EEL 6814

Project 2

Due April 27, 2016

Deep Learning Hello World

In this project you should train a Multilayer Perceptron (MLP) and a Convolutional Neural Network (CNN) on the MNIST dataset. The MNIST dataset (28x28) contains 60k images for training and 10k images for testing. The last 10k images in the training dataset are used as validation dataset for cross-validation, early stopping and hyper parameter choices.

1 - Download the MNIST dataset and code from the website. (curtesy of ufdl.stanford.edu)

2 - Load images and labels using loadMNISTImages and loadMNISTlabels scripts.

3 - Train multilayer perceptrons and convolutional neural networks for classification. Use the Softmax (Categorical Cross-entropy) cost function discussed in class. For the MLP downsample the image to decrease the number of inputs or use PCA to project to a subspace.

4 - Use samples 50000 to 60000 from the training dataset as the validation dataset for early stopping.

5 - Report results on the test set.

6 - Show learning curves comparing training and validation cost function. Do the same for the accuracy.

7 - Discuss differences in results between MLP and CNN

8 – Compare performance with SGD and SGD-momentum and RMS Prop.

Hints:

* You should be getting better results with CNN.
* Use initialization techniques explained in class for better results
* Use ReLU activation function for better results and faster convergence
* Use dropout regularization with probability 0.5 for better results on the test set

The report should follow the IEEE paper format with 7 page limit, just like in project 1.