
  <div id="container">
    <div id="child"></div>
  </div>

  <div class="second">
    <form class="leftsection">
    <div class="left">

      <p style="padding: 8px; width: 575px;"> Give your city name to know the
        weather conditions</p>

      <div style="margin-left:14%">
        <form action="{{ url_for('windapi')}}" method="post">
          <select name="city" required>
            <option value="" selected>select City</option>
            <option value="Ariyalur"> Ariyalur </option>
            <option value="Andimadam"> Andimadam </option>
            <option value="Coimbatore"> Coimbatore </option>
            <option value="Chengalpattu"> Chengalpattu </option>
            <option value="Cuddalore"> Cuddalore </option>
            <option value="Chennai"> Chennai </option>
            <option value="Dindigul"> Dindigul </option>
            <option value="Dharmapuri"> Dharmapuri </option>
            <option value="Erode"> Erode </option>
            <option value="Karur"> Karur </option>
            <option value="Kancheepuram"> Kancheepuram </option>
            <option value="Krishnagiri"> Krishnagiri </option>
            <option value="Kallakurichi"> Kallakurichi </option>
            <option value="Madurai"> Madurai </option>
            <option value="Mayiladuthurai"> Mayiladuthurai </option>
            <option value="Nagapattinam"> Nagapattinam </option>
            <option value="Kanyakumari"> Kanyakumari </option>
            <option value="Namakkal"> Namakkal </option>
            <option value="Perambalur"> Perambalur </option>
            <option value="Pudukottai"> Pudukottai </option>
            <option value="Ramanathapuram"> Ramanathapuram </option>
            <option value="Ranipet"> Ranipet </option>
            <option value="Salem"> Salem </option>
```

```
            <option value="Sivagangai"> Sivagangai </option>
            <option value="Tenkasi"> Tenkasi </option>
            <option value="Thanjavur"> Thanjavur </option>
            <option value="Theni"> Theni </option>
            <option value="Thiruvallur"> Thiruvallur </option>
            <option value="Thiruvarur"> Thiruvarur </option>
            <option value="Tuticorin"> Tuticorin </option>
            <option value="Trichirapalli"> Trichirapalli </option>
            <option value="Thirunelveli"> Thirunelveli </option>
            <option value="Tirupathur"> Tirupathur </option>
            <option value="Tiruppur"> Tiruppur </option>
            <option value="Tiruvannamalai"> Tiruvannamalai </option>
            <option value="The Nilgiris"> The Nilgiris </option>
            <option value="Vellore"> Vellore </option>
            <option value="Viluppuram"> Viluppuram </option>
            <option value="Virudhunagar"> Virudhunagar </option>


          </select><br><br>
        </form>
        <div style="margin-left:-16%"><button type="submit" class="myButton">Check the Weather
            Conditions</button></div>
      </div>
      <br>
    </div>
    </form>
</div>
<form class="center">
    <div class="card">
      <table style="margin-left:2%; text-align:center; border-spacing:20px;">
        <tr>
          <td colspan="2" style="font-size:25px;">The weather conditions of the city are</td>
        </tr>
        <tr>
          <td>Temperature</td>
          <td>{{temp}}</td>
        </tr>
        <tr>
          <td>Humidity</td>
          <td>{{humid}}</td>
        </tr>
        <tr>
          <td>Pressure</td>
          <td>{{pressure}}</td>
        </tr>
```

```
          <tr>
            <td>Wind Speed</td>
            <td>{{speed}}</td>
          </tr>
        </table>
      </div>
    </form>

      <form class="rightside">
        <div class="inside">
          <div >Predict the Wind Energy!!</div>
          <br><br>
            <form action="{{ url_for('y_predict')}}" method="post">
            <input type="text" name="theo" placeholder="Theoretical Power in KWh" required="required" />
            <input type="text" name="wind" placeholder="Wind Speed in m/s" required="required" /><br><br>
            <button type="submit" class="myButton">Predict</button>
            </form>
          </div>
          <br>
          <br>
      </form>
</body>

