

Artificial Neural Networks

1st Assginment - Shahid Beheshti University - Master's Program

October 29, 2022

I hope all is well with you. This is the first series of homework for the Artificial Neural Networks course. The deadline for this assignment is **due date November 8, Monday**. All students are expected to submit their homework on time. Feel free to **ask questions regarding the exercises in the course Telegram group** if needed. As part of your assignment, you are required to write a detailed report.

Exercise 1

This part aims to provide definitions of the following terms:

- Online Learning
- Progressive Learning
- Meta-Learning
- Self-supervised Learning
- Federated Learning

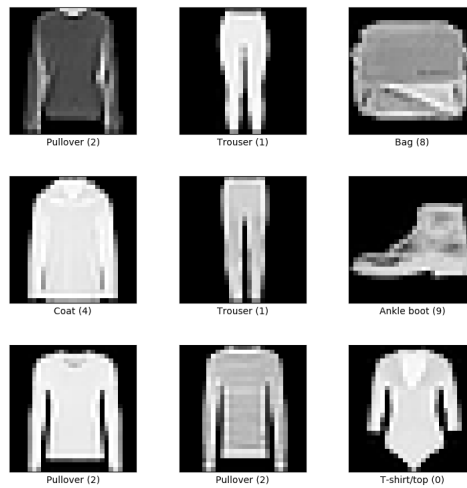
Exercise 2

As you know, we have three variants of gradient descent algorithm: Full Gradient Descent, Stochastic Gradient Descent, and Mini-Batch Gradient Descent.

- Please describe the main differences between them, including their convergence rates.
- Also, declare the advantage and disadvantages of each one separately.
- Which one is practical for the online learning paradigm?

Exercise 3

In this part, you will implement a simple multi-layer perceptron neural network using PyTorch to solve a clothing classification problem. You have to work with the Fashion MNIST dataset, which consists of 10 classes with 60,000 examples in the training set and 10,000 examples in the test set.



- Report the depth effect of different hidden layers.
- Analyze the dropout technique and report its results.
- Use early stopping criteria.
- Become familiar with batch normalization and report its effects.
- The model should be tested for L1 and L2 regularization.
- Add a regularization term for the weight parameter using the following sample code:

```
output = model(input)
loss = criterion(output, target)
loss = loss + torch.norm(model.layer.weight, p=2)
```