# Neural-Wavelet Based Hybrid Model for Short-Term Load Forecasting

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**Abstract**
Exactly power load forecasting especially the short term load forecasting is of important significance in the case of energy shortage today. Conventional ANN-based load forecasting methods deal with 24-hour-ahead load forecasting. In this research, the application of neural networks to study the design of Short Term load Forecasting (STLF) Systems for 33 kv Substation of Dayalbagh Educational Institute, Agra was explored. The paper has introduced the neural networks and how we can use it to forecast electric power load. This paper proposes a model developed through neural-Wavelet for prediction of short-term load forecasting.
**Keywords:** Wavelet transform, ANN, Load forecast, Short-term load forecast

## 1. INTRODUCTION

Currently, power utilities are using various load forecasting techniques worldwide. Most of the developed methods can be broadly categorized into three groups, namely parametric, nonparametric, and artificial intelligence based methods. In the parametric methods, a mathematical or statistical relationship is developed between the load and the factors affecting it. Some examples of these models are time functions, polynomial functions, linear regressions, Fourier series and Auto Regressive Moving Average (ARMA) models. In time-series methods, the load is treated as a time series signal with known periodicity such as seasonal, weekly, or daily. Such repetitive cycle gives a rough prediction of the load at the given season, day of the week, and time of the day. The difference between the estimated and actual load can be considered as a stochastic process, which can be then analyzed using Kalman filter methods. Nonparametric methods forecast the load directly from historical data. For example, using nonparametric regression, the load can be forecasted by calculating an average of historical loads and then assign weights to different loads using a multivariate product kernel.

Recently, significant interests and efforts have been directed towards the application of artificial intelligence techniques to load forecasting. This includes the application of expert systems to load forecasting, and comparing its performance to traditional methods. It also includes the use of fuzzy inference and fuzzy-neural models.

However, the models that have received a high share of efforts and focus are the artificial neural networks (ANNs). The main advantage of ANNs is their outstanding performance in data classifications and function approximation. ANN is also capable of detecting dependencies from historical data without the need to develop a specific regression model. First publications on ANN application to the load forecasting problem were made in late 1980's and early 1990's. Since then ANN have been well accepted in practice, and are used by many utilities[11].

Several researchers preferred differential applications. The paper ref. [1] shows the hybrid model based on wavelet support vector machine and modified genetic algorithm penalizing Gaussian noises for power load forecasts, furthermore a short-term load forecasting by using similar day-based wavelet neural network [2]. In ref. [3], the intelligent hybrid wavelet models for prediction. In 2009, the combination of wavelet transform and neuro-evolutionary algorithm approach to demand forecasting [4]. In 2008, the research shows an adaptive wavelet neural network-based energy price forecasting in electricity markets [5] and in the year 2006 the wavelet based nonlinear multi-scale decomposition model [6]. In ref. [7], in the same year, the researcher proposes techniques of applying wavelet transform into combined model for demand forecasting in electricity. In research ref. [8], presents an adaptive neural wavelet model and in ref. [9] proposes a hybrid wavelet-Kalman filter method for load forecasting. Lastly, the wavelets transform and neural networks for short-term electric load forecasting are proposed [10]. All of the researches above were proposed load and price forecasting by using wavelet transform and neural network algorithm but did not present in sub-control center area forecasting.

In this research, proposes the Neural Network-Wavelet (NNW) Short term Load forecasting, implemented by using wavelet transform in preprocessing stage of all areas and neural network for forecasting in the last process. In preprocessing stage, wavelet transform is used to decompose the original signal of demand into one to four levels and after that will take it to find the relationship between factors and demand before choosing the suitable factors for feature input for neural to prediction. Finally, this paper presents the comparison between the different soft computing techniques for STLF based on root mean square error (RMSE).

This article proposes the four major sections. The second section offers an implementation of the research stages.

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