

# SHORT-TERM LOAD FORECASTING USING ANN TECHNIQUE

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**Abstract** - Load forecasting has been viewed as the initial building block for all the planning efforts. Power industries rely on accurate electricity load forecasting to minimize risks and to optimize output of the industry. For the purpose of optimal planning and operation of an electric power system, there is need for appropriate evaluation of the present and future electric load to avoid losses. Among various techniques, neural network techniques have been recently recognized for short-term load forecasting by a large number of researchers. This paper presents the applicability of this kind of models. The work is targeted to be a basis for a real forecasting application for any power industry. Many statistical and artificial intelligence techniques have been applied to short term electric load forecasting in the past but were disturbed with some limitations. The comparative study of the different models is necessary. We worked out short-term load forecasting for data of Australia using ANN (Artificial Neural Network) technique. It was implemented on MATLAB-15. MLP (Multi-layer Perceptions) was made with input as days and hourly load. Error was calculated as MAPE (Mean Absolute Percentage Error). This paper can be used by any power consuming industry for predicting the future load and would proved to be very useful tool while calculating the load.

**KeyWords:** Load forecasting, Artificial Neural Network, Mean Absolute Percentage Error, Mean Absolute Error, Non Linear.

## 1.INTRODUCTION

The key function of an electric power company is to supply users with high quality electric energy in effective and economical manner. An electric load forecasting is used by an electric power company to forecast the amount of electric energy needed to supply so as to meet up the demand of the users. But to give users uninterrupted supply of electricity there must be perfect analysis of present day and future demand of power. That is the reason a technique is required to interpret about the demand of users and the exact capability to generate the power which is called LOAD FORECASTING technique. Power companies use this to evaluate the amount of power needed to fulfil the demand. There

are certain applications such as energy purchasing and generation, load switching, contract evaluation, and infrastructure development. In order to supply high quality electric energy to the customer in a secure and economic manner, an electric company faces many economical and technical problems in operation, planning, and control of an electric energy system. But it is however a difficult task because of certain reasons.

### 1.1 Necessity of LOAD FORECASTING

For the purpose of optimal planning and operation of electric power system, there is need for proper evaluation of present day and future electric power load.

A large number of mathematical methods and tools have been developed for load forecasting. Accurate and effective models for electric power load forecasting are necessary to the operation and planning of a utility company. Many important decisions like load switching purchasing of electric power can be taken entirely with the help of the load forecasting.

### 1.2 Classification and characterization of load forecasting

Load forecasts can be classified into three categories:

[i] Short-term forecasts: The range varies from one hour to one week.

[ii] Medium forecasts : The range varies from a week to a year.

[iii] Long-term forecasts: The range can be longer than a year.

### 1.3 Important Factors For Forecast

In achieving the accurate load forecasting, the consideration of various factors such as time factor,

past weather data, class of users, load demanded by the region in past, growth of the region, amount of load increased etc, plays the significant role in estimating the demand of load.

**2. ARTIFICIAL NEURAL NETWORK**

ANN is a mathematical model or computational model based on biological neural system. It consists of an interconnected group of artificial neurons and processes information using a connectionist approach to computation. An artificial neural network (ANN) as a computing system is made up of a number of simple, and highly interconnected processing elements, which processes information by its dynamic state response to external inputs. In recent times the study of the ANN models is gaining rapid and increasing importance because of their potential to offer solutions to some of the problems which have hitherto been intractable by standard serial computers in the areas of computer science and artificial intelligence. Neural networks are better suited for achieving human-like performance in the fields such as speech processing, image recognition, machine vision, robotic control, etc

**2.1 Benefits Of Artificial Neural Network**

1. They are extremely powerful computational devices.
2. Massive parallelism makes them very efficient
3. They can learn and generalize from training data – so there is no need for enormous feats of programming.
4. They are particularly fault tolerant – this is equivalent to the “graceful degradation” found in biological systems.
5. They are very noise tolerant – so they can cope with situations where normal symbolic systems would have difficulty.
6. In principle, they can do anything a symbolic/logic system can do, and more.

