

MOTIVATION



Minimize financial loss

Contribute the stability of
Turkish Electricity Market

CURRENT SYSTEM

In KEPSAŞ, hourly electricity consumption forecast is done in intuitionist
way. The company does not have any systematic way of forecasting.

METHODOLOGY

APPROACH 1 :

Deep Neural Networks
and Python Programming
LanguageData set feature columns: Days, months,
hours, special holidays, weather variables
and past values of consumption

METHODOLOGY

APPROACH 2 :



Figure 1: Regression by Classification Splitting Decision Scheme

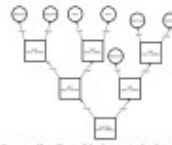
7 final submodels are built and there are 13 different ML models integrated.
Classifications in the methodology are done via Random Forest, and
regressions are done via MLP (Multi-Layer Perceptron).

Figure 2: Flow Chart of the Dataset in the Case Study

RESULTS

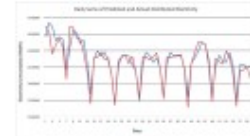


Figure 3: Predicted and Actual Electricity Distribution Amounts

Table 1: Daily MAPE Comparison with the Forecasts of the Company

Date	MAPE (Company)	MAPE (Ours)	Revenue
Monday	2.34	1.36	0
Tuesday	1.29	1.14	0
Wednesday	2.42	2.51	0
Thursday	1.95	1.16	0
Friday	2.25	1.29	0
Saturday	4.1	2.1	0
Sunday	2.42	2.81	0

Table 2: Hourly MAPE Comparison with the Forecasts of the Company

Hour	MAPE (Company)	MAPE (Ours)	Revenue
1	1.86	1.81	1.12
2	1.71	1.76	1.14
3	1.71	1.71	1.14
4	1.81	1.81	1.14
5	1.86	1.86	1.14
6	1.71	1.71	1.14
7	1.71	1.71	1.14
8	1.71	1.71	1.14
9	1.71	1.71	1.14
10	1.71	1.71	1.14
11	1.71	1.71	1.14
12	1.71	1.71	1.14
13	1.71	1.71	1.14
14	1.71	1.71	1.14
15	1.71	1.71	1.14
16	1.71	1.71	1.14
17	1.71	1.71	1.14
18	1.71	1.71	1.14
19	1.71	1.71	1.14
20	1.71	1.71	1.14
21	1.71	1.71	1.14
22	1.71	1.71	1.14
23	1.71	1.71	1.14
24	1.71	1.71	1.14

1

The pattern of electricity consumption depends on many different parameters such as seasons,
hours, weekdays, holidays, temperature and etc. Due to complexity of the forecast, the exper-
ience based forecasting method is not sustainable. The company needs systematic forecasting
method

2

KEPSAŞ does not have any study related to electricity price and they just operate in intra day
market according to their personal experience. In order to operate in intra day market more
actively, the company need to forecast electricity prices.

PROBLEM DEFINITION

MOTIVATION

To compensate the error made in the day ahead market, the companies
should be actively participate the intra day market. When they operate
in that market, they need to forecast system marginal prices to make
lucrative transactions.

CURRENT SYSTEM

Due to various factors affecting electricity prices, it is very hard to make
an accurate price forecast. Electricity companies need to forecast the
prices in order to compensate the forecast errors made in day ahead
market. However, KEPSAŞ does not have any price forecasting system
yet.

METHODOLOGY

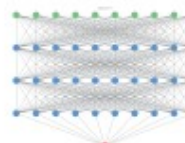
Differently from the consumption dataset, price dataset mainly focuses
on past values of the price, as SMF value depends on the PTF price and
electricity consumption values. Deep Neural Networks were used.

Table 3: Hyperparameters of the Model for Price Forecasting

Hyperparameter	Value
Layer Numbers	1, 2, 3, 4, 5
Nodes Numbers	100, 200, 300, 500, 1000
Epoch Numbers	100, 200, 300, 400
Batch Size	64, 128, 256
Activation Function Types	ReLU, ELU, Sigmoid
Optimizer Types	Adam, Adagrad

RESULTS

Table 4: MAPE of Hourly Price Forecasts

Hour	Average	Minimum	Maximum
1	18.10%	1.07%	181.07%
2	18.04%	1.06%	181.06%
3	18.06%	1.07%	181.06%
4	18.04%	1.07%	181.04%
5	18.04%	1.07%	181.04%
6	18.04%	1.07%	181.04%
7	18.04%	1.07%	181.04%
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