Neural Networks (152118003)

Spring Term

Term Project Question Set #1 (Each question is equally weighted for grading and is 15 % of your total project grades)

1) In the class, you are provided a python source code where a simple neural network was written from scratch. Expand the code by implementing a method called test_NN() to find out the results for the following training data X_1 and X_2 separately. Screen capture the corresponding neural network output Y value in your report.

$X_1 = [1, 1, 0] \rightarrow Y_1 = [\,?\,]$

$X_2 = [1, 1, 1] \rightarrow Y_2 = [\,?\,]$

2) Expand the code by implementing a mini-batch algorithm. As we have seen in the class, a mini-batch algorithm is a variant to Stochastic Gradient Descent (SGD) where instead of selecting every training sample and apply SGD, one use only a randomly selected subset of training data. Select at most two randomly selected data at each training operation. Test the new network with the test points in question 1. Screen capture the error results during your training.

3) Expand the code by adding a bias term in addition to Weights that are currently available for training in the code. Plot the error values as a function of every 1000 iteration.

4) Implement the cross-entropy loss function in the code instead of MSE that were utilized during the demo in the class. Present your results and error values in your report. Also plot error values as a function of every 1000 iteration.

Submission of the results:

Each submission will include:
- A Google Colab's Gdrive folder. Please make separate Jupyer notebook files for each question in the submission. Your source code should be clearly commented (both inline comments and Jupyter cell text comments) and readable. All code can also run with a one click 'Run all' button once opened in Colab. Any code that generates run time error after "Run All" command will receive a zero grade. Any code that is also not accessible through the share URL during grading will also receive a zero grade

- a PDF report file where the link to your Google Colab folder is included and also your results and code snippets explained with clear screen captures. The PDF file will be submitted via ESUZEM.

Good luck