</html>
```

8. Testing

8.1. Test Case:

Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)	BUG ID	Executed By
Functional	Home page	Verify if user is able to enter the GRE score	GRE marks	ter the GRE score by clicking in the GRE Score	GRE score	User should be able to enter the GRE score	Working as expected	Pass	Normal test case	Y	BUG ID -1	Priyadarshan S
UI	Home page	Verify if user enters above the limit	nil	1.Verify user enters the score below 340	GRE score	If the user enters above the limit,the application should display "Value must be below 340"	Working as expected	Pass	Normal test case	Y	BUG ID -2	Lenus M leonard
Functional	Home page	erify if user is able to enter the TOFEL scor	TOFEL marks	1.Enter the TOFEL score by clicking in the TOFEL Score field	TOFEL score	User should be able to enter the TOFEL score	Working as expected	Pass	Normal test case	Y	BUG ID -3	Mohamed sheik abdul kader
UI	Home page	Verify if user enters above the limit	nil	1.Verify user enters the score below 120	TOFEL score	If the user enters above the limit,the application should display "Value must be below 150"	Working as expected	Pass	Normal test case	Y	BUG ID -4	Kishore D
Functional	Home page	Verify if user is able to enter the university rating	nil	1.Enter the University Rating by clicking in the University Rating field	Rating	User should be able to enter the university rating	Working as expected	Pass	Normal test case	Y	BUG ID -5	Mohamed sheik abdul kader
UI	Home page	Verify if user enters above the limit	nil	1.Verify user enters the score below 5	Rating	If the user enters above the limit,the application should display "Value must be below 5"	Working as expected	Pass	Normal test case	Y	BUG ID -6	Priyadarshan S
Functional	Home page	Verify if user is able to enter SOP	nil	1.Enter the SOP by clicking in the SOP field	SOP	User should be able to enter the SOP	Working as expected	Pass	Normal test case	Y	BUG ID -7	Lenus M leonard
UI	Home page	Verify if user enters above the limit	nil	1.Verify user enters the score below 5	SOP	If the user enters above the limit,the application should display "Value must be below 5"	Working as expected	Pass	Normal test case	Y	BUG ID -8	Kishore D
Functional	Home page	Verify if user is able to enter LOR	nil	1.Enter the LOR by clicking in the LOR field	LOR	Users should be able to enter the LOR	Working as expected	Pass	Normal test case	Y	BUG ID -9	Lenus M leonard
UI	Home page	Verify if user enters above the limit	nil	1.Verify user enters the score below 5	LOR	If the user enters above the limit,the application should display "Value must be below 5"	Working as expected	Pass	Normal test case	Y	BUG ID -10	Kishore D
Functional	Home page	Verify if user is able to enter CGPA	CGPA	1.Enter the CGPA by clicking in the CGPA field	CGPA	User should be able to enter CGPA	Working as expected	Pass	Normal test case	Y	BUG ID -11	Priyadarshan S
UI	Home page	Verify if user enters above the limit	CGPA	1.Verify user enters the CGPA less than 10	CGPA	If the user enters above the limit,the application should display "Value must be less than 10"	Working as expected	Pass	Normal test case	Y	BUG ID -12	Mohamed sheik abdul kader
Functional	Home page	Verify if user is able to enter research	nil	1.Enter the Research experience by clicking in the research experience field and enter 0 for no experience and 1 for experience	nil	User should able to enter research experience data	Working as expected	Pass	Normal test case	Y	BUG ID -13	Kishore D
UI	Result page	Verify if user is able to see the result of prediction	nil	1.Click on the predict test box	nil	User should able to see the result of prediction	Working as expected	pass	Normal test case	Y	BUG ID -14	Mohamed sheik abdul kader
UI	Result page	Verify user is able to have a chance	nil	1.Click on the predict test box	nil	Application should display "Admission chances are"with percentage	Working as expected	Pass	Normal test case	Y	BUG ID -15	Priyadarshan S

8.2 User Acceptance Testing:

i) **Purpose of Document:**

The purpose of this document is to briefly explain the test coverage and open issues of the University Admit Eligibility Predictor project at the time of the release to User Acceptance Testing (UAT).

ii) **Defect Analysis:**

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved.

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

iii) **Test Case Analysis:**

This report shows the number of test cases that have passed, failed, and untested.

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. Results

9.1. Performance Metrices:

