Short Term Load Forecasting Using Different AI Techniques

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***Abstract*—— Load forecasting is very important and necessary for operation and planning of any power system for load flow study also. How good the load forecasting accuracy is better for any power system for reliability and healthiness of the system. In our small house, there is very difficult to predict how much amount of food is required in each meal for only four persons. Then we can easily understand that it is how much difficult to find out how much amount of power is required for the dynamic load. To solve this kind of situations or to overcome the problem there is some techniques are developed for load forecasting. There are serval methods are used to assume the load for consuming each day or month or for the year. This is called a short term, medium term or long-term load forecasting for the power system. In this paper, we are focussing the artificial intelligent method called AI methods for solving the short-term load forecasting STLF. In this method, there are different sub-methods also classified. In this paper, we are using fuzzy logic for STLF. To measure the system under the different approaches, make more accurate rather than one individual system in this paper we are focusing on fuzzy logic but we also try to compare with other approaches also like time series solution and Fourier series also. In the AI there is also isotopic and collapse result are undefine with the event. Thus, in concluding we can say that if there is AI is a very practical approach to find out the short-term load forecasting with an integral solution.**

Keywords—Artificial Intelligence, fuzzy logic, genetic algorithm, ANN

I. INTRODUCTION

In any massive power system load forecasting is extremely essential for efficient further as economical operation point of view. The dependability of the power system and security is additionally stricken by the nearer load prognostication of the load demand. Demand forecasting conjointly vital for formation of resources and also vital for designing and development of entire power system. There are several factors are affecting on the demand side which never kept in a constant manner. Closer pattern observation may be possible after analyse of serval years of data with the different conditions. Load determining techniques is crucial when the market is temperamental with the unstable global and regional situations. The cost of the unit production is also one of the considerable parameters for the possible load demand forecasting for economical operations. [4] Some uncertain constants gradually affect the demand side which can be distinguished by the appropriate method of forecasting. There are several assigned methods are available in the market to get the keen result of the demand. Such methods depend upon the demand for accuracy and available data from the resources from the undivided system.

The estimation of the load also depends upon the continuance of the time period of analysis. The short-term load forecasting is enormously visible at some time zone while the medium and long-term load forecasting gets a much immeasurable consequence for the certain time zone of the definite region. The aim of this review paper is to correlate, evaluate and distinguish the various load forecasting methods in general practice. In this paper, the significant techniques are comprised by abrupt content of

knowledge of individual section. The consequent subdivision further covered the brief aspects of the topic It also carries the outline from these various techniques like AI methods, Knowledge-based Expert System, Composite or hybrid systems, Analytical or statistical techniques and time series based graphical methods. In this paper, the primary focus is support over on the AI side techniques because of the modern trend in the market. It also a useful methodology for large power system where greatly enormous data has to be measured for the forecasting in significant time amount for estimations.

II. DIFFERENT TEQUNIQUES FOR SHORT TERM LOAD FORECASTING

There are a variety of techniques are available for studies like regression model, graphical method, artificial neural network, fuzzy logic, a hybrid method like neuro-fuzzy and statical methods also used to determine short-term load forecasting. But in this paper, we only focus on three popular methods ANN, fuzzy logic and genetic algorithm-based expert system.

A. Artificial Neural Network:

The artificial neural network is in trendy nowadays for STLF.ANN is partially based on the working of the human brain. In the human brain, there is complex decisions are done with the help of neurochemical signals. This approach is broadly recognized with the distinct algorithm meanwhile beginning in the early '90s hence this method is quite extended and carefully integrated with the AI system nowadays. Filipe Rodrigues et al. [1] used the forecasting algorithm like Levenberg-Marquardt for calculation the hourly based and day based blind data selection. E. Chogumaira and T. Hiyama [2] used this method to improve the data accuracy with previous year data and current scenario price of the market to determine the cost of the electricity. Chnag [3] determine an RBF NN approach to forecasting the STLF of the grid system.Gao et al. [4] present the patterns of ARIMA and ANN which are related to the further future load demand for up to 7 to 8 weeks ago in UK utility power grid. R. Behera, B. Panigrahi and B. Pati [6] also states that the developing country like India can be conflicted by the AI methods and the result can be a conflict the current scenario as the graph of such a problem depends upon several unexplored parameters. H. S. Hippert et al. [6] observed the serval research papers for evaluating the NN methodology to understand the working counter and examination of such techniques and also check the performance. Yamin, et al. [7]

proposes a list of factors influencing the load demand and similarly observe the unit price which concerns the modern load scenario similar weather data, evaluation of technology, load factor etc.

