Report :: TIPR Assignment - III

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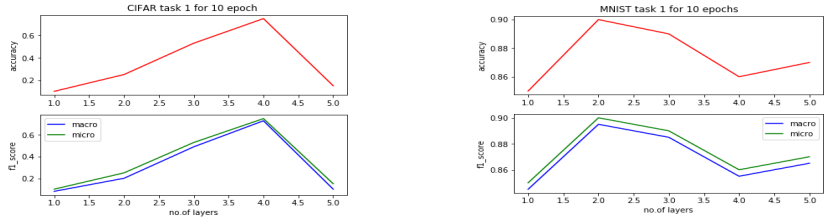
1 INDRODUCTION

Python version -3
In this assignment we have worked with Convolutional Neural network and used T-SNE to visualize the cluster . Furthermore compare the results on with Multi layer perceptron. Dataset to work upon are

- Fashion-MNIST
- CIFAR-10

2 Task1

We have to experiment with different no. of layers. i have fixed the no.of of neurons in each layer. For Fashion- MNIST it is 64 neurons per layer and for Cat-Dog it is 128 neurons each layer. for each task i have divided the data into train(70%), test(30%)



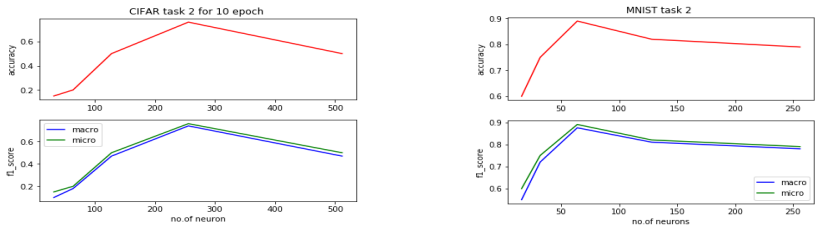
(a) CIFAR-10 (b) Fashion-MNIST

70% Accuracy on test set while using 4 layers with CIFAR data, Accuracy first increases then decreases with increase in no. of layer. Approx 90% accuracy on the test data for the Fashion-MNIST dataset.

Figure 1

3 Task2

In task 2 we have to fix the no. of layers and experiment with no.of neurons. so i choose the no.of layer = 4 for CIFAR and 2 for Fashion-MNIST and experimented with no.of neurons



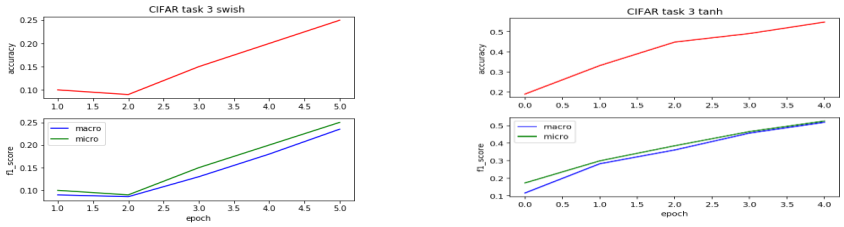
(a) CIFAR-10 (b) Fashion-MNIST

68% Accuracy on test set while using 4 layers with 256 neurons each for CIFAR-10 data. 88% accuracy in case of Fashion-MNIST using 64 neurons while keeping the no. of layer to be 2.

Figure 2

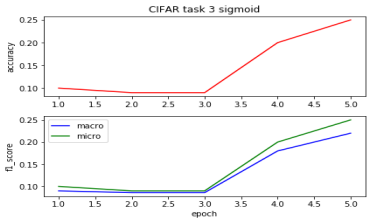
4 Task3

in this we have to play with different activation function .

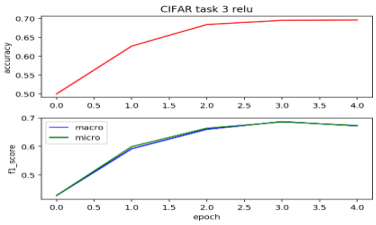


(a) CIFAR (b) CIFAR

Figure 3



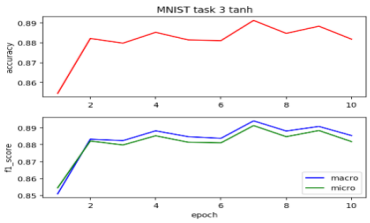
(a) CIFAR



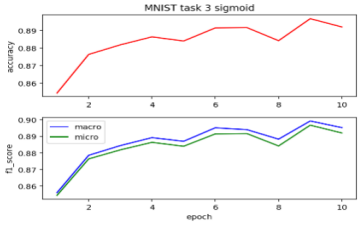
(b) CIFAR

For CIFAR-10 sigmoid and swish is not performing good , at max they are giving 25% accuracy. whereas tanh is performing average giving 53% accuracy and relu is performing best giving 70% accuracy.

