

Assignment 1

Dataset

You are given a set of photos (250x250x3) of 28 famous people faces. Dataset URL is <https://www.mimuw.edu.pl/~ciebie/dnn2020-1.zip> (119MB)

Dataset is split in two parts:

- 2772 test photos - 99 photos * 28 persons
- 11200 train photos - 400 photos * 28 persons

Your task is to implement a neural network, perform experiments and discuss the results. You should **not use any external data** during training.

Technology

You should use pytorch

Deadline

You should submit your solution (preferably in the form of a Jupyter notebook/lab) by email by 23:59 on 05.05.2020 (Tuesday) to your lab teacher with email title "Assignment 1 - Deep neural networks". Your code will be inspected during the lab session following the deadline. Note that even if you are one minute late after the deadline, your solution will not be inspected. We have no mercy whatsoever so you better not count on that.

Task 1 - pre analysis (0.5 points)

- Take a look (with an eye) at the data set and describe it. Does it look easy or difficult? Is the data properly labeled? What accuracy do you expect as a result and why?

Task 2 - implementation (1.5 point)

- Implement a convolutional neural network.
- The network should consist of no more than four convolutional layers and no more than two fully connected layers.

- The neural networks should have two versions, one with batch normalization and another without it. Don't use BatchNorm2d from nn module, implement batchnorm by basic operations (using only simple mathematical operations like +, -, ·, / and matrix multiplication) instead - it is fine if you use the train mode even for the test check.
- Describe your design.

Task 3 - experiments (1 points)

Using no more than 15 epochs perform experiments. Answer the following questions:

- What is the accuracy and average loss of your network? Is loss different on test and train?
- What is the impact of batch size on accuracy?
- What is the impact of batch normalization on accuracy and learning speed?
- What optimizer gives the best results?

The best version of your network should reach at least 75% accuracy on the test set. Illustrate your results with graphs.

Task 4 - results (1 point)

Prepare a confusion matrix of your network. Explain the values in it.