Project design phase

1.Problem solution:

Algorithm: Random Forest Regressor

About Random Forest Algorithm

Random Forest is an ensemble learning algorithm that constructs multiple decision trees during training and outputs the average of their predictions in regression problems.

It improves prediction accuracy and reduces overfitting by combining the results of many trees instead of relying on a single model.

Why Random Forest is Used in Your Project:

1.Handles Non-Linear Relationships: Wind energy production does not follow a simple linear pattern. Random Forest effectively captures complex and non-linear relationships between input variables and output**.**

2. High Prediction Accuracy: By averaging multiple decision trees, Random Forest reduces variance and improves overall model accuracy**.**

3. Reduces Overfitting: Unlike a single decision tree, Random Forest minimizes overfitting by combining predictions from multiple trees**.**

4. Robust to Noise: Weather data may contain fluctuations and irregular patterns. Random Forest performs well even with noisy environmental data.

5. Minimal Assumptions: Unlike Linear Regression, Random Forest does not assume linearity or normal distribution of data.

2. proposed solution:

The proposed solution is to develop a real-time wind energy prediction system using Machine Learning and web technology.

First, historical wind turbine data is collected and used to train a Random Forest Regression model. The model learns the relationship between wind speed, theoretical power, wind direction, and actual energy output.

After training, the model is saved and integrated into a Flask-based web application.

In real time:

1. The user enters current weather parameters (Speed, Theoretical Power, Direction) into the webpage.

2. The input is sent to the Flask backend.
3. The trained Random Forest model processes the input instantly.
4. The system predicts the energy output.
5. The predicted result is displayed immediately on the screen.

This real-time system helps in quick and accurate wind energy forecasting, supporting better renewable energy management and planning.