Prediction Based Future Electricity Consumption using Data Mining

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Abstract— This paper combined artificial neural network and regression modeling methods to predict electrical load. An approach of Data Mining technique to predict electricity demand of a geographical region based on the meteorological conditions. The value prediction predictive data mining technique is implemented with the Artificial Neural Networks. The values of the factors Such as temperature, humidity and public holiday on which electricity consumption depends and the daily consumption values constitute the data. Data mining operations are performed on this historical data to form a prediction model which is capable of predicting daily consumption provided the meteorological parameters. The steps of knowledge discovery of data process are implemented. The data is preprocessed and fed to neural network for training it. The trained neural network is used to predict the electricity demand for the given meteorological conditions.

Key words: Data Mining, Predictive modeling, Artificial Neural Networks, KDD

I. INTRODUCTION

Data Mining is the process of extracting valid, previously unknown, comprehensible, and actionable information from large databases and using it to make crucial business decisions [1]. Data mining is set of procedures to find out useful knowledge after analyzing the large data bases. . Predictive modeling is technique to predict from observations. Two phases are involved in it. First is to learn from the observations and second to applicate the learning.

ANN is especially useful for prediction problems where mathematical formula and prior knowledge on relationship between inputs and outputs are unknown. Recently, applications of hybrid ANNs model with statistical methods or other intelligent approaches have received attentions. Examples of such systems are hybrids with Bayesian inference, self-organizing map etc. Since the 1980s, Artificial Neural Network (ANNs) methods have received a great deal of attention and were proposed as powerful computational tools to solve the load forecasting problem.

Electricity demand increases due to the population growth, higher per capita consumption, and rapid development of industrial & commercial sectors, higher Gross Domestic Product (GDP) growth and structural changes in the economy of India with other countries. The underestimation of the demand would lead to potential outages that are devastating to life and economy, whereas the overestimation would lead to unnecessary idle capacity which means wasted financial resources. Therefore, it would be better to model electricity demand with good accuracy in order to avoid costly mischievous.

II. TECHNIQUES USED

A. Data Mining

The methods for load forecasting can be categorized in two ways: Models and methods which follow a classical approach i.e. which apply time series & regression analysis and the models which belong to fields of artificial and computational Intelligence [4]. Time series and regression analysis are called univariate modeling and later are considered as multivariate modeling techniques [3]. In univariate models the load is modeled as function of its past observed values and the exogenous factors are ignored. Multiplicative autoregressive models, dynamic linear, or non- linear models, threshold autoregressive models, Kalman filtering are univariate models. Regression based models are used to figure out the relationship between the load and external factors like weather and calendar information. Mainly linear regression is used. Advantages of this method are that regression methods are relatively easy to implement.

B. ANN

An Artificial Neural Network (ANN) is a computational model that attempts to account for the parallel nature of the human brain. Specifically, it is a network of highly interconnecting processing elements (neurons) operating in parallel.

ANN is trained to minimize the error between the ANN output and the target, resulting in an optimal solution. ANN is most powerful learning model.ANN is also information processing paradigm that is motivated by way biological nervous system, such as brain.

Due to the ability of ANN model to perform pattern recognition, prediction and optimization in a fast and efficient manner, it has become one of the main topics of interest for many researchers to investigate its application in many fields including power system.

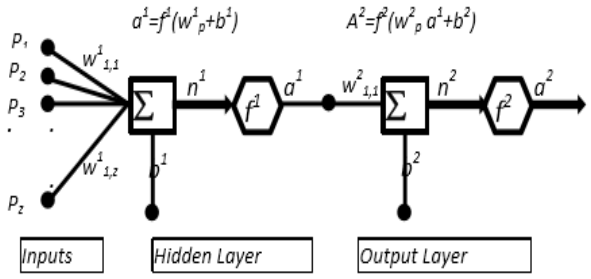

Fig. 1: A 2-layer ANN with multiple inputs and single hidden and output neurons

There are four types of neural networks:

C. Perceptron

This is the neural network with only one neuron having many inputs but only one output.

D. Multi-layered Perceptron

This is the neural network with multiple inputs, multiple hidden layers and multiple outputs. All of them has forward links.

E. Recurrent Neural Networks

This is just same as multi-perceptron but also with backward links from output to input.

F. Self-Organizing maps

This ANN can self-organize itself.

III. SYSTEM ARCHITECTURE

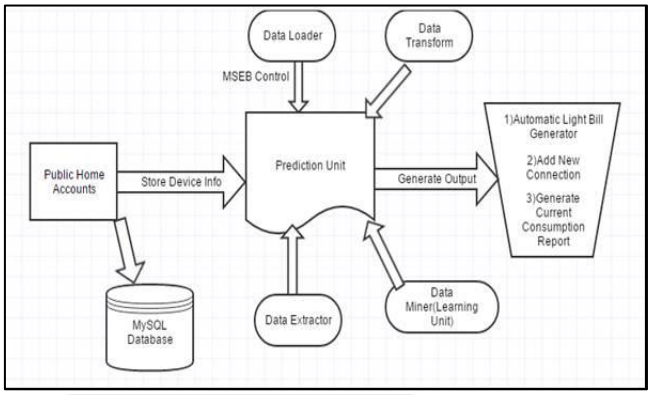

Fig. 2:

All data entered are stored in database and finally fed to the prediction unit which will then predict the electricity consumption with the help of data mining and artificial neural network algorithms. The architecture also has facility to add new connection for new user. It can generate light bill along with current electricity consumption.

IV. COMPARISON BETWEEN EXISTING SYSTEM AND PROPOSED SYSTEM

There are some similarities between Existing System and Proposed System as well as there are some dissimilarities between both of them.
Few points are mentioned below:

A. Existing System

1) Future Electricity Consumption Prediction is very difficult to estimate.
2) Does not provide facility to sending current reading and generate and transfer light bills to public.
3) Not facility to maintain previous and current data records online

B. Proposed System

1) Proposed System estimate and determine current and future electricity consumption.
2) This Project will have ability to sending current reading and light bills between MSEB system and public.
3) Project Have Ability To Maintain Huge Amount Of Previous & Current Data Record.

1) In short:

Parameter	Existing System	Proposed System
Payment	Online	Online
User Account & Information	Not Available	Available
Online bill download	Yes	Yes
Bill Notification	No	Yes, through message
Future Prediction	No	Yes
New Application for account creation	No	Yes
Bill Generation	By Authorized person	Capture & Upload image by user himself

Fig. 3:

C. Advantages over Existing System

1) Meter Reading Send By Public.
2) Generation And Sending of Light Bills.
3) Predict Future Electricity Consumption.
4) Generate Final 2016 & 2017 Report For a specific city.

D. Disadvantages over Existing System

– Big Data Management: As huge amount of data is collected and processed managing such data will be very difficult task for programmers and authorities.
– Internet Connection: User must have internet connection and should be smart enough to use it, as many task are based on internet connectivity like applying for connection, uploading the captured bill photo, downloading and paying bills online.

V. FUTURE SCOPE

Following are some of the major work area where this system can be useful and can improve the way this tasks are carried out by MSEB systems.

– As a future work, this may be extended to predict the agricultural electricity consumption.
– Future Scope of this project will be used by all MSEB System of India.

VI. CONCLUSION

The data mining model for prediction of electricity demand based on the meteorological parameters and public holiday is designed. Proposed System estimate and determine current and future electricity consumption. Also we have proposed the successful idea for creating user account and storing his/her information in database. However this also involve big data management. Also due to use of internet based tasks this also possess some limitations. Future Scope of this project will be used by all MSEB System of India.

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