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**1.INTRODUCTION**

**1.1Overview:**

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. 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.

Wind turbine power output is known to be a strong function of wind speed, but is also affected by turbulence and shear. For a randomly selected atmospheric condition, the accuracy of the regression tree power predictions is three times higher than that from the traditional power curve methodology. The regression tree method can also be applied to turbine test data and used to predict turbine performance at a new site.The power output from the turbine is not a linear function of wind speed .so, multivariate linear regression is not an appropriate technique. Non-linear regression assumes that the relationships are constant throughout the model space  which from  is incorrect, so non-linear regression is also inappropriate.

                         For this reason, we propose a machine learning technique called 'regression trees' . Regression trees are models that use simple branching question paths to predict an outcome based on inputs. In the ensemble method, subsets of the training data are used to generate different trees, and power is calculated using each tree, forced with the same input. The outputs from the 100 different trees are combined to give the mean and variance of the power estimate. An ensemble of trees reduces variance and is less affected by 'noisy' training data, than a single tree.

**1.2 Purpose:**

                         Our aim is to map weather data to energy production. We wish to show that even data that is publicly available for weather stations close to wind farms can be used to give a good prediction of the energy output. Furthermore, we examine the impact of different weather conditions on the energy output of wind farms. We are particularly, interested in the correlation of different components that characterize weather conditions such as wind speed, pressure, and temperature .

**2.LITERATURE SURVEY:**

**2.1 Existing problem:**

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

**2.2 Proposed solution:**

                          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 India. 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.

**3.THEOETICAL ANALYSIS:**

**3.1Block diagram:**

**3.2 Hardware/Software designing:**

The model is designed using Jupyter notebook in Anaconda which is a open source distribution of the Python and R programming languages for scientific computing, that aims to simplify package management and deployment.The application building is done using flask which is a web framework that provides tools, libraries and technologies that allow the developer to build a web application. This web application can be some web pages, a blog, a wiki or go as big as a web-based calendar application or a commercial website.

**4.EXPERIMENTAL INVESTIGATIONS:**

    In this project we used Multilinear regression,decision tree regression,random forest,polynomial,linear support vector regression.**Regression** analysis consists of a set of **machine learning** methods that allow us to predict a continuous outcome variable (y) based on the value of one or multiple predictor variables (x). Briefly, the goal of **regression** model is to build a mathematical equation that defines y as a function of the x variables.**Regression** models are used to predict a continuous value. Predicting prices of a house given the features of house like size, price etc is one of the common **examples** of **Regression**. It is a supervised technique.Simple **regression** is **used** to examine the relationship between one dependent and one independent variable. After performing an analysis, the **regression** statistics can be **used** to predict the dependent variable when the independent variable is known. ... People use **regression** on an intuitive level every day.

**5.FLOWCHART:**

**6. RESULT:**

         This model is built using ML model Regression.We used different regression techniques and other techniques which are updated versions of regression like decision tree,random forest to differentiate between accuracy. The model was integrated with a flask web application which Predicts the Energy Output Of Wind Turbine Based On Weather Condition  .

**7.Advantages & Disadvantges:**

**Advantages:**

Regression analysis refers to a method of mathematically sorting out which variables may have an impact. The **importance of regression** analysis for a small business is that it helps determine which factors matter most, which it can ignore, and how those factors interact with each other. The importance of regression analysis lies in the fact that it provides a powerful statistical method that allows a business to examine the relationship between two or more variables of interest.

**Disadvantages**:

              Despite the above advantages, the technique of regression analysis suffers form the following serious **limitations**:

* It is assumed that the cause and effect relationship between the variables remains unchanged. This assumption may not always hold good and hence estimation of the values of a variable made on the basis of the regression equation may lead to erroneous and misleading results.
* The functional relationship that is established between any two or more variables on the basis of some limited data may not hold good if more and more data are taken into consideration. For example, in case of the Law of Return, the law of diminishing return may come to play, if too much of inputs are used with ca view to increasing the volume of output.
* It involves very lengthy and complicated procedure of calculations and analysis.
* It cannot be used in case of qualitative phenomenon viz. honesty, crime etc.

As the disadvantages of regression technique are more. We also used other techniques which are updated version of regression  like decision tree ,random forest to differentiate between accuracy.

**8.Applications:**

5 Uses of Regression Analysis in Business:

1. Predictive Analytics:

2.Operation Efficiency

3.Supporting decisions

4.Correcting errors

5.New insights

**9.CONCLUSION:**

In this study, we showed that wind energy output can be predicted from publicly available weather data with accuracy up to 80% R2 on the training range.We are pleased that the presented framework is so simple that it can be used by literally everybody for predicting wind energy production on a smaller scale—for individual wind turbines on private farms or urban buildings, or for small wind farms. For future work, we are planning further study of the possibilities for longer-term wind energy forecasting.

**10.FUTURE SCOPE:**

**Future Scope** of **Wind Energy in India**. The paper first deals with the current scenario of the **wind energy in India**. **Wind energy** is available without any cost and it does not emit any greenhouse gases. This makes it a great source of **energy** production for any developing state. 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.

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