Project Initialization and Planning Phase

Date	12 July 2024
Team ID	SWTID1720108739
Project Title	Predicting The Energy Output Of Wind Turbine Based On Weather Condition
Maximum Marks	3 Marks

Project Proposal (Proposed Solution) template

The objective of this project is to develop a predictive model for estimating the energy output of wind turbines based on prevailing weather conditions. As renewable energy sources like wind power continue to play a crucial role in global energy strategies, accurate forecasting of energy production becomes increasingly essential for energy companies, grid operators, and wind farm operators alike. By leveraging machine learning techniques, we aim to harness historical data on weather parameters and corresponding energy generation to train models capable of forecasting turbine output.

This proposal outlines the methodology, data sources, and intended outcomes of the project. Through comprehensive analysis and modeling, we intend not only to predict energy production accurately but also to enable proactive maintenance scheduling and enhance grid integration efficiency. This report details the significance of the project, the approach we plan to take, and the potential impact of our findings on the renewable energy sector.

Project Overview	
Objective	The primary objective is to create machine learning models capable of predicting wind turbine energy output based on weather conditions, enabling optimized energy management and grid integration strategies in the renewable energy sector
Scope	The project will focus on predicting energy output for onshore wind turbines based on weather conditions. It will encompass model development, training on historical data, and validation for accuracy using appropriate performance metrics

Problem Statement	
Description	Developing accurate predictive models to forecast the energy output of onshore wind turbines based on varying weather conditions to optimize energy management and grid integration strategies
Impact	Implementing accurate predictive models for wind turbine energy output will enhance operational efficiency, reduce maintenance costs through proactive scheduling, optimize energy distribution, and facilitate more efficient grid integration of renewable energy sources, contributing to sustainable energy practices and reducing reliance on fossil fuels.
Proposed Solution	
Approach	The methodology involves preprocessing the data to handle missing values, feature engineering to extract pertinent weather variables, and applying regression models such as multilinear regression, Random Forest or Gradient Boosting to predict wind turbine energy output. Model performance will be validated using metrics like Mean Absolute Error and Root Mean Squared Error, with the ultimate goal of deploying a reliable forecasting system to optimize energy management and grid integration strategies in the renewable energy sector.
Key Features	The proposed solution distinguishes itself through its integration of machine learning models to forecast wind turbine energy output, leveraging comprehensive historical weather and energy data. This approach not only enhances operational efficiency and maintenance scheduling but also supports reliable grid integration, thereby advancing sustainable energy practices with robust predictive capabilities.

Resource Requirements

Resource Type	**Description**	**Specification/Allocation**
Hardware		
Computing Resources	CPU/GPU specifications, number of cores	e.g., 2 x NVIDIA V100 GPUs
Memory	RAM specifications	e.g., 8 GB

Storage	Disk space for data, models, and logs	e.g., 1 TB SSD
Software		
Frameworks	Python frameworks	e.g., Flask
Libraries	Additional libraries	e.g., scikit-learn, pandas, numpy
Development Environment	IDE, version control	e.g., Jupyter Notebook, Git
Data		
Data	Source, size, format	e.g., Kaggle dataset, size- 50,000x5