ABSTRACT

There is lot of uncertainties on demand of electricity in the global market. Building a model to predict the future electricity demand would be very useful. There are various factors which are needed to be considered for the prediction of the demand, some of them are climate, socio-economic activities , population etc. In the model we are going to see different forecasting methods used for predicting the demand.

In the model we are doing comparative and testing analysis between different parameters. We try to reduce the error percentage to get an accurate reading . We have used linear regression and mean absolute error methods to solve the problem. Linear Regression is used to predict the value of a variable using another variable. Linear and Logistic are most widely used regression techniques. The projection of a societies long term power demand helps us to determine how much capacity is needed for the future demand. Such methods are very helpful in electrical compositions in the power generation like nuclear plants, hydro plant , etc.

Similar to energy demand evaluation, electricity supply analysis is vital to determine the feasibility of an strength challenge. This forecast needs to be based on our historic records, consisting of evaluations of beyond tendencies and the present power deliver, studies of the electricity technology, transmission and distribution systems, of the available assets for energy technology and of existing and deliberate interconnections to neighboring structures.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

 Electricity is flow of electric charge. It has been one of our primary requirement in our lives over more than 5 to 6 decades. It is very important to generate the electricity on par to the demand and it has been a very serious issue over the years. In this project we have developed a model to predict the future electricity demand using artificial intelligence. It would help us predict the demand.

Technological improvements are changing the form of the grid by using converting a demand driven Strength device toward a era energy driven machine. This is largely because of a multitude of Factors which include multiplied the penetration of renewable electricity resources and new technology At purchaser side . This creates uncertainties in terms of the future Strength call for. Consequently, the importance of load forecasting has increased multifold for the future. Electric powered loads, on all horizons, i.e., short, medium and lengthy terms, are noticeably variable in nature. Electricity demand does not best change at utility, but also at sectorial or nearby degrees. It additionally Relies upon notably on the financial profile of a country. As an example, the energy call for Trends are special for each developed and growing economies.

We have used linear regression ,mean absolute error and various methods in building our model. First we have to use the dataset to do the testing and comparative analysis. later train the model and find the error or accuracy percentage then we have to predict the demand.

LITERATURE SURVEY

PAPER DETAILS:

A Review of Electricity Demand Forecasting in Low and Middle Income Countries: The Demand Determinants and Horizons.

Year published: 23 July 2020

Objective: With the globally increasing electricity demand, its related uncertainties are on the rise as well. Therefore, a deeper insight of load forecasting techniques for projecting future electricity demands becomes imperative for business entities and policy makers.

Electricity demand forecasting using machine learning.

Objective: Forecasting power demand plays an essential role in the electric industry, as it provides the basis for making decisions in power system planning and operation.

2.1. Existing system:

Various demand forecasting software's are available in the market like sigmaxl.

It is a model where the demand of electricity can be forecasted using various machine learning and artificial intelligence algorithms

Problem statement:

With the globally increasing electricity demand, its related uncertainties are on the rise as well. Therefore, a deeper insight of load forecasting techniques for projecting future electricity demands becomes imperative for business entities and policy makers.

OBJECTIVE:

Electrical companies use various methods for predicting electricity demand. These are applied to short-term, medium-term, or long-term forecasting.
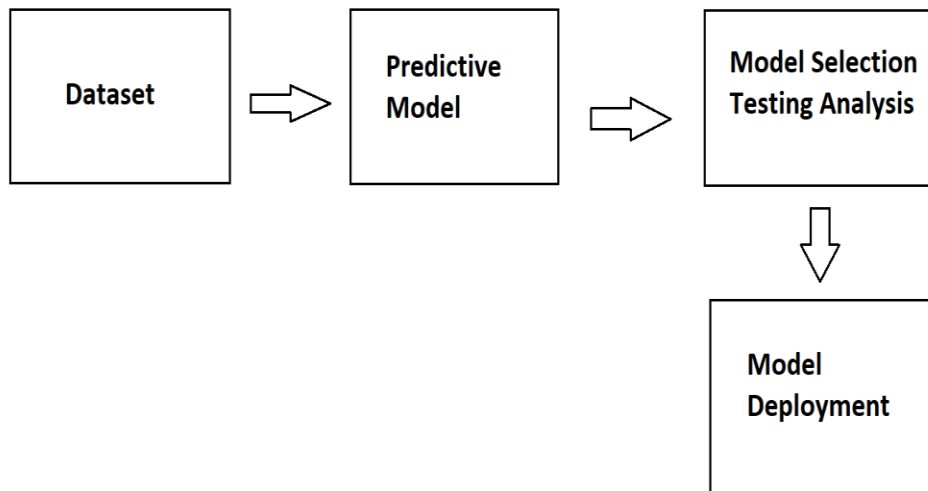
BLOCK DIAGRAM

