Introduction to ML
Exercise 3

Due: 13.6.2019 10:00PM (there will be no extensions!)

Guidelines

1. You are not allowed to use external packages other than numpy and scipy.
2. You are allowed to work in pairs.
3. In order to submit your solution please submit the following files:
   (a) `details.txt` - A text file with your full name (in the first line) and ID (in the second line).
   (b) `ex3.py` - The file that contains your main function (attach ANY additional files needed for your code to run).
   (c) `ex3_report.pdf` - A pdf file in which you describe your model and parameters.
   (d) `test_y` - your model's predictions on the given test set (see instructions below).

Follow the instructions and submit all files needed for you code to run.

Good Luck!

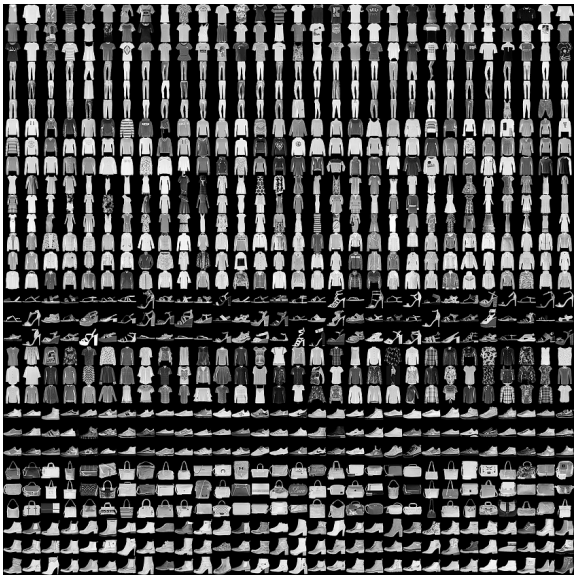
Ex3

In this exercise you will train your first neural network on a dataset called "Fashion-MNIST". This dataset contains 10 different categories of clothing. Your task is to train a classifier that classifies this data.

Data. Each image is 28 pixels in height and 28 pixels in width, for a total of 784 pixels in total. Each pixel has a single pixel-value associated with it, indicating the lightness or darkness of that pixel. This pixel-value is an integer between 0 and 255.

Labels. The possible labels are:

0. T-shirt/top
1. Trouser
2. Pullover
3. Dress
4. Coat
5. Sandal
6. Shirt
7. Sneaker
8. Bag
9. Ankle boot



Instructions

1. Your goal is to train a multi-class neural network for the Fashion-MNIST dataset. Your network should have **at least** one hidden layer with the ReLU activation function.

2. Your model should minimize the **Negative Log Likelihood** (NLL) loss function as seen in class.

3. You will receive the data in the form of 3 files: (i) `train_x` will contain the training set examples; (ii) `train_y` will contain the corresponding training set labels; and (iii) `test_x` will contain the test set examples.

4. You should train and validate your model using files (i)+(ii). Finally, you should output you model's predictions on the examples in `test_x` to a file named `test_y` using the same format as in `train_y` (e.g., row 10 in `test_y` should correspond to the example in row 10 of `test_x`). Your prediction file should contain 5000 rows exactly.

5. You can load the provided data files using `train_x = numpy.loadtxt("train_x")` (repeat this for any data file you wish to load).

6. Describe your network's architecture and explain your hyper-parameters choice in `ex3_report.pdf`.

7. Submit **ALL** source code files along with your predictions file `test_y`. Note that you name it exatly as specified. Your grade will be based on your performance on the test set.