```
In [47]: mae = metrics.mean_absolute_error(y_test, predlinear)
         mse = metrics.mean_squared_error(y_test, predlinear)
         rmse = np.sqrt(mse) # or mse**(0.5)
         r2 = metrics.r2_score(y_test, predlinear)

In [48]: chart = {
                 'Metric':["MAE", "MSE", "RMSE", "R2-SCORE"],
                 'LINEAR_REGRESSION':[mae,mse,rmse,r2],
                 }
         chart = pd.DataFrame(chart)

In [49]: display(chart)
```

	Metric	LINEAR_REGRESSION
0	MAE	0.043051
1	MSE	0.003313
2	RMSE	0.057560
3	R2-SCORE	0.807216

```
In [43]: model = LinearRegression(normalize=True)
         model.fit(X_test, y_test)
         # model.score(X_test, y_test)
         predlinear = model.predict(X_test)
         print ("Accuracy : ",model.score(X_test, y_test)*100)
         methodDict = {}
         methodDict['Linear Regression'] = model.score(X_test, y_test)*100

         Accuracy :  80.7216438856893
```

9.2. Tune The Model:

Hyperparameter Tuning:

- The number of features is important and should be tuned in random forest classification.
- Ini ally all parameters in the dataset are taken as independent values to arrive at the dependent decision of chronic kidney disease or No Chronic Kidney Disease.
- But the result was not accurate so used only 8 more correlated values as independent values to arrive at the dependent decision of Chronic Kidney Disease or not.

9.3. Validation Model:

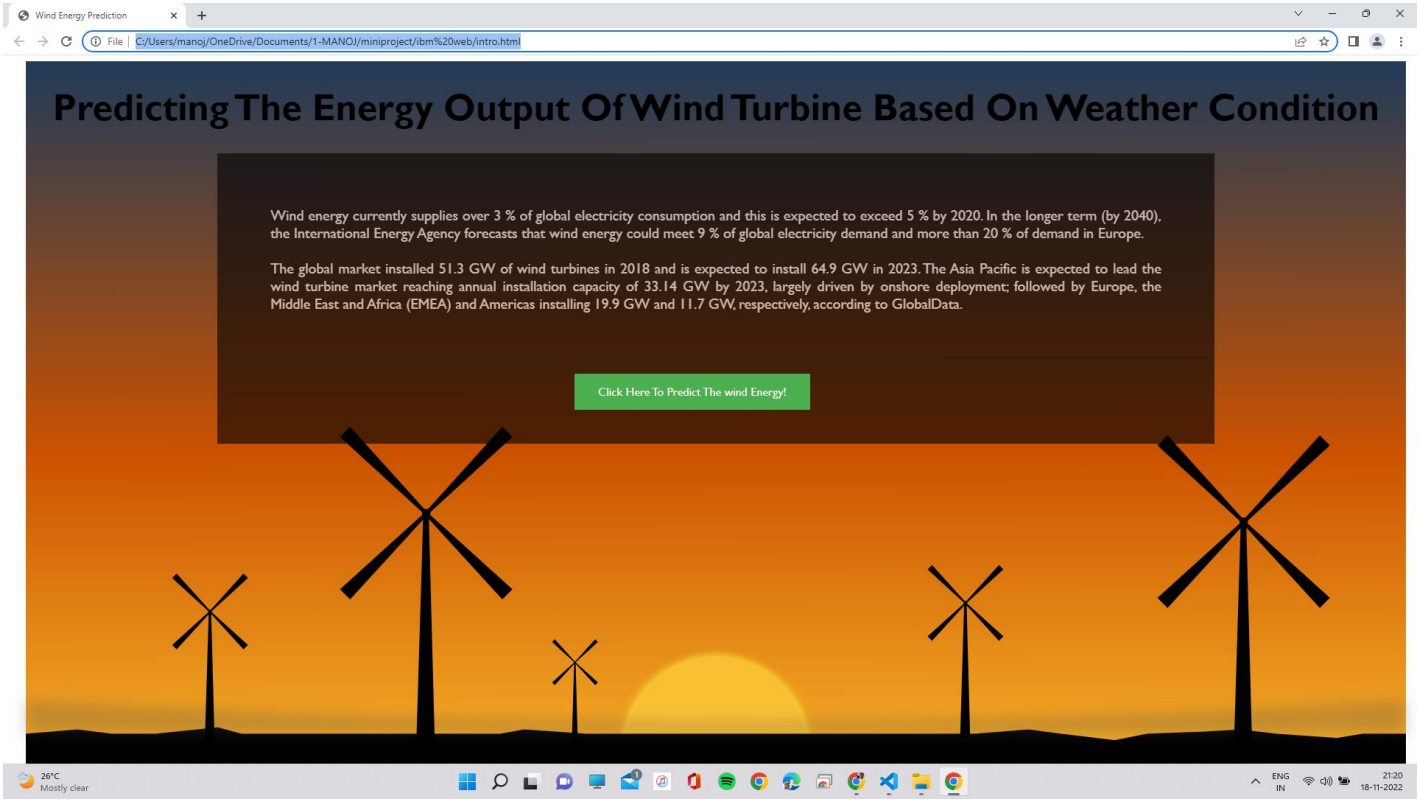
It involves partitioning the training data set into subsets, where one subset is held out to test the performance of the model. This data set is called the validation data set.

Cross validation is to use different models and identify the best:

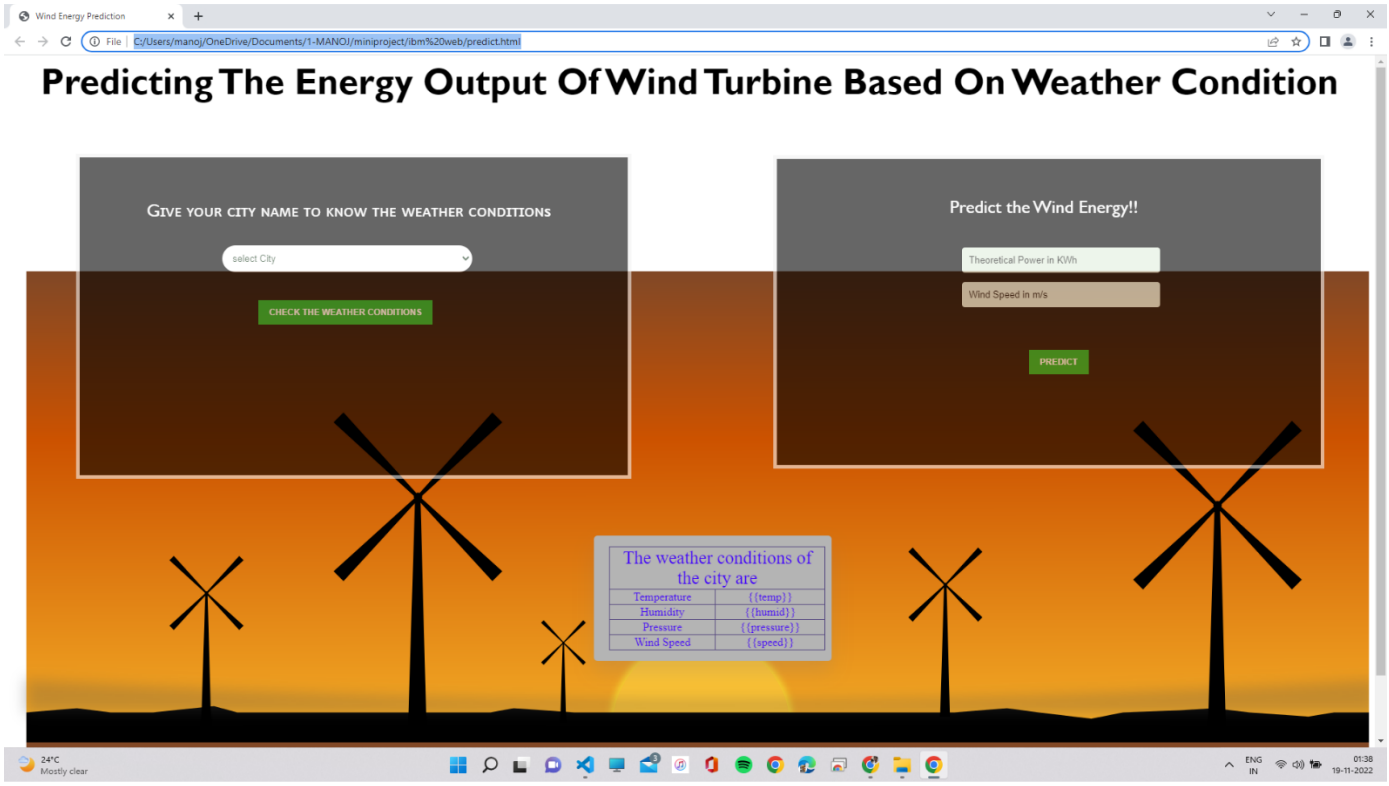
```
In [64]: scores = cross_val_score(model, X_train, y_train, scoring='r2', cv=5)
         scores

