Deep Learning Report 2

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Objective and Task

This project is to implement neural network and convolutional neural network for the task of classification. The classification task will be that of recognizing an image and identify it as one of ten classes. You are required to train the classifiers using Fashion-MNIST clothing images. Following are the two tasks to be performed:

1. Build multi-layer Neural Network with open-source neural-network library (pytorch/tensorflow) on Fashion-MNIST dataset.
2. Build Convolutional Neural Network with open-source neural-network library (pytorch/tensorflow) on Fashion-MNIST dataset.

Approach

Neural Network

Model Architecture :
Input layer Size : 784
Hidden Layer : 3 layer with 150 neuron in each layer
Output Layer Size : 10
Activation Functions : Relu in hidden layers and softmax at output layer.
Optimizer: Adam with learning rate=0.01
Loss function: Cross Entropy
Batch size: 400
No. of epoch: 300

Results

Train Accuracy:: 99.32 %
Test Accuracy:: 88.79 %

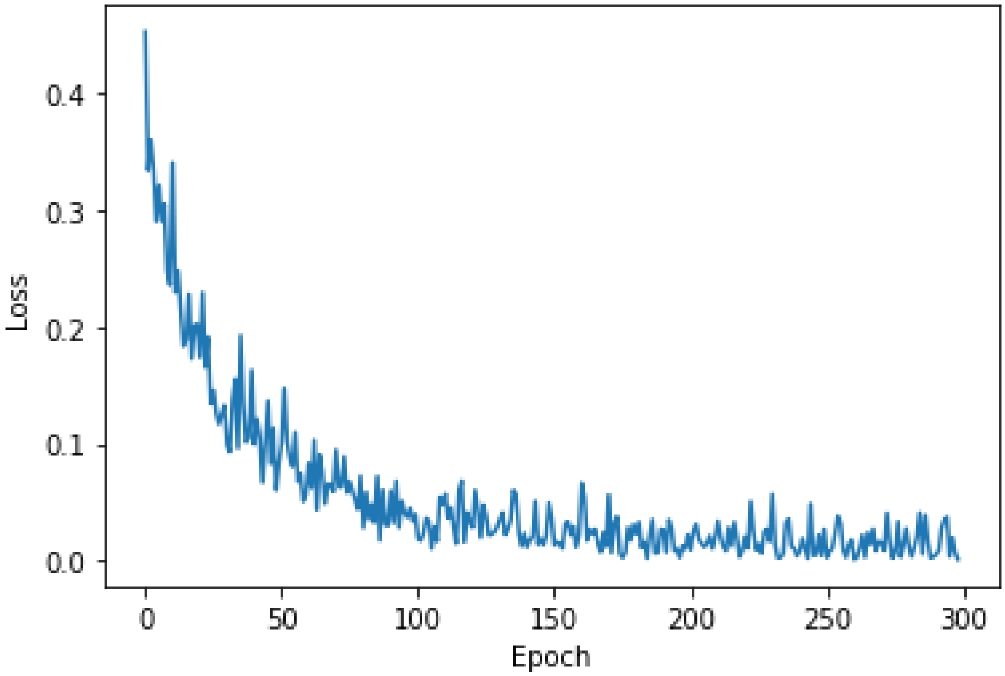
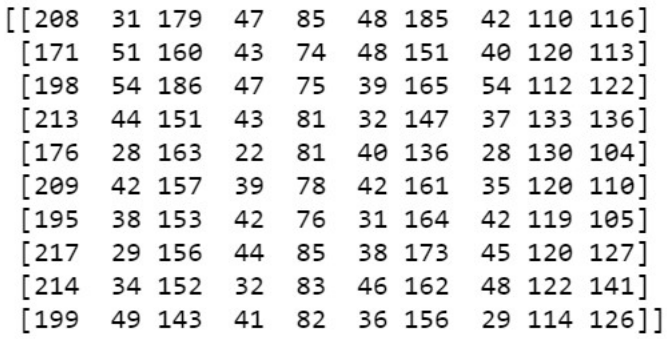


Figure 1: Loss vs Epoch plot for neural netowrk

Confusion Matrix for neural network::



