

097200- Deep learning:

Convolutional networks exercise

Submission date: 31/12/2018

1. Exercise

In the following exercise, you will create a classifier for the CIFAR10 dataset. You should write your own training code and meet the following constraints. You can submit your work only after achieving the performance levels listed below.

The goal of this exercise is to get familiar with training a convolutional neural network. You should try different model architectures (different depths, filter sizes, types of pooling layers etc.) and different other hyper parameters (learning rate, batch size etc.) to see how it affects the performance.

2. Submission instructions

Submission will be in pairs (course partners) and will contain a short (two pages) pdf report containing:

- Model architecture description and illustration, training procedure (hyper parameters, optimization details etc.).
- Two convergence plots - (1) for error (2) for loss, both as a function of time (epochs). Each plot should depict both training and test performance (i.e. two curves per plot, one for train and one for test).
- A summary of your attempts and conclusions. Your conclusions and explanations should be based on the actual results you received during your attempts.
- Your best test accuracy result (of the submitted model) should be written explicitly in your report.
- You should evaluate 3 different data augmentation methods (or combination of them) and for each you should attach: best accuracy, number of epochs to get the best accuracy.

In addition, you should also supply:

- Code (python file) able to reproduce your results - we might test it on different variants on these datasets (which are not taken from Pytorch dataset) .
- The trained network with trained weights (.pkl file). If the model size is less than 500MB you should submit it on the Moodle. Otherwise, upload it to your Google-Drive.
- A function called `"evaluate_hw2()"`. The function should load the CIFAR10 test-set, load your trained network (you can assume that the model file is located in the script folder) and return the average accuracy on the test-set. This function should be written in a separate script. Use this line to load your model:

```
model.load_state_dict(torch.load('model.pkl',map_location=lambda storage, loc: storage))
```

Moodle submission:

you should submit a Zip (not rar!) file containing:

- **2 python files (training procedure, evaluation)**
- **1 pdf file (containing your names and ID's)**
- **.pkl file (If the file is too big for the Moodle, upload it to your Google-Drive and copy the link to your pdf report)**

3. Classification Network

Write a complete training procedure for a classification network on CIFAR10 dataset. Design and train your network so that it will satisfy the 2 following goals:

- Final accuracy on the test-set should be **> 80%**
- Number of trainable parameters (weights) within the network should be **< 50,000**.

4. Data

You will train the network ONLY on torchvision.datasets. CIFAR10 with train=true, and test the network with train=false. The network should be trained from scratch (without any transfer learning methods)

5. Grades policy

- Successful submission - 65 points.
- Report - 15 points.
- Competition - 20 points: the teams will be sorted according to test error results, then will be split into groups. The group with the best performance will receive $20 - 0 \cdot (20/\text{\#groups})$, the next best group will receive $20 - 1 \cdot (20/\text{\#groups})$ and so on. Alternatively, the formula will be $20 \cdot ((\text{accuracy} - \text{min}) / (\text{max} - \text{min}))$. The formula that gets the best result for you (on average) will be chosen.

Good luck!