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┌───────────┐      ┌───────────┐      ┌──────────────────┐
│  Dataset  │ ⟹    │ Predictive│ ⟹    │ Model Selection  │
│           │      │  Model    │      │ Testing Analysis │
└───────────┘      └───────────┘      └──────────────────┘
                                              ⟱
                                      ┌──────────────────┐
                                      │     Model        │
                                      │   Deployment     │
                                      └──────────────────┘
```

Fig 1.0 block diagram

Dataset:

A records set is a collection of related, discrete gadgets of related facts that can be accessed personally or in aggregate or controlled as an entire entity.

A statistics set is organized into some kind of data shape. In a database, as an instance, a records set may include a set of business data (names, salaries, contact statistics, sales figures, and so forth).

Predictive model:

Predictive modeling is a mathematical procedure used to predict future events or outcomes with the aid of analyzing patterns in a given set of input information. It is a important issue of predictive analytics, a kind of data analytics which uses modern-day and historical data to forecast pastime, conduct and traits.

Model selection and testing analysis:

In records, version choice is a procedure researchers use to evaluate the relative value of different statistical fashions and decide which one is the exceptional suit for the located statistics. The Akanke data criterion is one of the maximum not unusual techniques of version choice.

A set of exploratory equipment for improving regression models. Each version choice device includes deciding on a subset of viable predictor variables that still account nicely for the variation inside the regression version's remark variable.

Model deployment :