Out[64]: array([0.81813967, 0.77169539, 0.83989563, 0.74719974, 0.78589678])

In [65]: avg_score=scores.mean()

In [67]: print ("Cross Validation Scores : ",scores)
         print ("Average CV Score : ",avg_score)
         print ("Number of CV Scores used in Average : ",len(scores))

         Cross Validation Scores :  [0.81813967 0.77169539 0.83989563 0.74719974 0.78589678]
         Average CV Score :  0.7925654408790849
         Number of CV Scores used in Average :  5
```

9.4. Screenshots:

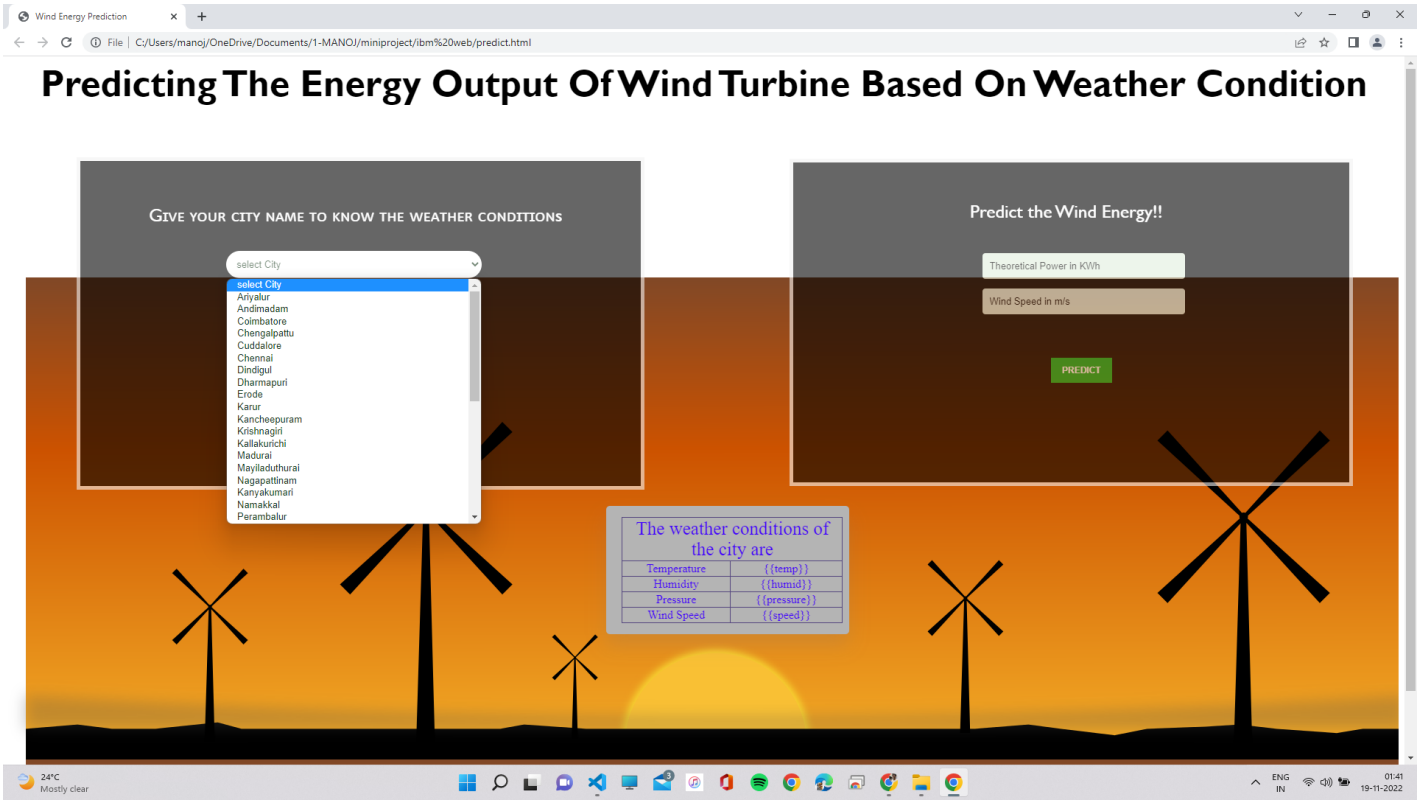
Information Page:



Prediction Page:



Select Area:



10. Conclusion

Most wind power forecasting models study ‘regular’ wind conditions. The EU funded project called ‘Safe wind’ aims to improve wind power prediction over challenging and extreme weather periods and at different temporal and spatial scales. Development activities are on-going to reduce error in the wind power prediction, to improve regionalized wind power forecasting for on - shore windfarms and to derive methods for wind power prediction for offshore wind farms. It is possible that use of ensemble and combined weather prediction methods together may enhance forecasting. If the error in wind power forecasting and prediction is reduced then electricity markets can trade with more certainty. Contract errors as a function of time in electricity markets can be as high as 39% for a forecasting lead time of 4 present a new tool called the WILMAR and ANEMOS scheduling Methodology (WALT) to reduce the number of thermal generators on stand-by or in reserve using the probability of generation outages and load shedding are system reliability criteria instead of generation adequacy based solely on generation outage. The wind and load forecast errors are modelled using a Gaussian stochastic variable approach. However, in another study it was found that the prediction errors do not satisfy the Kolmogorov Smirnov test for normal distribution. In Carta, it was shown that, the use of auto correlated (and thus not independent) successive hourly mean wind speeds, though invalidating all of the usual statistical tests, has