

Assignment 1 - Neural Networks

Start Assignment

- Due 27 Mar by 23:59
- Points 100
- Submitting a file upload

This assignment is split in two parts:

- Part A: build a Perceptron from scratch using Numpy
- Part B: train a custom Neural Networks Using PyTorch

Description:

Part A

In Part A, your task is to build a simple perceptron by implementing the forward and back propagation for a small dataset that contains only 3 features.

You will be given a template notebook where some code has been already implemented for you. You will need to fill the sections that are specified with the comments TODO.

Note: You are only allowed to use Numpy and Pandas packages for Part A. You can not use packages such as Sklearn or Tensorflow.

<https://colab.research.google.com/drive/1zljvTnmqvzn2eGSB56v48HfarfqFFhQI?usp=sharing> 
(<https://colab.research.google.com/drive/1zljvTnmqvzn2eGSB56v48HfarfqFFhQI?usp=sharing>)

Part B

In Part B, we are going to train a custom Neural Networks on the Japanese MNIST dataset. It is composed of 70000 images of handwritten Hiragana characters. The target variable has 10 different classes.

Each image is of dimension 28 by 28. But we will flatten them to form a dataset composed of vectors of dimension (784, 1). The training process will be similar as for a structured dataset.

Your goal is to run at least 3 experiments and get a model that can achieve 80% accuracy with not much overfitting on this dataset.

Some of the code have already been defined for you. You need only to add your code in the sections specified (marked with TODO). Some assert statements have been added to verify the expected outputs are correct. If it does throw an error, this means your implementation is behaving as expected.

<https://colab.research.google.com/drive/1PBr4IAIz8YY2PcLB--HeolYkoahjKq5H?usp=sharing> 

[\(https://colab.research.google.com/drive/1PBr4IAIz8YY2PcLB--HeolYkoahjKq5H?usp=sharing\)](https://colab.research.google.com/drive/1PBr4IAIz8YY2PcLB--HeolYkoahjKq5H?usp=sharing)

Note: You can only use fully-connected and dropout layers for this assignment. You can not convolution layers for instance

Submission:

You will submit a zip file containing your python notebooks and report.

The zip file needs to contain the following files:

- Part A Notebook (ipynb file)
- Part B Notebook (ipynb file)
- Part B Report (Word document or PDF)

The report will need to contain at least the following topics:

- Presentation of data
- Presentation of the different architectures and hyperparameters tested and rationales
- Analysis of models performance and limitations
- Presentation of remaining issues and recommendations

All assignments need to be submitted before the due date on Canvas. Penalties will be applied for late submission.

Assessment Criteria:

- Rigour in addressing technical brief in terms of completeness and appropriate coverage of test suite (20%)
- Clear, efficient, concise code appropriately commented (25%)
- Effort and results on model extension component (15%)
- Quality of results including their assessment, interpretation and benchmarking (25%)
- Well written report ensuring format and communication style is context appropriate (15%)