Artificial Neural Networks (Gerstner). Laboratory for week 2

Week 2: Setup, XOR

0. Setting up

Setup your computer so that you can run Keras in a jupyter notebook. You can either install Keras on your machine (using pip for example) or use the Docker image we provide. Instructions are on Moodle.

1. XOR

For this exercise, you will implement an ANN that model an XOR gate[1]. This exercise will allow you to get use to symbolic programming and the Keras frontend.

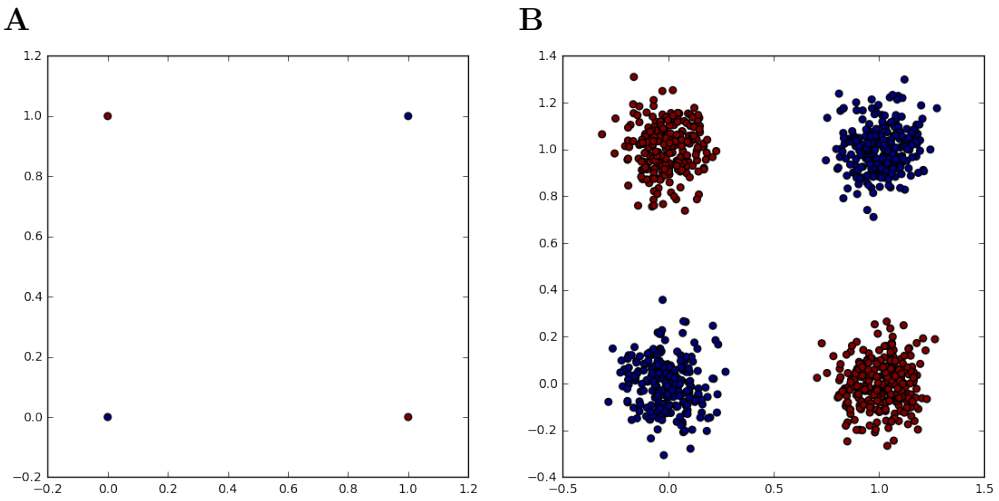

Figure 1: **XOR classification task.** Graphical visualization of the XOR problem. **A** XOR problem without noise $\sigma = 0$. **B** XOR problem with Guassian noise $\sigma = 0.1$.

(a) Read and follow a Keras tutorial on the XOR problem[2]

(b) Augment the XOR problem with noisy data as in Figure 1. Try several combinations of architecture, optimizer, and activation functions to achieve good performances. Report the network performances (loss and accuracy) in a table.

Hint: For robustness of your parameter search, use split sets (training, validation, testing) and cross validation.

(c) Plot the learning curves (loss and accuracy) and visualize the data and network predictions. Plot the separating surface.

Hint: Uniformly sample the input space to determine the separating surface.

[1] https://en.wikipedia.org/wiki/XOR_gate
[2] https://goo.gl/pUKAYL