

PROJECT SCOPE DOCUMENTATION

PROJECT NAME :

SBSPS-Challenge-1207-Predicting-the-energy-output-of-wind-turbine-based-on-weather-condition.

PROJECT MANAGER: SHEVYA SOLANKI

DATE :20/06/2020

1.PROJECT SUMMERY :

- ★ 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 DataModeler. Our studies are carried out on publicly available weather and energy data for a wind farm in Australia. We report on the correlation of the different variables for the energy output. The model obtained for energy prediction gives a very reliable prediction of the energy output for newly supplied weather data.

2.PURPOSE OF PROJECT :

- ★ Wind energy plays an increasing role in the supply of energy worldwide. The energy output of a wind farm is highly dependent on the wind 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.
- ★ Developing a time series model to Predict the power output of wind farm based on the weather condition in the site (1Hr prediction to 72Hrs. prediction) Build an application to recommend the Power Grid to suggest the best time to utilize the energy from wind farm.

3.PROJECT REQUIREMENT :

3.1 FUNCTIONAL REQUIREMENT :

- Predicting The Energy Output Of Wind Turbine Based On Weather Condition.

3.2 TECHNICAL REQUIREMENT :

- Python, IBM Cloud, IBM Watson, Github , Node Red in IBM Watson, Jupyter, Notebook Watson, Python 2 or 3, IBM Watson Studio, IBM Cloud for Deployment, Android / any Web frameworks Use Weather Company Data from IBM Cloud.

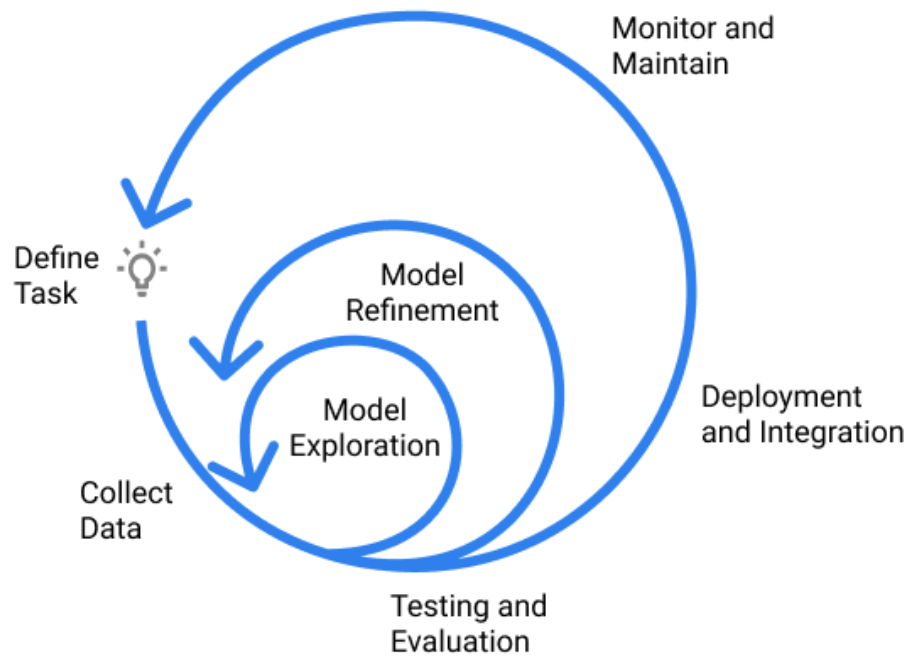
3.3 HARDWARE REQUIREMENT :

Processor - i5 7th Gen
Speed - 2GHz or more
Hard Disc - 10 Gb or more

4. MAJOR DELIVERABLES :

- The flow chart shown below gives the information regarding how the model is built and the description of the stages it involves. It includes 7 stages as described :

Machine Learning Development Lifecycle



1. Planning and project setup

- Define the task and scope out requirements.
- Determine project feasibility.
- Setting up project codebase.

2. Data collection and labeling :

<https://www.kaggle.com/berkerisen/wind-turbine-scada-dataset>

- Define ground truth (create labeling documentation)
- Build data model
- Validate quality of data

TOOLS - Excel SpreadSheets , CSV ffiles.

3. Model exploration

- a. Establish baselines for model performance.
- b. Overfit simple model to training data.
- c. Using various Libraries to explore data.

TOOLS- Matplotlib, Sklearn, Seaborn, Keras, Scikit-Learn.

4. Model refinement

- a. Perform model-specific optimizations (hyper parameter tuning)
- b. Iteratively debug model as complexity is added

5. Testing and evaluation

- a. Evaluate model on test distribution; understand differences between train and test set distributions (how is “data in the wild” different than what you trained on)
- b. Revisit model evaluation metric; ensure that this metric drives.

6. Model deployment

- a. Expose model via a REST API , IBM Watson.
- b. Deploy new model to small subset of users to ensure everything goes smoothly, then roll out to all users
- c. Monitor live data and model prediction distributions

7. Ongoing model maintenance

- a. Understand that changes can affect the system in unexpected ways .
- b. Periodically retrain model to prevent model staleness
- c. If there is a transfer in model ownership, educate the new team

5. ADVANTAGE OF THE PROJECT :

- ★ Renewable energy, such as wind and solar energy, plays an increasing role in the supply of energy world wide. This trend will continue because global energy demand is increasing, and the use of nuclear power and traditional sources of energy such as coal and oil is either considered unsafe or leads to a large amount of CO2 emission
- ★ Wind energy is a key player in the field of renewable energy. The capacity of wind energy production has been substantially increased during the last years. In Europe, for example, the capacity of wind energy production has doubled from 2005 to 2007 [13]. However, levels of production of wind energy are hard to predict as they rely on potentially unstable weather conditions present at the wind farm. In particular, wind speed is crucial for energy production based on wind, and it may vary drastically over time. Energy suppliers are interested in accurate predictions, as they can avoid overproduction by coordinating the collaborative production of traditional power plants and weather-dependent energy sources.

6. FLOWCHART :

- How does the model actually works is shown by the flowchart below. We will use Regression algorithms to solve or to find solution to the problem statement .Flow chart explains the whole process from start to the end.

