CST 395:
NEURAL NETWORKS AND DEEP LEARNING

Assignment 1

Design a simple Neural Network on MNIST Handwritten Digit Dataset. Use cross entropy loss function with adam optimizer for your model. The performance measurement can be done in terms of accuracy.

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Language used: Python 3.8.10 on Jupyter Notebooks

Additional Libraries used:

- Matplotlib for plotting graphs
- Keras for loading MNIST dataset
- Numpy for mathematical operations

DataSet: MNIST

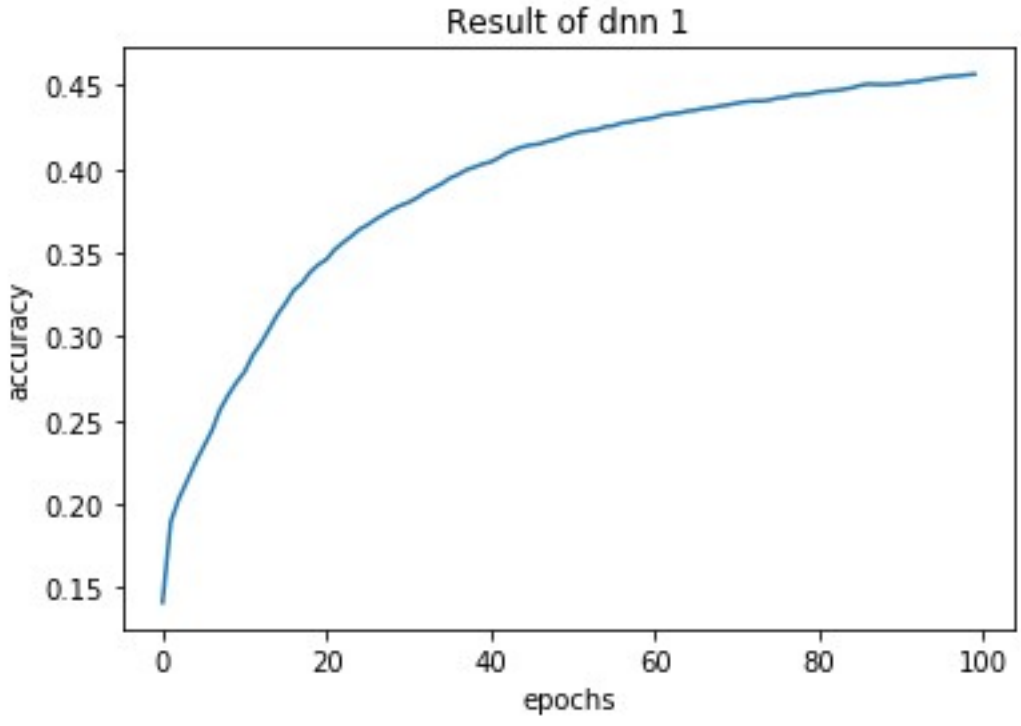
- Number of training images = 60, 000
- Number of Testing images = 10, 000

Neural Network 1:

Structure:

- Input Layer: 784 nodes
- Hidden Layers:
  1. 40 Nodes, Sigmoid Activation
  2. 20 Nodes, Sigmoid Activation
- Output Layer: 10 Nodes, Softmax activation

Loss function: Cross entropy loss
Mini Batch size = 1000
No of epochs: =100
Max Accuracy = 45.67%
Time taken to run = 283s

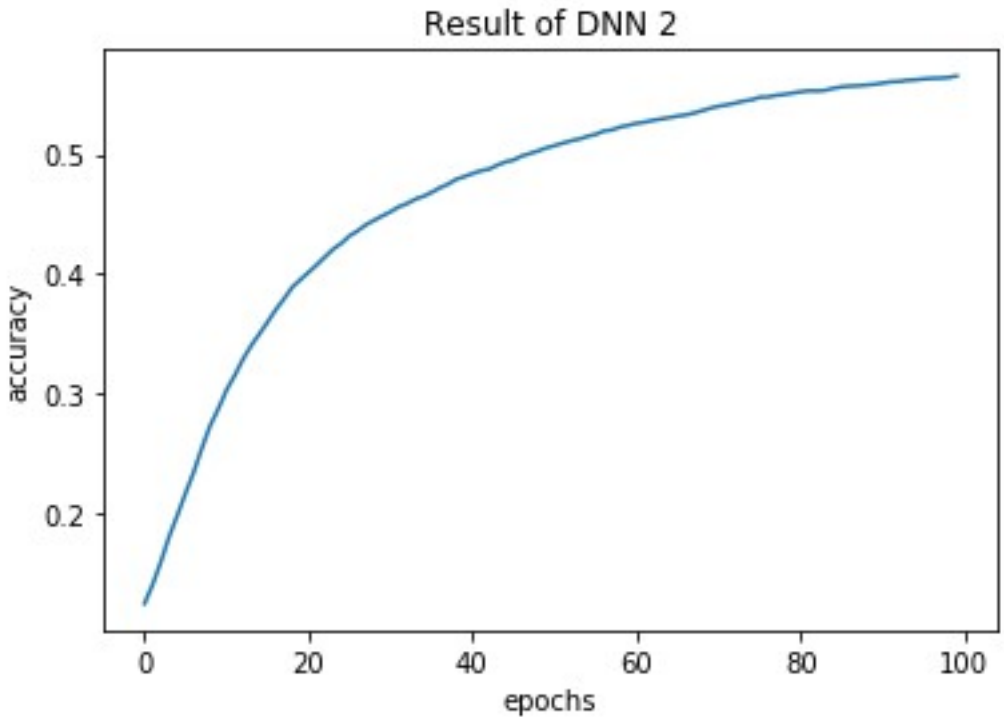


Neural Network 2:

Structure:

- Input Layer: 784 nodes
- Hidden Layers:
  1. 200 Nodes, Sigmoid Activation
  2. 100 Nodes, Sigmoid Activation
  3. 50 Nodes, Sigmoid Activation
- Output Layer: 10 Nodes, Softmax activation

Mini Batch size = 10000
No of epochs: =100
Max Accuracy = 56.52%
Time taken to run = 970s



Result:

2 different Neural Networks were Created using a model developed from scratch, and from the given results, we can see that: with the same number of passes through the dataset, the model with higher number of nodes was able to reach a higher accuracy than the model with lower number of nodes.

Source Code: Link to Github Repository