



## ORIGINAL RESEARCH PAPER

## Engineering

### A TECHNOLOGICAL LITERATURE REVIEW ON LOAD FORECASTING IN POWER SYSTEM USING ARTIFICIAL INTELLIGENCE

**KEY WORDS:** Load Forecasting, Power System, Particle Swarm Optimization, Artificial Intelligence, Fuzzy Logic, Artificial Neural Network, Intelligent systems.

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#### ABSTRACT

This paper reports a technological literature review on various methods of load forecasting using Artificial Intelligence. Artificial Intelligence means to make the computers think. Artificial intelligence includes different technologies but not limited to, fuzzy logic, neural networks, genetic algorithm and swarm intelligence. Genetic algorithm is a method for moving from one population of chromosomes to a new population by using a kind of natural selection. Swarm intelligence is a specialization in the field of self organizing systems. Genetic algorithm can also be applied to problems with a large number of variables. Swarm intelligence uses the behaviour of non-human living species for solving of problems. Behaviour of self organization by a group of social insects is known as Swarm Intelligence. Neural network intelligent systems are being developed on the basis of functioning of the human brain. A neuron is the fundamental unit of the brain. The first fuzzy logic controller was used for controlling a steam generator. Load forecasting is the prediction of future loads of a power system. It is an important component for power system energy management. Precise load forecasting helps to make unit commitment decisions, reduce spinning reserve capacity and schedule device maintenance plan properly. Besides playing a key role in reducing the generation cost, it is also essential to the reliability of power systems. By forecasting, experts can have an idea of the loads in the future and accordingly can make vital decisions for the system.

#### I. INTRODUCTION

Intelligence is the ability of humans to demonstrate their intelligence by communicating effectively. Artificial Intelligence is both an art and science. The Intelligent systems possess ability to use knowledge to solve problems, capacity to deal with complex problems, ability to handle any type of vagueness, capability to solve complex optimization problems. Fuzzy systems can focus on modeling problems having imprecise or ambiguous information. Artificial neural networks can model the behavior of biological neural networks. Artificial Neural Networks are proving their supremacy over other traditional forecasting techniques and the most popular artificial neural network architecture for load forecasting is back propagation. This network uses continuously valued functions and supervised learning i.e. under supervised learning, the actual numerical weights assigned to element inputs are determined by matching historical data (such as time and weather) to desired outputs (such as historical loads) in a pre-operational "training session". The model can forecast load profiles from one to seven days.

#### II. LITERATURE REVIEW

**[1] Pradeepta Kumar Sarangi, Nanhay Singh, R. K. Chauhan and Raghuraj Singh** said that load forecasting holds a great saving potential for electric utility corporations since it determines its main source of income, particularly in the case of distributors. Precise load forecasting helps the electric utility to make unit commitment decisions, reduce spinning reserve capacity and schedule device maintenance plan properly. It is therefore necessary that the electricity generating organizations should have prior knowledge of future demand with great accuracy. Some data mining algorithms play the greater role to predict the load forecasting. This research work examines and analyzes the use of artificial neural networks (ANN) and genetic algorithm (GA) as forecasting tools for predicting the load demand for three days ahead and comparing the results.

**[2] Saeed M. Badran, Ossama B. Abouelatta,** This paper combined artificial neural network and regression modeling methods to predict electrical load. We propose an approach for specific day, week and/or month load forecasting for electrical companies taking into account the historical load. Therefore, a modified technique, based on artificial neural network (ANN) combined with linear regression, is applied on the KSA electrical network dependent on its historical data to predict the electrical load demand forecasting up to year 2020. Application results show that the proposed method is feasible and effective.

**[3] Salman Quaiyum, Yousuf Ibrahim Khan, Saidur Rahman, Parijat Barman** have presented several neural network models for

short-term load forecasting were studied in this work. According to the discussion and the comparison of model forecast accuracy shows that Particle Swarm Optimized Elman Recurrent Neural Network (PSOERNN) is the best model for 168 hours ahead load forecasting. This type of network can be very efficient in terms of predicting future loads.

**[4] Shijie Ye1, Guangfu Zhu1, Zhi Xiao2** said that Long-term load forecasting (LTLF) is a challenging task because of the complex relationships between load and factors affecting load. However, it is crucial for the economic growth of fast developing countries like China as the growth rate of gross domestic product (GDP) is expected to be 7.5%, according to China's 11th Five-Year Plan (2006-2010). In this paper, LTLF with an economic factor, GDP, is implemented. A support vector regression (SVR) is applied as the training algorithm.

**[5] Badar Islam,** This paper picturesquely depicts the comparison of different methodologies adopted for predicting the load demand and highlights the changing trend and values under new circumstances using latest non analytical soft computing techniques employed in the field of electrical load forecasting. A very clear advocacy about the changing trends from conventional and obsolete to the modern techniques is explained in very simple way. Load forecast has been a central and an integral process in the planning and operation of electric utilities.

**[6] Vinutha H D, K C Gouda, Chandan K N** said that the electric Power industry is currently

undergoing an unprecedented reform. One of the most exciting and potential benefit of recent developments is increasing usage of artificial intelligence techniques. The intention of this paper is to give an overview as well as the techniques for the Short term load forecasting using the

weather parameter like rainfall and implementing a neural network techniques in the power systems. This prediction shows a combined approach of predicted rainfall and the ANN will help for the better forecasting of electric load at city scale.

**[7] Amera Ismail Melhum, Lamya abd allateef Omar, Sozan Abdulla Mahmood** said that Load forecasting helps an electric utility to make important decisions including decisions on purchasing and generating electric power, load switching, and infrastructure development. Load forecasts are extremely important for developing country like Iraq, financial institutions, and other participants in electric energy generation, transmission, distribution must be studied and took a good attention. This work

analyzes and discusses a comprehensive approach for Short Term Load Forecasting (STLF) using artificial neural network. Control in Iraq. Four ANN models are implemented and validated with reasonable accuracy on real electric load generation output data.

**[8] Ankita Shrivastava and Arti Bhandakkar,** This paper proposes a neural network approach for forecasting short-term loads. Three ANN- techniques – Radial Basis Function Neural Network, Feed forward Neural Network and Cascade- Forward Neural Network are discussed in this paper. Their performances are evaluated through a simulation study. Historical Load Data from the Load Dispatch Centre Jabalpur are used for training, testing and showing the good performance of the proposed method.

**[9] Pituk Bunnoon, Kusumal Chalermyanont, and Chusak Limsakul** have presented the review of the computing models applied for solving problems of mid-term load forecasting. The load forecasting results can be used in electricity generation such as energy reservation and maintenance scheduling. Principle, strategy and results of short term, midterm, and long term load forecasting using statistic methods and artificial intelligence technology (AI) are summarized, which, comparison between each method and the articles have difference feature input and strategy.

### III.CONCLUSION

With the rapid growth of power system and the increase in their complexity of the networks, load forecasting plays a vital role in economic operation of power systems, network planning and infrastructure development. Electricity demand forecasting is concerned with the prediction of a very short term, short term, medium term and long term load demand, depending on the time horizon. This paper presents an application of neural network for real time short term load forecasting and has been compared with the conventional exponential smoothing technique. In this paper technological literature survey on load forecasting in power system using AI has been done. ANN will help for the better forecasting of electric load at city scale.

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