

DI504 Foundations of Deep Learning Assignment 1

For this assignment, You will create a network that will do a multiclass classification task using the MNIST dataset. This assignment's primary purpose is to give you hands-on experience on the basics of neural networks. If you have any difficulties during the assignment, feel free to consult your TA.

1) Creating a Basic network (30 pts)

In the first part of the assignment, you will create a basic network that will do a classification task while following the instructions given in the notebook given with the assignment. Working code should have an accuracy of around %80. After completing and training the network, save your work in network format (with the outputs) and name it as "studentID_part1.ipynb" format.(for example 1814441_part1.ipynb)

2) Tuning the parameters (30 pts+5pts bonus)

The purpose of this part is to show the effects of the network parameters. Firstly make a copy of the working notebook from part 1. Then for each parameter, print loss graphs and compare them according to accuracy, convergence, and loss.

- Learning rate (Try one higher and one lower)
- Try two different optimizers. (Select them from PyTorch page)
- Try two different batch sizes (in train data loader)
- Bonus: visualize weights of each class in 28x28 format

3) Deeper network (40 pts)

Firstly make a copy of a working network from part 1. In this part of the assignment, you will create a three-layer network and "relu" activation function. Then train your network for one epoch. Try to obtain %95+ test accuracy. Do not forget to fine-tune your parameters for better accuracy (i.e, batch size, learning rate, optimizer). You are free to choose any parameter you like.

Tip: You can select any network size, but please note that the higher the parameter count, the network has a higher chance to overfit your data. (i.e., try to create the smallest network possible)

After fine-tuning a, save your results as "studentID_part2.ipynb" format and report;

- Loss graph
- Optimizer
- Learning rate
- Batch size
- Layer neuron numbers
- Training time

You can also add your previous iteration to compare your results.

Note: it is not required for this assignment, but you can utilize Weights & Biases¹ to fine-tune your network

¹ <https://wandb.ai/site>