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[[208  31 179  47  85  48 185  42 110 116]
 [171  51 160  43  74  48 151  40 120 113]
 [198  54 186  47  75  39 165  54 112 122]
 [213  44 151  43  81  32 147  37 133 136]
 [176  28 163  22  81  40 136  28 130 104]
 [209  42 157  39  78  42 161  35 120 110]
 [195  38 153  42  76  31 164  42 119 105]
 [217  29 156  44  85  38 173  45 120 127]
 [214  34 152  32  83  46 162  48 122 141]
 [199  49 143  41  82  36 156  29 114 126]]
```

Figure 2: Confusion matrix for neural network

Convolution Neural Network

Model Architecture :
No. of convolution layer : 2
Input channel for layer 1 : 1
Output channel for layer 1 : 16
Kernel size (filter size) : 5
Padding : 2
Input channel for layer 2 : 16
Output channel for layer 2 : 32
fully connected layer size : 7*7*32
Output Layer Size : 10
Activation Functions : Relu
Pooling : Max Pooling
Optimizer: Adam with learning rate=0.01
Loss function: Cross Entropy
Batch size: 400
No. of epoch: 300

Results

Train Accuracy:: 99.41 %
Test Accuracy:: 90.02 %

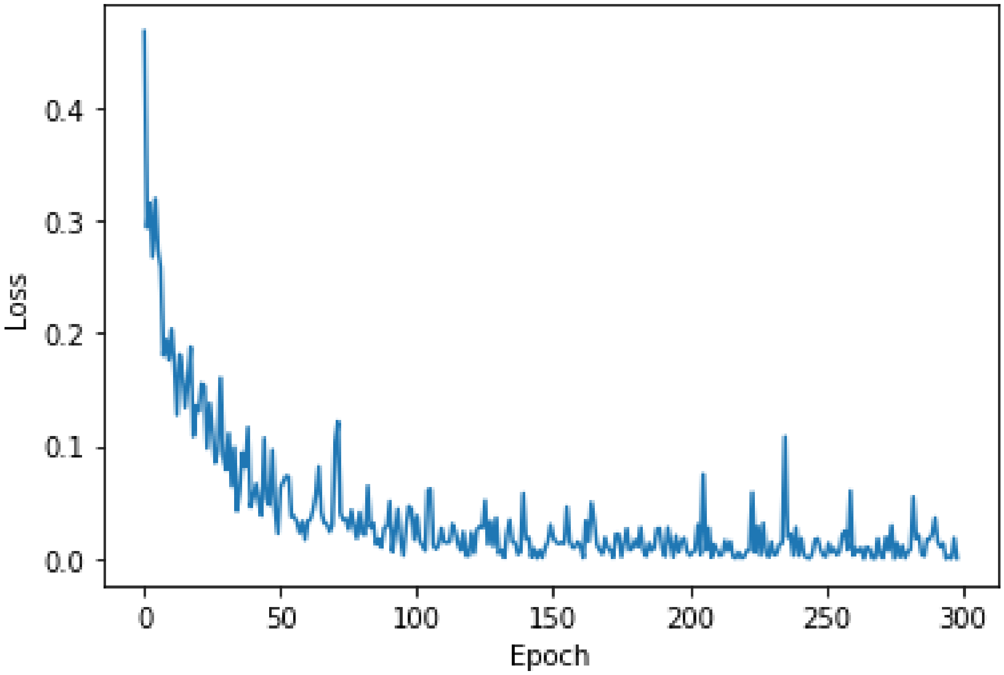
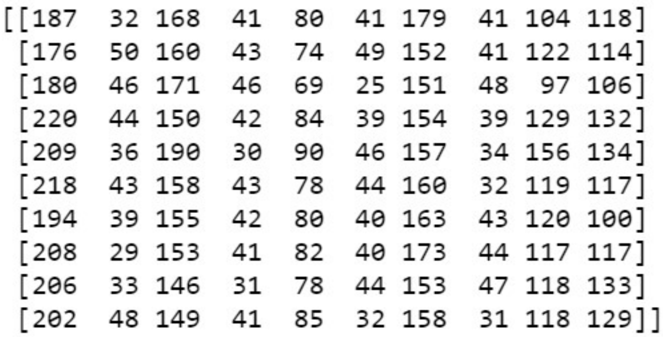


Figure 3: Loss vs Epoch plot for CNN

Confusion Matrix for CNN::



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[[187  32 168  41  80  41 179  41 104 118]
 [176  50 160  43  74  49 152  41 122 114]
 [180  46 171  46  69  25 151  48  97 106]
 [220  44 150  42  84  39 154  39 129 132]
 [209  36 190  30  90  46 157  34 156 134]
 [218  43 158  43  78  44 160  32 119 117]
 [194  39 155  42  80  40 163  43 120 100]
 [208  29 153  41  82  40 173  44 117 117]
 [206  33 146  31  78  44 153  47 118 133]
 [202  48 149  41  85  32 158  31 118 129]]
```

Figure 4: Confusion matrix for CNN