

INESC TEC - Report III

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1 Introduction

This report presents the results of the two experiments, one without the lines and generators statuses variations, and the other with these variations. Sections 2 and 3 explain, respectively, the details of the first and second experiments. For last, Section 4 shows the results obtained.

2 First experiment

The first experiment, without the statuses variations, only used the following input features: (1) Carga subrede de 138 kV, (2) Potência solar gerada subrede 138 kV, (3) Potência eólica gerada subrede 138 kV, (4) Carga subrede de 230 kV, (5) Potência solar gerada subrede 230 kV, (6) Potência eólica gerada subrede 230 kV. As presented on the Report I, the architecture maintained the same.

3 Second experiment

The second experiment, which contained all the statuses, used the previous input features combined with generator and line status from the 138kV grid.

The architecture differed from the first experiment in the sense that: (1) there was no addition in the dataset from the output of the "Magnitude tensão barramento" features to predict the others, (2) each neural network also had to take into account the statuses, increasing the neurons from the first layer from six to 81, and (3) there was no feature augmentation given the already high count of features.

As for the hyperparameters, the batch size was changed to 30 and the epoch to 20.

4 Results

Table 1 presents the results obtained in both experiments. Apart from the feature "Potência ativa injetada barramento 24", all other errors from the second experiment were smaller than the first experiment, most likely due to the data richness that the statuses variations give.

In order to help the analysis of the results, the description of the output data used in the first and second experiments are present on tables 2 and 3

Table 1: RMSE results for the two experiments

Feature	First experiment	Second experiment
Magnitude tensão barramento 11	0.0059	0.0045
Magnitude tensão barramento 12	0.0054	0.0046
Magnitude tensão barramento 24	0.0057	0.0045
Potência ativa injetada barramento 11	4.0167	5.3641
Potência ativa injetada barramento 12	4.3976	3.3335
Potência ativa injetada barramento 24	3.6511	4.8684
Potência reativa injetada barramento 11	7.4950	4.7233
Potência reativa injetada barramento 12	6.9905	3.9030
Potência reativa injetada barramento 24	2.8054	1.8658

Table 2: Description of the output dataset used in the first experiment

	mean	std	min	max
Magnitude tensão barramento 11	0.996569	0.021639	0.952364	1.034885
Magnitude tensão barramento 12	0.997564	0.021008	0.953941	1.032754
Magnitude tensão barramento 24	0.993244	0.021868	0.950000	1.022086
Potência ativa injetada barramento 11	44.794038	32.318890	-27.531718	159.904392
Potência ativa injetada barramento 12	65.017462	46.834371	-45.061452	233.978721
Potência ativa injetada barramento 24	98.531922	53.707492	-29.154621	261.648979
Potência reativa injetada barramento 11	-15.602551	11.060453	-34.601205	16.029554
Potência reativa injetada barramento 12	-3.119726	15.983727	-30.758948	47.883536
Potência reativa injetada barramento 24	25.755603	10.808798	-0.197103	57.932657

Table 3: Description of the output dataset used in the second experiment

	mean	std	min	max
Magnitude tensão barramento 11	0.930757	0.245329	0.000000	1.037192
Magnitude tensão barramento 12	0.932674	0.245811	0.000000	1.040975
Magnitude tensão barramento 24	0.928119	0.244779	0.000000	1.050000
Potência ativa injetada barramento 11	61.921753	74.191413	-141.873767	465.782920
Potência ativa injetada barramento 12	91.009106	60.936221	-82.386932	466.262804
Potência ativa injetada barramento 24	69.871945	52.058470	-26.491069	273.246314
Potência reativa injetada barramento 11	-0.993731	21.132315	-45.583309	81.584726
Potência reativa injetada barramento 12	2.929570	19.695334	-39.121608	70.183933
Potência reativa injetada barramento 24	19.667142	11.887073	-4.390776	68.135129