PROJECT REPORT

INTRODUCTION:

Overview:

A typical Regression Machine Learning project leverages historical data to predict insights into the future. This problem statement is aimed at predicting Wind Energy output given various features.

Purpose:

This problem statement provides a way to predict future data required for Power Grids to best utilize energy obtained from wind farms as most energy suppliers are interested in accurate predictions, so that they can avoid overproduction by coordinating the collaborative production of traditional power plants and weather-dependent energy sources.

LITERATURE SURVEY:

Existing problem:

Currently, the most used renewable resource in the US, Wind Energy still has huge untapped potential. The initial cost of installation and maintenance in unfavorable terrain, where factors other than high speed wind cause damage to machines, are two of the leading reasons why investors are shy to participate. In a 2018 study, it was seen that 4.8% of the world's entire power requirements were satisfied by wind energy.

If the current acceleration of wind energy being utilized is kept up, then by 2050, 26.9% of the world's entire power needs will be covered by this. This would reduce greenhouse gas emission, globally, by approximately 150 gigatons.

Proposed solution:

The levels of production of wind energy are hard to predict as they rely on potentially unstable weather conditions present at the wind farm; Gust speed and dew point in particular. Yet our product solves this problem by using technology to predict with reasonable accuracy if it's a viable period to produce energy. The given 2018 data set with a time-gap of 10 minutes between each data point is extensively analysed through algorithms to predict required power output. The cloud will be used to store new data sets offered by willing volunteers to increase accuracy and efficacy of the output.

THEORETICAL ANALYSIS:

Software Designing:

IBM Watson studio platform for creating the machine learning model and deploying it. A Random Forest regression model based on 3 features considering data from a period of 01/01/2018 to 31/12/2018 consisting 50,000 rows. Node Red UI for providing a user friendly interface for the machine learning model.

EXPERIMENTAL INVESTIGATIONS:

Investigations in the form of data analysis were conducted to interpret how various factors like wind speed and wind direction affected Life expectancy in the form of Histograms, bar graphs, box plots and so on. Relationships among analysed features and Active Power were mapped giving insights into the features our prediction mainly depended.

FLOWCHART:

The project revolves around mainly these 6 milestones:

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| 1. **Project Planning & Kickoff** |
| 1. **Explore IBM Cloud Platform** |
| 1. **Explore IBM Watson Services** |
| 1. **Introduction to Watson Studio** |
| 1. **Predicting Life Expectancy with python** |
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RESULT:

A machine learning model for predicting the Wind Energy Output is developed.

APPLICATIONS:

Our service makes it easier for potential investors to participate in this field as the unpredictability is addressed/mitigated through the application of bleeding edge technology.

Such a model could even identify and warn us about upcoming occurrences of tropical cyclones and tornadoes based on available data. This would prevent setting up wind farms in such disastrous environments which may appear to be of high wind potential but would cause losses financially and environmentally in the long run.

CONCLUSION:

If the current acceleration of wind energy being utilized is kept up, then by 2050, 26.9% of the world's entire power needs will be covered by this. This would reduce greenhouse gas emission, globally, by approximately 150 gigatons.

FUTURE SCOPE:

The addition of more data on wind speed, wind direction and theoretical wind energy power output of recent years, can provide the machine learning model with further accuracy. A long term trained model can provide whereabouts of perfect locations for maximum and continuous utilisation of undiscovered wind potential. Such a model could even identify and warn us about upcoming occurrences of tropical cyclones and tornadoes based on available data.

BIBLIOGRAPHY:

* <https://www.kaggle.com/berkerisen/wind-turbine-scada-dataset>
* <https://www.youtube.com/user/krishnaik06/playlists>
* <https://www.youtube.com/channel/UCvB8PgOZdb2y7lgToPE-Dfw>
* <https://www.w3schools.com/>
* <https://stackoverflow.com/>

APPENDIX:

* Wind Pred- Data Analysis.ipynb
* Wind Pred- Modelling & Deployment.ipynb
* Wind Pred NodeRed flow.json