

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 : 4 layer with 150 neuron in each layer

Output Layer Size : 10

Activation Functions : Relu in hidden layers and softmax at output layer.

Optimizer: Adam

Loss function: Cross Entropy

Batch size: 100

No. of epoch: 57

Results

Train Accuracy:: 97.53 %

Test Accuracy:: 89.17 %

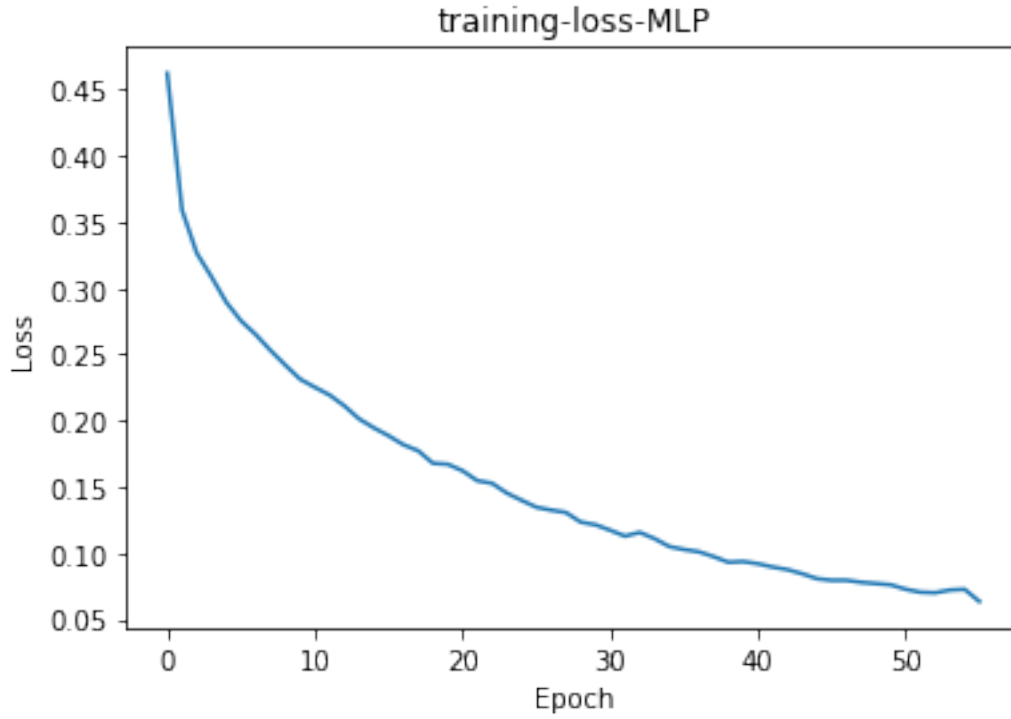


Figure 1: Loss vs Epoch plot for neural netowrk

Confusion Matrix for neural network::

```

[[849  3  15  18  0  0 123  0  3  0]
 [ 2 978  2  7  1  0  0  0  1  0]
 [ 15  0 836 15 88  0 90  0  2  0]
 [ 29 12 13 918 32  1 39  0  6  0]
 [ 6  2 87 21 812  1 47  1  4  0]
 [ 2  0  0  2  0 947  0 12  3  6]
 [ 85  2 47 16 66  0 695  0  6  1]
 [ 0  1  0  0  0 21  0 967  3 49]
 [11  2  0  3  1  2  6  5 971  0]
 [ 1  0  0  0  0 28  0 15  1 944]]

