Selected Topics From CS: Assignment 3

Due date and time: April 23rd 9:00 am

The goal of this assignment is to implement two different neural networks to classify handwritten digits from 0-9. All submission should be in Python. All Python packages are allowed, including packages like Tensor Flow, Keras and Theano.

1 Simple Neural Network (Fully connected)

- use cross-entropy error function (Refer Bishop Section 4.3.4).

- use minibatch gradient descent with ADAM.

- use validation set to control number of iterations. With maximum number of iterations set at 4000.

- experiment with network sizes ranging from 3-5 layers[1] and choose any one.

2 Convolutional Neural Network

- Use at least one Convolutional Layer

- use cross-entropy error function (Refer Bishop Section 4.3.4).

- use minibatch gradient descent with ADAM.

- use validation set to control number of iterations. With maximum number of iterations set at 4000.

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[1]including input and output layer

- experiment with network sizes ranging from 3-5 layers[2] and choose any one. Also don't consider pooling layer when counting total number of layers i.e a neural network with input layer, followed by convolutional layer, followed by pooling layer, followed by output layer is a 3 layered neural network, not 4 layered.

3 Dataset

The dataset came form MNIST database[3] of handwritten digits. Each image is 28*28 square consisting of integers in range 0-255. rescale pixel values to range 0-1.
The train and test sets can be found in CMS. You could also use MNIST dataset which come preloaded with some python package, including packages like Keras, Tensorflow or Theano.

4 Report and Code

The Report should contain both accuracy over test set and number of training iterations for both CNN and Fully connected network. Also upload 2 separate code files in the format specified below.

- py_your ID_fullyconnected.txt and py_your ID_cnn.txt . For example student with ID:2014A7PS123H should submit py_2014A7PS123H_fullyconnected.txt and py_2014A7PS123H_cnn.txt.

Only one person from a group should submit the assignment.
Keras documentation and installation guide : https://keras.io.
Tensor Flow documentation and inatallation guide: https://www.tensorflow.org/tutorials/ ,https://www.tensorflow.org/install/
For queries contact: Jinu Sunil
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[2]including input and output layer
[3]http://yann.lecun.com/exdb/mnist/