

PROJECT OBJECTIVE

Date	13 November 2022
Team ID	PNT2022TMID28461
Project Name	Predicting the energy output of wind turbine based on weather condition

Objective:

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 conditions present at its site. If the output can be predicted more accurately, energy suppliers can coordinate the collaborative production of different energy sources more efficiently to avoid costly overproduction. In this paper, we take a computer science perspective on energy prediction based on weather data and analyze the important parameters as well as their correlation on the energy output. To deal with the interaction of the different parameters, we use symbolic regression based on the genetic programming tool Data Modeler. The model obtained for energy prediction gives a very reliable prediction of the energy output for newly supplied weather data.

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Data Preprocessing Techniques:

In recent years, data-driven models based on past observations have been widely employed in the literature. Various types of data processing methods are successfully applied to assist these models and further improve forecasting performance. Comprehensive research of their methodologies is called on for a thorough understanding of current challenges that affect model accuracy and efficiency. To address the knowledge gap, this paper presents an exhaustive review and categorization of data processing in wind energy forecasting. The utilized techniques are classified into seven categories according to the applications: decomposition, feature selection, feature extraction, denoising, residual error modeling, outlier detection, and filter-based

correction. An overall analysis of their intentions, positions, characteristics, and implementation is provided. The phrase "Garbage In, Garbage Out" is particularly applicable to data mining and machine learning.

Data through visualization:

The number of wind farms is increasing every year because many countries are turning their attention to renewable energy sources. Wind turbines are considered one of the best alternatives to produce clean turbines to monitor wind turbines and logged the information as time-series data. It demands a powerful information extraction process for analysis and prediction. In this research, we present a data analysis framework to visualize the collected their long short-term memory (LSTM) based prediction. The data analysis is presented in cartesian, polar, and cylindrical coordinates to understand the wind and energy generation relationship. The four features: wind speed, direction, generated active power, and theoretical power are predicted and compared with state-of-the-art methods data from the SCADA system and recurrent neural network-based variant energy. Most of the wind farms installed supervisory control and data acquisition (SCADA) .

Build a web application:

Develop an end to end web application to predict the energy output of the wind turbine based on weather conditions retrieved from the open weather API. The application must be built with python-flask or Django framework with the machine learning model trained & deployed on IBM Watson Studio.

Data cleaning:

The first step of Data Preprocessing is Data Cleaning. Some have missing values and some have junk data in it. If these missing values and inconsistencies are not handled properly then our model wouldn't give accurate result.