

LCPB 21-22 exercise 2 (Deep Neural Network, DNN) → **assignment**

What to submit:

the pdf of the short “paper” (=assignment), and a compiled Jupyter notebook with all figures.

In both cases, the **file name starts with the code the group**, for instance for group 34 this could be *2234_assignment.pdf*

and each file contains the list of students in the group.

In addition to the code written during the lesson, for the grid-search part consider notebook NB11 by Mehta et al., which can be found in github or at this website:

<http://physics.bu.edu/~pankajm/MLnotebooks.html>

Analyze the data introduced in the lesson, and try to explain the findings of the following points.

1.

Study the performance of the DNN when the number N of samples is

- a) reduced
- b) increased
- c) augmented

Point 1.c means taking the given $N=4000$ samples, split them in training and validation, and “augment” the training samples by generating artificial ones that are similar to the real samples. For instance, a given sample $x=(x_1, x_2)$ can be transformed to multiple copies (x_1+s_1, x_2+s_2) where each (s_1, s_2) is a small random shift.

2.

Implement a “grid search” as shown in NB11 to improve one or more of the aspects or parameters of the model. Possible tests include: different activation units (sigmoid, relu, elu, etc.), different minimization algorithms (ADAM, RMSprop, Nesterov, etc.), different dropouts, different size or number of layers, etc.

OPTIONAL

3.

Check if any other rescaling of data or initialization of weights may improve the accuracy of the DNN.

4.

Study different data, for instance generated by the second nonlinear function or other choices.