no appreciable effect on the shape of the pdf estimated from the data. every year. And this number won’t go down in upcoming years either. In our technological and compete world, the students constantly feel the need to upskill themselves and fare be er than their peers and competitors every day and thus a er they are under graduation, a vast number of

students tend to leave for higher education abroad. To facilitate an easy migration, and to provide them with a tool which can help them shortlist their potential college/university based on various parameters will not just empower them in finding their preferred ins tuitions but also ensure that it saves their precious me as well as their hard-earned money at the same me. Many researchers have tried to come up with ideas using machine learning, data mining, and generic algorithm from me to me, each with their own benefits and drawbacks. If we go through the research done ll date, the success rate of hybrid systems with the implementations of more than one algorithm concurrently is higher with low error rates, as the work done by each algorithm in any hybrid system relies on each of them only for the specific task and hence later collaboration ensures higher accuracy. In this regard, the stacked ensemble approach, which itself is based on an ensemble approach which tries to bring different algorithms together to gain be er accuracy, fares be er than all the other approaches discussed and reviewed in this project.

11. FUTURE SCOPE

The success rate of hybrid systems with the implementations of more than one algorithm concurrently is higher with low error rates, as the work done by each algorithm in any hybrid system relies on each of them only for the specific task and hence later collaboration ensures higher accuracy. In this regard, the stacked ensemble approach, which itself is based on an ensemble approach which tries to bring different algorithms together to gain be er accuracy, fares be er than all the other approaches discussed and reviewed in this project.

12. APPENDIX

GitHub Link: https://github.com/IBM-EPBL/IBM-Project-28344-1660110839