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# THE SHOT-TERM LOAD FORECASTING WITH ARTIFICIAL NEURAL NETWORK MODELS

It is crucial to understand the electric power industry before tackling the electric load forecasting problem. The fundamental characteristic that makes the electric power industry unique is the product, electricity. More specifically, it is the limited storage capability of electricity that makes it distinctive. Power systems have to be built to meet the maximum demand, the so called peak load, to insure that sufficient power can be delivered to the customers whenever they need it. In transmission and distribution systems, the capacity of any equipment has to exceed the peak demand of all the downstream customers it serves. It is due to this nature that many utilities are concerned with the forecasting quality of peak loads more than that of the off-peak ones [2].

Load forecasting is very important for the power system planning and security. There are three types of load forecasting: short-term, middle-term and long-term load forecasting [1, p. 66]. Load forecasting is a difficult task. The first reason is because the rows of electrical loadings are difficult and some levels of seasonality are shown. Secondly, there are many important variables which should be considered during forecasting, especially those variables that are connected to weather. During the last several years new concepts of energy planning and management such as decentralized planning, energy conservation through improved new technologies, integrated energy planning, introduction of renewable energy sources and energy forecasting have emerged.

As stated above short-term load forecasting is an important factor in the planning and operation of power system. Because it is necessary to provide the readiness of the generating units to provide electricity supply to consumers if before the large power consumption was not expected. On the generator side, the power waste could occur if the power that generated is greater than the use of electricity at the consumer side. On the consumer side, the power blackout can occur if the power that raised less than the electricity needs of consumers.

Short-term load forecasting is to predict the hourly loads, one day or even one week. Many methods have been developed for the forecasting. They are based on various statistical methods such as regression. The most popular and developing method is the short-term load forecasting with artificial neural network models.  Neural networks are currently finding practical applications, ranging from 'soft' regulatory control in consumer products to accurate modelling of non-linear systems.

Application of neural networks gives the chance of fast creation of the model without involvement or with the minimum involvement of the expert, enables to work with noisy data. Besides, this method enables to work with small selections and that is also an actual problem due to the lack of statistics about power consumption for the last periods.

Artificial neural networks are the devices based on parallel processing of information by all links. They have the ability to learn and to generalize the accumulated knowledge. Lines of machine intelligence are inherent in neural networks. The network trained on limited set data is capable to generalize the acquired information and to show good results on the data not used in the training activity.

At the initial stage of the first decision made about the implementation of artificial neural network is the choice of network type. Feed-forward neural network is the mostly used neural network model for time series data forecasting. Feed-forward neural network model in statistics modelling for time series forecasting can be considered as a non-linear autoregressive model. This model has a limitation, which can only represent autoregressive effects in time series data. The selection of the artificial neural networks model architecture depends on the problem to be solved. The architecture includes the number of inputs, number of outputs, number of layers, number of neurons in each layer, etc. The number of layers and the number of neurons within each layer depends on the efficiency of the learning rule. The trial and error process is carried out until the error (the difference between the desired output and actual output) is reduced to an acceptable level [3, p. 40].

The main idea of the indistinct neural networks is that existing data sampling to determine the parameters of accessory functions which best of all correspond to the system of a logical output is used; that is the outputs are drawn on the basis of the device of fuzzy logic. And algorithms of training of neural networks are used to find the parameters of accessory functions. Such systems are able to use known information in advance; to be trained, to acquire new knowledge, to predict time series, to execute classification of the images and besides they are quite evident for the user. So the method of short-term load forecasting with the artificial neural network is one of the most perspective methods.

In turn the prediction of electrical loading is based on the accounting of properties of predicted process. The principal feature of loadings of a power system is a certain recurrence of selections characterizing them depending on a day of the week and month.

Literature:

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