Comparison of Machine Learning Algorithms with Electrical Energy Consumption Dataset

[1]Pooja M Tevari
CSE, Government College of Engineering, Karnataka

DOI: 10.29322/IJSRP.14.07.2024.p15120

Paper Received Date: 15th June 2024
Paper Acceptance Date: 16th July 2024
Paper Publication Date: 20th July 2024

Abstract - Electric load forecasting or future electric load prediction is necessary in both domestic as well as industrial sectors. Since electric energy cannot be stored, it is necessary to predict the future electric load in every sector. If the load forecasting is incorrect on the transmission side, a high load current may travel through the conductors, potentially damaging them. The increased loads result in more current flowing through the conductors and ultimately through the equipment, load forecasting is also important in the distribution system. In this work, the techniques of linear regression and random forest regressor have been used for future load prediction. The main purpose of this work is to determine the best regression algorithm for future load prediction with reduced error among both linear regression and random forest regressor. A front end form is also developed to determine the future load.
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Index Terms - Load forecasting, linear regression and random forest regressor.

I. Introduction

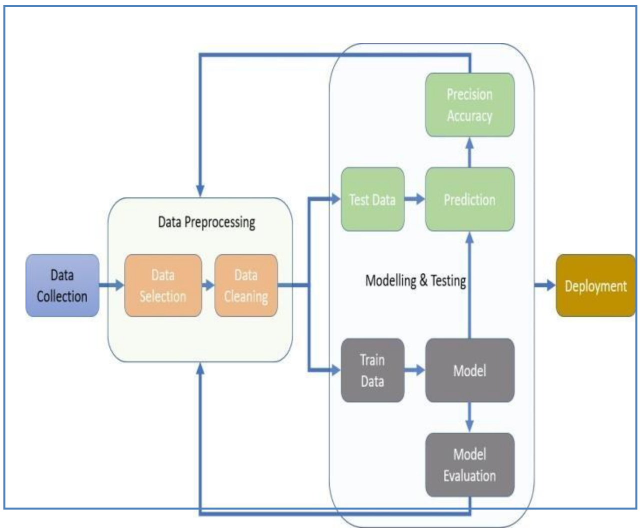
This article gives importance of electricity nowadays has grown significantly; the world is unimaginable without it. Large amounts of electricity cannot be stored. For the system to operate as intended, the equality restrictions must be met (i.e. generation must meet the load demand and losses). Electric load forecasting is a technique used by power companies to predict future electricity load. There are various factors which will affect the load forecasting like temperature, type of day and weather conditions. The load forecasting is divided as four types. Very Short-term Load forecasting (VSTLF), Short-term Load forecasting (STLF), Medium-term Load forecasting (MTLF) and Long-term load forecasting (LTLF).The very short-term load forecasting has forecasting limit of less than an hour. Short-term load forecasting has forecasting horizon of less than 30 days. Medium-term load forecasting has limit less than one year and long-term load prediction consisting limit of more than one year. There are various methods such as time serious analysis and exponential smoothing and weighted iteration etc. But these are failed to provide accurate results. In this paper two machine learning techniques and evaluation indices are compared. Here python language is used for coding and 75% of load data is taken for both and 25% of data is taken for testing purpose. The correlation matrices can be used to know how well the predicted outcome performed.

II. LITERATURE SURVEY

Weilin Gue et al - **"The Machine Learning models for short term load forecasting"** in this approach Discusses the three machine-learning methods taken for load predicting, they are SVM model, random forest regressor, long and short artificial neural network. The charecteristics and applications of these methods are checked andcompared. Since they know that single load forecasting model is not enough to get accurate forecasting results. To get rid of this issue, they proposed a combined forecasting model [1]. Tomas Vantuch et al – **"Short term load forecasting with ANN"** Proposed ANN technique to forecast the electric load. They used previous load data which includes both weekend and weekday load. Neural Network with more than one hidden layers are used and tested. The results were compared. From the results they conclude that ANN with more number of hidden layers can give better results and also showed that load data with more number of load patterns can give accurate forecasting [2]. Kuldeep S. et al – **"Short term load forecasting with MLP"** Carried out short term load forecasting using two methods. One is conventional method and other is machine learning method. After calculating Mean Absolute Percentage Error they conclude that machine learning method is best to predict future load [3]. Satish K. Kumar – **"Industry Electricity load Prediction using Data Mining Technique".** In this approach machine learning models such as random forest regressor and support vector machine are used. The former one shows less error than later [4].Deramex D – **"Data Prediction models of electric power use of appliances".** In this research they discussed about common algorithms such as multiple regressions, support vector machine and time series analysis. But after calculating all these evaluation indices and conclude that to get more accurate results along with these methods some of machine learning algorithms are to be used [5].

III. PROPOSED METHODOLOGY

There are number of methods for predicting the amount of electricity being used. The process of predicting how much power will be needed in future is known as load forecasting. There must be synchronization between generation of electricity and demand for electricity. Usually load prediction is done using SCADA software which works on principle of distributed computing. But there is no automated system to



analyze the various parameters and to draw conclusions. The machine learning can analyze parameters quickly and provide accurate results. Therefore in this work by making the use of machine learning concept, a model is developed which is able to predict future load of particular area. In this work, electric power consumption of a small scale industry is collected which includes variables such as industry power consumption, lagging current reactive power, leading current reactive power and week days.

IV. RESULTS AND CONCLUSION

Load forecasting can be done using traditional methods such as time series model, similar day approach etc. But these methods give us somewhat less accurate results. Therefore in this work two machine learning models linear regression and random forest are taken to predict future load and for both models evaluation indices are calculated. The first model that is regression gives Mean Absolute Error of 2.55 and Random Forest Regressor gives Mean Absolute Error of about 0.35. Since Random Forest Regressor showed less error compared to linear regression we can use random forest regressor to predict future load.

FIGURE 2. FRONT END FORM OF RESULTS

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