Deployment is the technique by using which you integrate a machine studying version into an existing production surroundings to make sensible enterprise selections primarily based on records. It's miles one of the ultimate degrees within the gadget gaining knowledge of life cycle and can be one of the maximum bulky. Frequently, an organization's IT systems are incompatible with traditional model-constructing languages, forcing facts scientists and programmers to spend treasured time and brainpower rewriting them.

Dataset:

Import python libraries required for the building the model. Load and display the dataset using read_csv function.

	datetime	id	name	geoid	geoname	value
0	2014-01-01 23:00:00	600	Precio mercado SPOT Diario ESP	3.0	España	25.280833
1	2014-01-02 23:00:00	600	Precio mercado SPOT Diario ESP	3.0	España	39.924167
2	2014-01-03 23:00:00	600	Precio mercado SPOT Diario ESP	3.0	España	4.992083
3	2014-01-04 23:00:00	600	Precio mercado SPOT Diario ESP	3.0	España	4.091667
4	2014-01-05 23:00:00	600	Precio mercado SPOT Diario ESP	3.0	España	13.587500
...	...	...	...	...	...	...
40207	2018-12-27 23:00:00	3	Generación programada PBF Turbinación bombeo	NaN	NaN	8838.000000
40208	2018-12-28 23:00:00	3	Generación programada PBF Turbinación bombeo	NaN	NaN	8738.800000
40209	2018-12-29 23:00:00	3	Generación programada PBF Turbinación bombeo	NaN	NaN	9020.000000
40210	2018-12-30 23:00:00	3	Generación programada PBF Turbinación bombeo	NaN	NaN	8466.200000
40211	2018-12-31 23:00:00	3	Generación programada PBF Turbinación bombeo	NaN	NaN	10764.000000

40212 rows × 6 columns

Plotting of graphs and performing various python functions:

Graph between the energy demand and the year. We can see the how much power it has been generated over the years.

Target analysis:

A target market evaluation is an assessment of ways your product or service suits into a selected market and wherein it'll benefit the most traction with clients. Target marketplace analyses assist agencies establish techniques for powerful advertising and marketing and sales techniques.
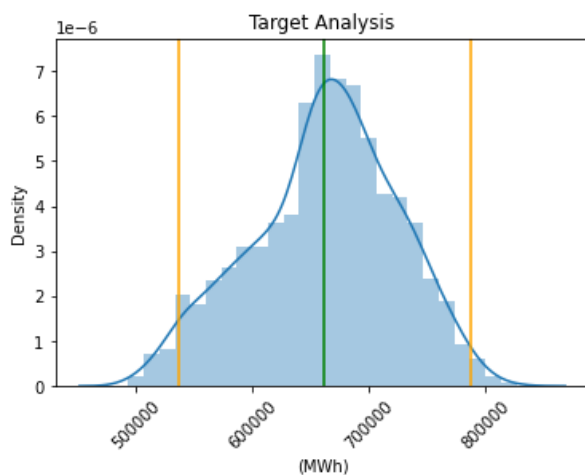

Fig 1.1 target analysis graph between density and power.

Volatility analysis:

