Hands on Lab 1

A Gentle and Practical Introduction to Neural Networks

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Abstract

You will perform in this lab the classification task using neural network models. First, you will use existing libraries where everything is ready to use (Keras[*]). Next, you will build your own neural networks and train them using Theano[†]. Provide the result that you find.

Keep your code clean and modular as possible. You will re-use it later.

At each Exercise/question, describe how did you proceed to solve the problem.

1 Exercise 1

Neural networks for classification over Mnist dataset.

1. Install Keras. How?
2. Download Mnist dataset from here: `https://sbelharbi.github.io/otherdocs/teaching2016-20` `ASI4/datasets/mnist.pkl.gz`
3. How did you download it?
4. Give a description of the dataset Mnist. (what are the pertinent information about this set?).
5. Build different neural network models (using different number of hidden layers, different number of neurons). Start from smaller networks to bigger ones.
6. What it the size of each model? (i.e. the total number of parameters)

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[*]https://keras.io/

[†]http://deeplearning.net/software/theano/

7. Train them using few/a lot of training examples. When you select only few samples samples, how did you do it? Save the model. Compare.
8. Plot the training loss and validation loss. Describe your strategy for the learning rate. Do you see any over-fitting?
9. When did you stop training? why?
10. Find the best model for your problem. How did you do it?
11. Load the saved models. Evaluate them.
12. Use regularization. Is there a difference? how did you fix the regularization coefficient?

2 Exercise 2

Same questions as in Exercise 1, but this time you will build your own neural networks and you will train them by yourself using Theano.