```

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

Loss function: Cross Entropy

Batch size: 100

No. of epoch: 18

Results

Train Accuracy:: 97.34 %

Test Accuracy:: 91.01 %

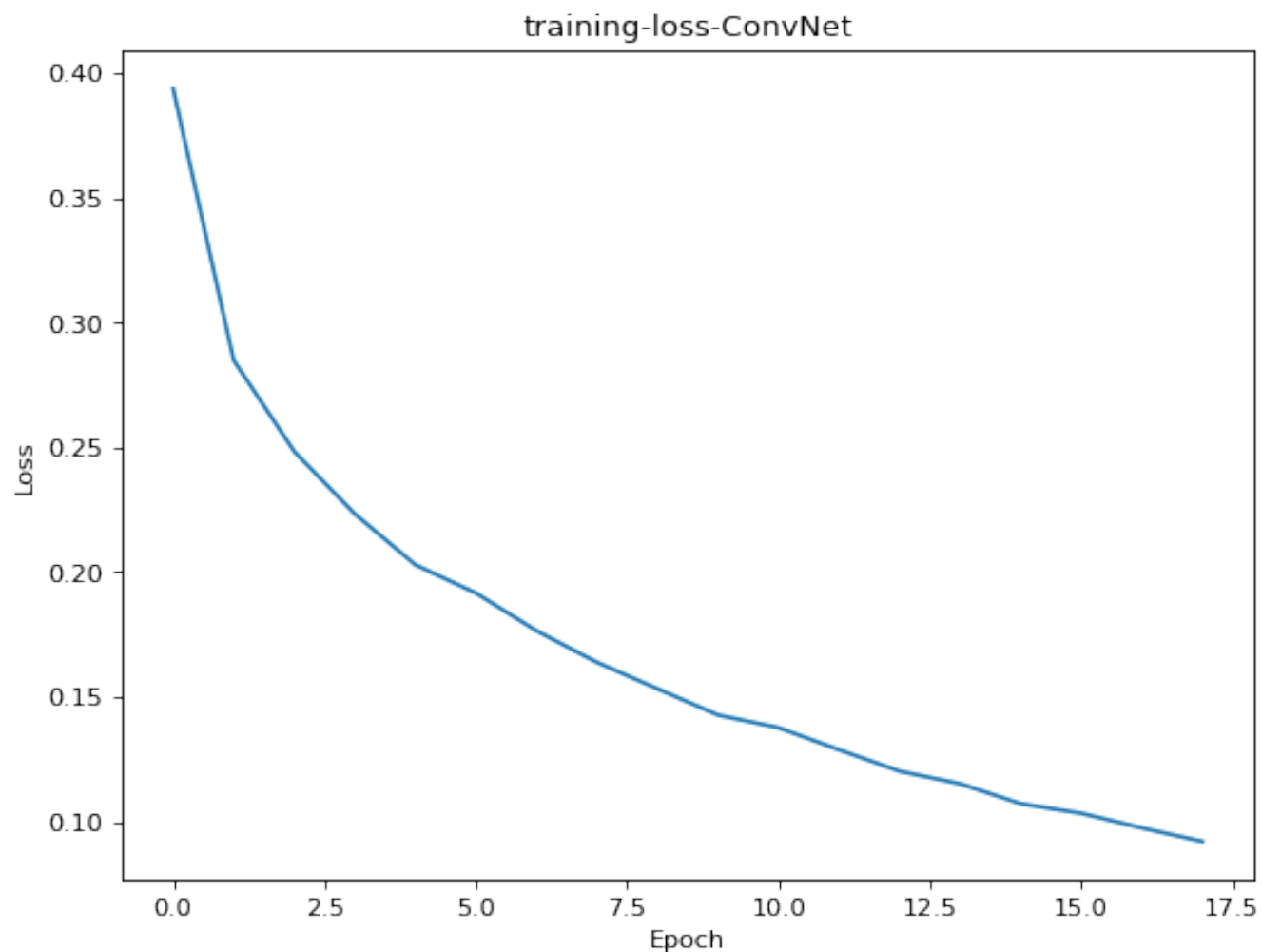


Figure 3: Loss vs Epoch plot for CNN

Confusion Matrix for CNN::

[	876	1	15	27	0	0	140	0	3	1]
[	1	983	2	2	0	0	0	0	1	0]
[	13	1	828	14	37	0	48	0	2	0]
[	10	11	5	889	20	0	20	0	1	0]
[	3	1	86	36	915	0	89	0	4	0]
[	2	0	0	0	0	989	0	6	2	7]
[	85	2	63	30	26	0	699	0	1	0]
[	0	0	0	0	0	7	0	988	3	41]
[	9	1	1	2	2	0	4	0	983	0]
[	1	0	0	0	0	4	0	6	0	951]]

Figure 4: Confusion matrix for CNN