The most critical feature of the conditional return distribution is arguably its second moment structure, which is empirically the dominant time-varying characteristic of the distribution.
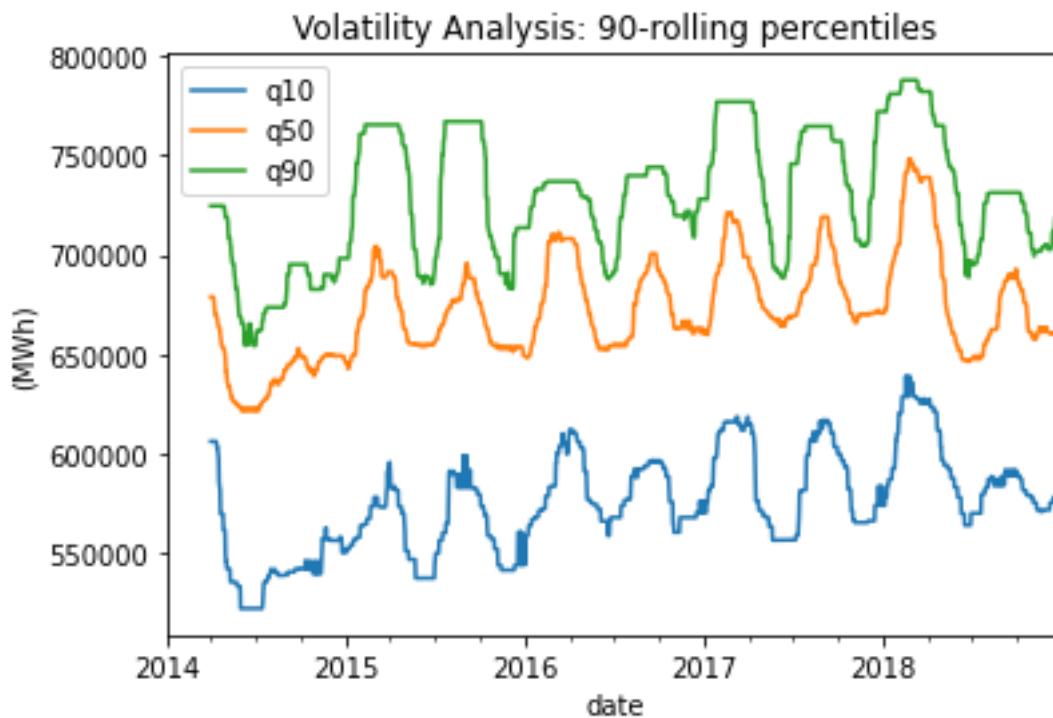

Fig 1.2 Volatility analysis graph between power and date(year)

Train and test split:

The train-test split procedure is used to estimate the performance of machine learning algorithms when they are used to make predictions on data not used to train the model.It is a fast and easy procedure to perform, the results of which allow you to compare the performance of machine learning algorithms for your predictive modeling problem. Although simple to use and interpret, there are times when the procedure should not be used, such as when you have a small dataset and situations where additional configuration is required, such as when it is used for classification and the dataset is not balanced.
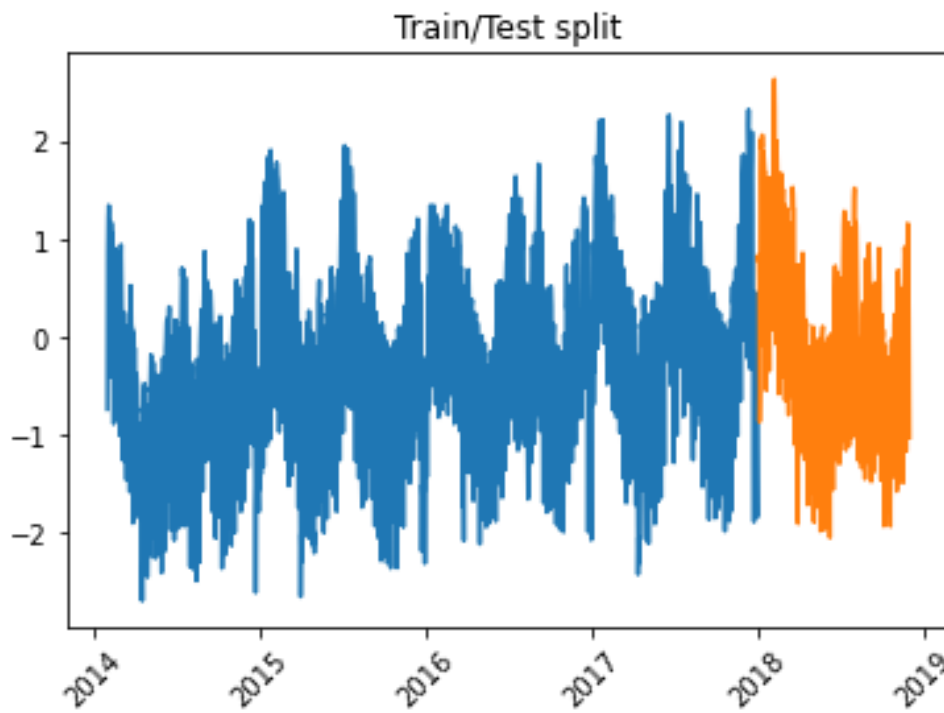
Fig 1.3 The train and split of the model of different years.

Model building:

The predicted is done and demand can be predicted. There is very low error percentage and the accuracy is high.

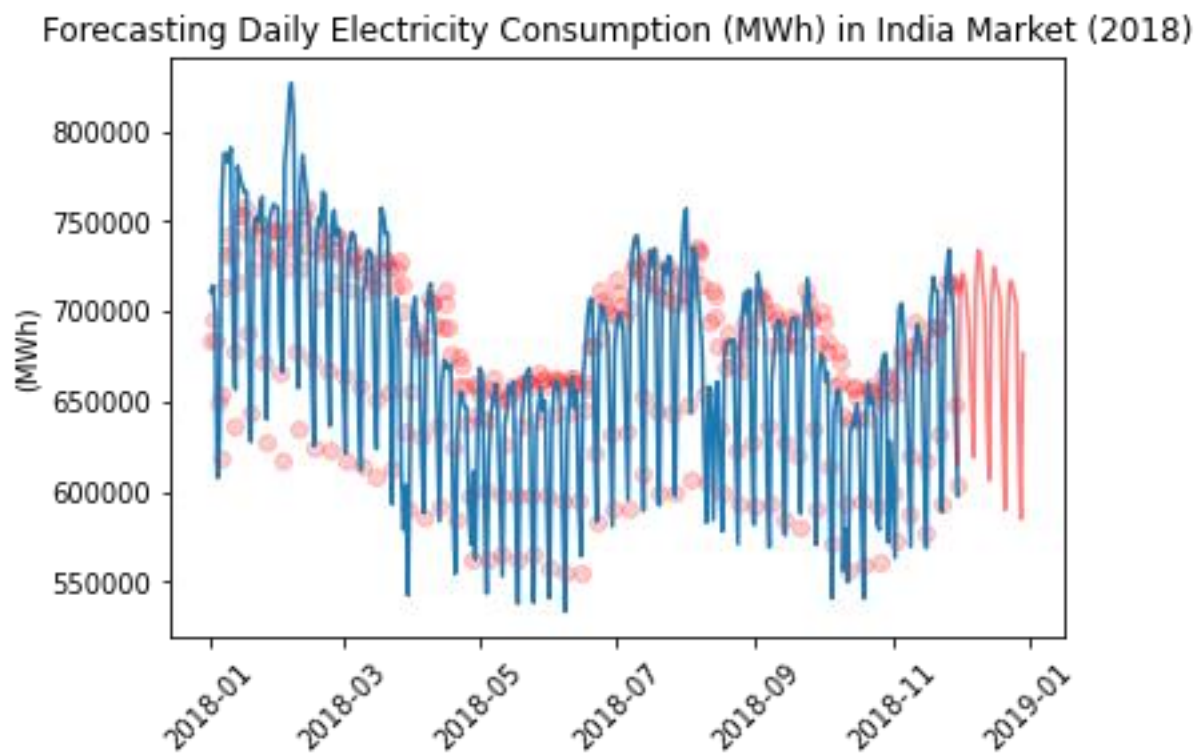Forecasting Daily Electricity Consumption (MWh) in India Market (2018)

Fig 1.4 Predicted model graph between date and the power(MWH)

Methods and algorithms used to build the model:

Kurtosis:

It refers to the degree of presence of outliers in the distribution .Kurtosis is a statically measure whether the data is heavily tailed or light tailed in normal distribution. Different types of kurtosis is leptokurtic , platykrutic and mesokurtic.

Skewness:

Data is symmetrically distributed in left side and right side. If the data has 90 values then the left hand side has 45 observations,right hand side has 45 obsevations.

Formula: 3 * (Mean – Median) / Standard Deviation ……..eqn(1)

Standard deviation:

Standard deviation is used to measure the amount of dispersion data points. It helps to identify the position of datapoint with respect to the mean.

$$\text{SD} = \sqrt{\frac{\sum |x - \bar{x}|^2}{n}}$$

………..eqn(2)

Square of difference of each value to the mean.