B. Fuzzy Logic:

T. Helmy et al. [8] explained that fuzzy rules can be interpreted dynamic equations in a comprehensive practice with the help of nonrelevant and fuzzy data set and also node the inaccessible combination of data with logical way. Xiaojuan Liu et al. [9] presented that WTVS techniques are much efficient than traditional TVS style fuzzy membership can be substituted with effective data which correlate the situation and the outcome based on the coefficients. S. Sachdeva et al. [10] described a general practice that concludes the counter of the fuzzy inference and fulfils the power system much durable and responsive in changing contingencies. Xiao et al. [11] observed ionospheric SLTF and measure the range between these pair layers which similar illustrate the unknowns load point in an extended system. A. Yona et al. [12] used the AR and KF methods to measure the consequence of wind power production based on the wind field and estimate the outcome for a few seconds. V. H. Hinojosa and A. Hoese [13] applied for future load prediction. The temperature and humidity, the Previous load has corresponded for future load determination. They also note the relation between neuro-fuzzy and ANN and compare the respective results with the deterministic model. G.-C. Liao and T.-P. Tsao [14] assessed the statically and ML model correlated with the grey model and conclude the result with each combination and minimize the error and also reached the relevant data. They also estimate the vector regression of the inputs and do a comparative analysis of the methodology. S. Rahman and R. Bhatnager [15] reviewed with specific data and syntactical connections with the 24 hours with four corresponding data division and associate the result with the study. T. Helmy et al. [16] also estimate the AAE (absolute average error) with reference to the algorithms. The statically data convey the minimum deviation with the load curve and make assumption curve quite smooth. H. Hahn et al. [17] present the study about the various logistic methodology for active composite type STLF. They also mention about the sequential error diminishing systems and cumulative error detecting techniques throughout the expert and fuzzy based data manipulation.

C. Genetic Algorithms:

the The GA has a comprehensive influence of outcome than a general solution like EA and MA..Limin Huo et al. [18] compare the GA with time series approach for STLF after gathering the study it's clearly noted that GA has a satisfying outcome than time series. Z. H.Rong et al. [19] presented the algorithm based on humidity and atmospheric temperature for assessing the regional and grid-based load prediction which are manipulated by the additional dynamic circumstances also. G.C.Liao et al. [20] proposed the fuzzy integrated system with chaos-search GA and it consolidates with the simulated annealing (SA). They also present the comparative analysis about FHCNN method with simply FCS with a specific standard dataset. They observed the degree of precision is much higher in FHCNN. S. Ye et al [21] A support vector regression (SVR) is implemented as the practice algorithm to get the nonlinear correlation among demand and the commercial part of GDP to enhance the precision of forecasting. R. Beheraet al. [22] it has been recommended that consideration of serval years data for a developing nation should be neglected as the growth of a nation is extremely changeable. Still, the effect of prior data should not be neglected. Here, now previous few years of data are practiced to ascertain the earlier circumstances. Here training ought to be provided to extemporize the precision of electrical measurement forecasting recognizing the factors, past data of the load, corresponding climate situation and commercial maturity of the region. This paper represents the importance of a logical model of extrapolation and substitution plans for STLF of an Indian grid station. D. Chaturvedi et. al [23] STLF obtained by a generalized neuron wavelet transform method is presented. The submitted method consists of soft computing method. The WT breaks upload time series into basic and feature parts to be the points for common methodology Generalized Neurons Network (GNN).

III. CONCLUSION

This paper presented three Artificial Intelligent based methods (ANN, Fuzzy logic and GA) to deal with STLF the problem which is identified as one of the most significant difficulties in regulating supply and need for power. For the objective of enhancing the performance of AI-based techniques, all of them were implemented with data pre-processing theories. Outcomes determined that due to the greater practice process, data pre-processing significantly updated forecasting ability of all AI-based techniques. Furthermore, the ANFIS approach gave lower MAPE values than ANN and GA, so it can be considered as a promising alternative for dealing with STLF problems.

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