

CSA 250 : Deep Learning Project II

Report

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February 2, 2020

Task/Objective : The aim of the project is to implement neural and convolution neural network for the task classification which involves recognizing an image and identify it as one of ten classes.

Task 1 : Build a multi layer neural network with open source neural-network library(pytorch) on Fashion-MNIST dataset.

Task 2 : Build Convolution Neural Network with open-source neural-network library(pytorch) on Fashion-MNIST dataset.

Model Architecture:

1. Neural Network :

Given dataset is an image dataset with input images of size 28×28 , when flatten it will become 784. So after considering it we build a multi layer neural network with input 784 and resulting output as 10 classes.

First layer : Input layer of size 784×256

Second layer : Hidden layer of size 256×128

Third layer : Hidden layer of size 128×64

Fourth layer : Output layer of size 64×10

- Used Relu as a activation function on all the hidden layers
- Used softmax on output layer.
- Used negative log likelihood as loss function.
- Used a learning rate of 0.03

2. Convolution Network :

For the similar dataset we build a convolution neural network with two convolution layer in it.

First layer : Convolution layer with kernel size 5

Second layer : Convolution layer with kernel size 5

Third layer : Linear layer with output 10 neurons.

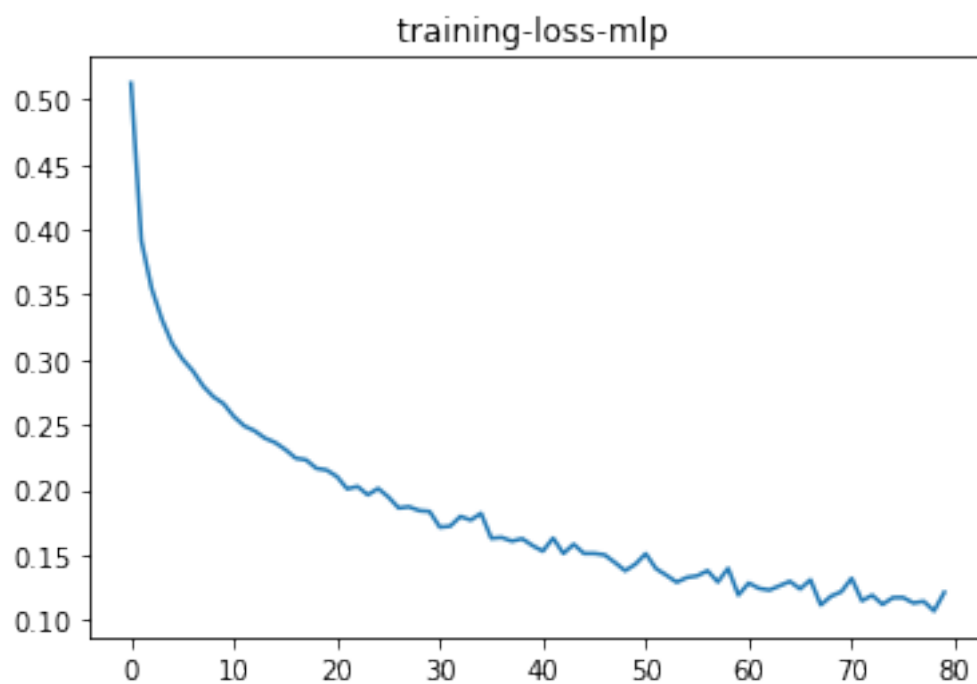
- At both convolution we are using padding of size 2.
- Used cross entropy as loss function.
- kernel size =5

Results :

1. Multi-layer Neural Network :

Accuracy on test data = 87.97 %

Training Loss :



Confusion Matrix :

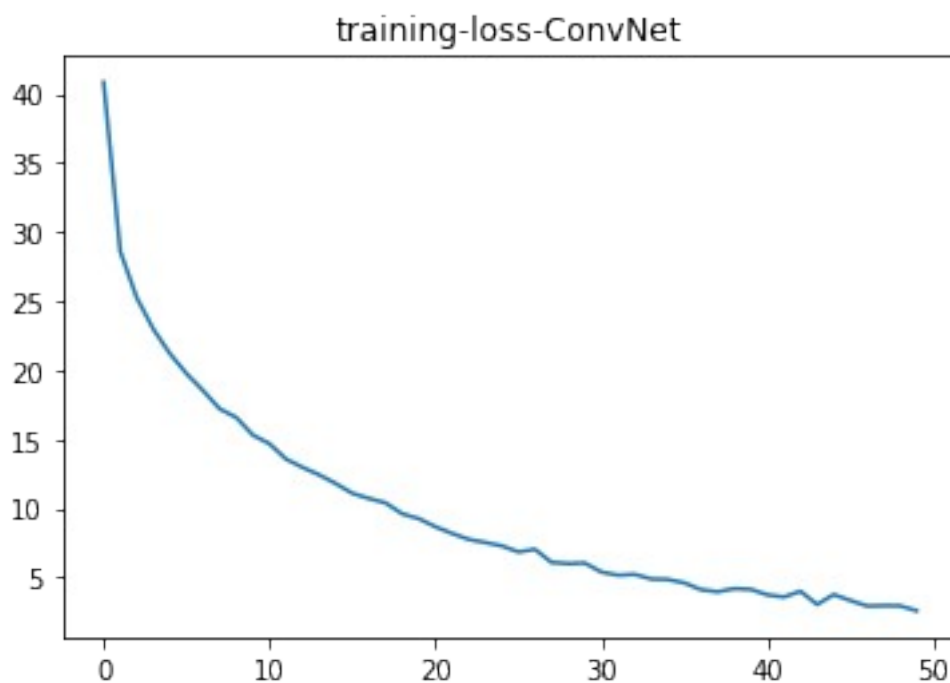
Accuracy : 0.8797

```
[[805    2   18   18    1    0  109    0    4    1]
 [   1  965    1    3    2    0    2    0    0    0]
 [  16    0  797    9   82    0   69    0    3    0]
 [  22   19    9  902   43    1   29    0    7    0]
 [   2    3   76   19  812    0   72    0    5    0]
 [   1    0    0    0    0  955    0   17    3    3]
 [147   10   99   46   60    7  714    3   30    1]
 [   0    0    0    0    0   20    0  944    1   39]
 [   6    1    0    3    0    2    5    1  947    0]
 [   0    0    0    0    0   15    0   35    0  956]]
```

2. Convolution Neural Network :

Accuracy on test data = 90.14 %

Training Loss :



Confusion Matrix :

```
[[ 880    3   32   29    1    0  141    0    3    0]
 [   0  977    1    5    0    0    0    0    1    0]
 [  16    1  818   17   54    0   53    0    2    0]
 [  17   10    9  886   12    0   26    0    5    0]
 [   6    6   62   30  869    0   64    0    6    0]
 [   2    0    0    0    0  979    1   23    4    5]
 [  74    2   74   31   62    0  707    0    5    1]
 [   0    0    0    0    0   10    0  938    2   12]
 [   5    1    4    1    2    3    8    0  972    0]
 [   0    0    0    1    0    8    0   39    0  982]]
```