

# Electricity Load Forecast using Artificial Neural Networks Clustering

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## Abstract

Forecasting the electricity load is important for the efficient and safe management of the electrical generation system of a country. The accurate predicted maximum and minimum daily loads enables the operators to schedule maintenance of units. In this EUNITE network competition, the half-hourly electrical loads data of the 1997-1998 years, together with the daily temperature is provided, and the participants are required to predict the maximum electrical load of January 1999.

In this paper, I used the ability of artificial neural networks (ANN) to classify patterns without supervision. The auto-associative variant of ANN (AA-ANN) can build a model that predicts it's inputs as outputs. The analysis of the "hidden neurons" outputs of the trained 48-5-48 AA-ANN model can cluster similar patterns of the half-hourly record of the electrical load.

31 clusters were identified, and the date and temperature attributes of these clusters, enabled to label them 4 sub-clusters were identified containing most of the 1997 and 1998 January data. The daily temperatures did not influence the clustering, as January 1997 was somewhat colder than January 1998, but the clustered daily patterns are similar. However, the correlation coefficient of the load with the temperature for weekdays is about -0.75, while for weekend and holidays is about -0.44.

The 4 sub-clusters January 1999 labels are "Sundays and Holidays", "Saturdays", "Weekdays (Mondays, Fridays)", "Weekdays (Tuesdays-Thursdays)". The predicted average maximum of the half-hourly load of these sub-clusters was multiplied by a factor of 1.03 to adjust for the average load increase during the year, and the average expected temperature decrease of, January 1999, as calculated from the December 1998, December 1997 ratios.

The Sundays and Holidays predicted maximum load is 741 MW, the Saturday and Holiday Eve predicted maximum load is 765 MW, Mid-weekdays predicted maximum load is 798 MW, and Mondays and Fridays predicted maximum load is 770 MW. In actual practice the predicted next day temperature, using the above coefficients, would adjust these values daily.

(Full paper to follow ASAP. Sorry, I am traveling now in Sydney)

Date	Day	Cluster #	Max-Load
	1	-6	1 741
	2	7	2 765
	3	1	1 741
	4	2	5 798
	5	3	2 765
	6	-4	1 741
	7	5	3 770
	8	6	5 798
	9	7	2 765
	10	1	1 741
	11	2	5 798
	12	3	3 770
	13	4	3 770
	14	5	3 770
	15	6	5 798
	16	7	2 765
	17	1	1 741
	18	2	5 798
	19	3	3 770
	20	4	3 770
	21	5	3 770
	22	6	5 798
	23	7	2 765
	24	1	1 741
	25	2	5 798
	26	3	3 770
	27	4	3 770
	28	5	3 770
	29	6	5 798
	30	7	2 765
	31	1	1 741