Mean mode median:

Median : value that occur in the middle of dataset.

Odd= (n+1)th/2 ………..eqn(3)

Even= (n/2)+(n+1/2)/2 …………eqn(4)

Mode: the elements which have more frequency of occurance.

Mean: Average of all the values instead of dataset.

Mean = sum of n elements/ no of elements ……………eqn(5)

Formula used: MAPE(mean absolute percentage error):

MAPE**:1**/NΣ i=N to N
(|y-y'|/ y ………………………eqn(6)

Linear Regression:

It is a prediction process in which a variable value using an another variable value. It is used for prediction ,forecasting and error handling. It is extensively used in many practical applications.

ADVANTAGES

- Significantly improve human errors
- more efficient
- less time taking
- automates the error
- perform repetitive jobs

APPLICATION

- Demand forecasting..
- Fluctuations decreases.
- Used in generation for nuclear plants.
- Infrastructure development.
- Important in smart grids.
- Supply chain management.
- Increase profit margin.
- Development planning

CONCLUSION

Electricity is flow of electric charge. It has been one of our primary requirement in our lives over more than 5 to 6 decades. It is very important to generate the electricity on par to the demand and it has been a very serious issue over the years. In this project we have developed a model to predict the future electricity demand using artificial intelligence. It would help us predict the demand.

We have used linear regression ,mean absolute error and various methods in building our model. First we have to use the dataset to do the testing and comparative analysis. later train the model and find the error or accuracy percentage then we have to predict the demand.

FUTURE SCOPE

In future we can build the model with several techniques. We can implement real time processing. Custom performance metric can be performed. Use advance future engineering and independent variables. Implement calendar.

REFERENCE

A Review of Electricity Demand Forecasting in Low and Middle Income Countries: The Demand Determinants and Horizons .

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