**3. ACTUAL IDENTIFICATION OF INPUT DATA**

Historical load demand data for year 2006 was used as a reference for prediction and data for holidays is also used for accurate predictions. Data was taken from January 1st 2006 until December 31st 2006. The selection of parameters were taken accordingly to produce the best possible results

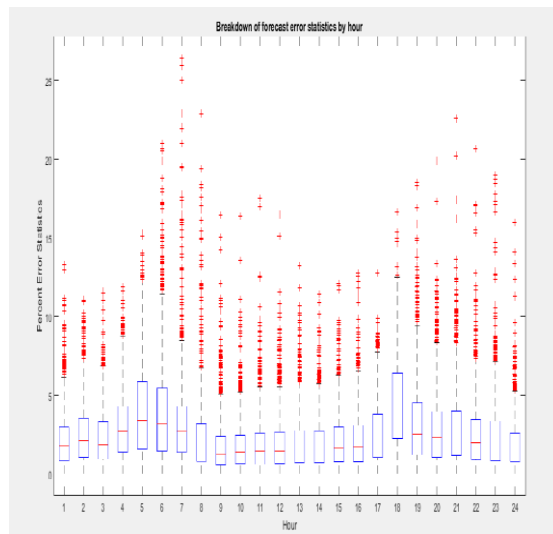
in the predictions.

Preparing a list of holidays of the year to predict particular results for the day.

Choose the best range of data to train .

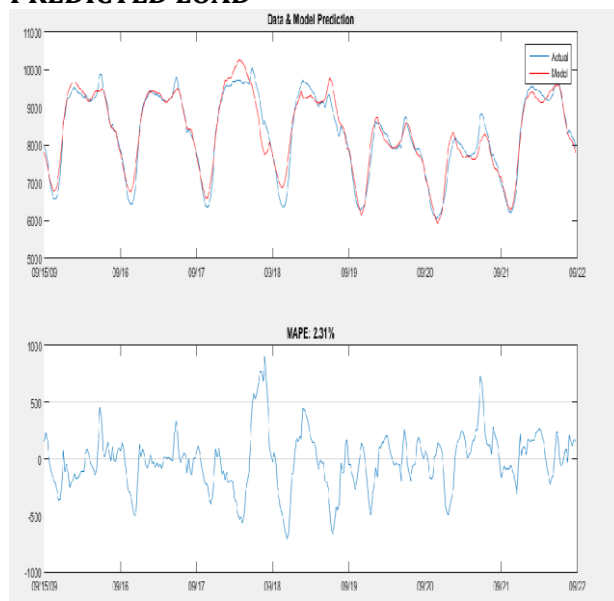
MATLAB can be trained by typing out the right profile or pattern for each day. MATLAB 10 has been used by us carry out our work.

Based on the data we have plotted the graph shown below using Microsoft Excel 2007.



**Fig -1:** This graph shows the actual variation of load for 24 hrs of Friday, Saturday and Sunday

**4. COMPARISONS OF ACTUAL LOAD AND PREDICTED LOAD**



## 5. CONCLUSION

Electric load forecasting for the year 2006 has been carried out and the future load has been predicted using the trained neural network. Actual data was the actual energy consumed .We have used MATLAB.10 for prediction of load.

The model was able to determine the nonlinear relationship that exists between the historical load data and temperature. With forecasted average temperature for the forecasting day, the model could make a prediction of the next day (hourly)load.

## 6. RESULTS

Mean Absolute Percent Error (MAPE): 2.65%

Mean Absolute Error (MAE): 233.62 MWh

Daily Peak MAPE: 2.65%.

## 7.FUTURE SCOPE

Future studies on this work can incorporate additional information (such as customer class and season of the year) into the network so as to obtain a more representative forecast of future load. Network specialization (i.e. the use of one neural network for the peak periods of the day and another network for the hours of day) can also be experimented upon.

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