

Assignment 2

Score: 15

Implement a model, based on the perceptron algorithm that will be able to classify hand written digits

For training, use the mnist dataset. This can be found, in a format that can be easily worked with in python, at the following url: <http://deeplearning.net/data/mnist/mnist.pkl.gz>

The dataset is split in 3 sets: training_set, validation_set, test_set. Each of these 3 sets contains two vectors of equal length:

1. A set of digits written as a vector of length 784. The digits from the mnist dataset have the shape 28x28 pixels and are represented as a vector (each of the 28 lines from the 28x28 matrix are written one after each other, thus forming a vector of 784 elements). Each pixel from the matrix has a value between 0 and 1, where 0 represents white, 1 represents black and the value between 0 and 1 is a shade of grey.
2. A label for each element from the first vector: a number between 0 and 9 representing the digit from the image

The 3 sets have the following meaning:

- training_set (used for training your model); 50000 elements
- validation_set (usually used to adjust hyper-parameters and to perform a first evaluation of the resulted model); 10000 elements
- test_set (dataset used for testing. Use it only after you've fine-tuned the algorithm using the validation set. Do not use it for fine-tuning); 10000 elements

The dataset was saved using the cPickle python module. (it is very used for datasets serialization)

To load the dataset, use the following code.

```
import cPickle, gzip, numpy
f = gzip.open('mnist.pkl.gz', 'rb')
train_set, valid_set, test_set = cPickle.load(f)
f.close()
```

The classification algorithm must be based on 10 perceptrons. Each of these 10 perceptron will be trained to classify images that represent only one digit. For example, the first perceptron will be trained to output value of 1 for the digit 0 and the value 0 for every other digit).

When each perceptron has been successfully trained and you want to see how the classification works, the input will be fed to each perceptron and the class will be given by the perceptron which outputs a 1 or the perceptron who has the biggest net input