Figure 4

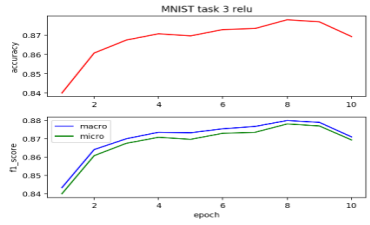


(a) Fashion-MNIST

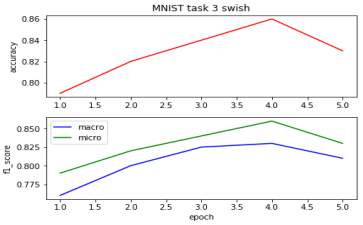


(b) Fashion-MNIST

Figure 5



(a) Fashion-MNIST



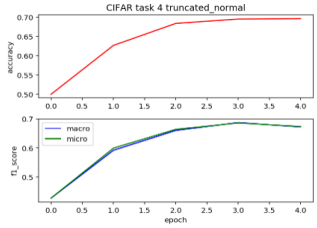
(b) Fashion-MNIST

For MNIST sigmoid and tanh is performing good , at max they are giving 92% and 89% accuracy. whereas relu and swish ar also performing good giving more than 85%.

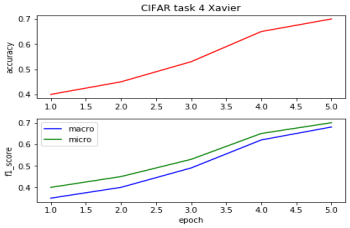
Figure 6

5 Task4

using different weight initialization technique i have used Xavier initialization and random_normal initialization

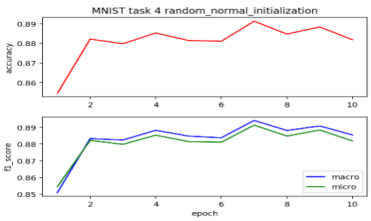


(a) CIFAR

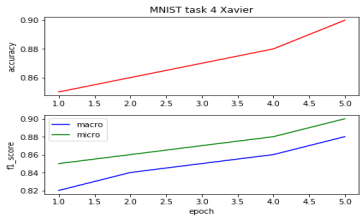


(b) CIFAR

Figure 7



(a) Fashion-MNIST



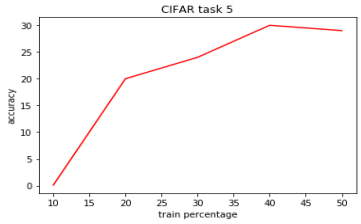
(b) Fashion-MNIST

For both dataset any initialization method is giving the same accuracy .the only difference for Xavier curve is smooth i.e. accuracy keeps on increasing whereas that is not the case with normal initialization.

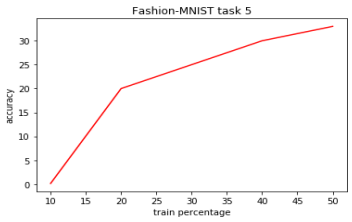
Figure 8

6 Task5

In this task we have take the embeddings from the penultimate layer of the CNN architecture and perform clustering . plot of accuracy vs train percentage is given below.(Accuracy is calculated on test data)



(a) CIFAR



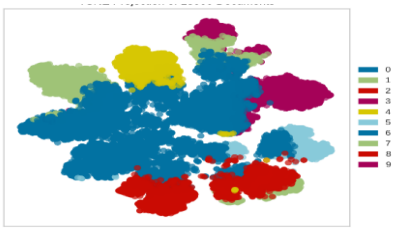
(b) Fashion-MNIST

The cluster accuracy is not good just 30% on both the dataset. Accuracy is less maybe due to less amount of train data.

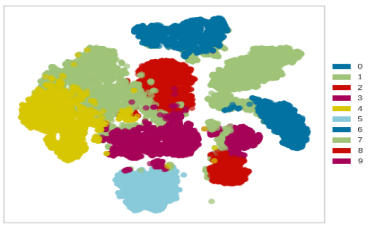
Figure 9

7 Task-6

Projecting the cluster made in previous task using T-SNE.



(a) CIFAR-10



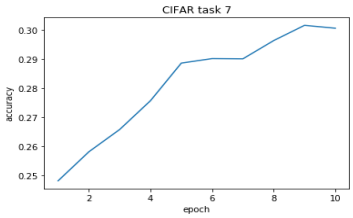
(b) Fashion-MNIST

These plots are made by using T-SNE visualizer . we can see over here that Fashion Mnist Cluster is way better than Cifar this may be because embeddings learnt for the MNIST data is good. Most of th points in CIFAR are labelled as class 0.

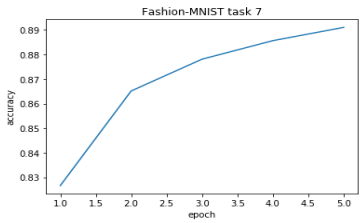
Figure 10

8 Task-7

Comparing the result of CNN with MLP



(a) CIFAR-10



(b) Fashion-MNIST

For Cifar data i have used 4 layes dense layer configuration i.e. layers containing [128,64,32,10] neurons and got the test accuracy of 33.5% .For MNIST data i have used two dense layer one with 128 neurons and the second with 10 neurons and getting the test accuracy as 87.43%.

Figure 11

9 Github link

`https://github.com/Nidhi-kumari/tipr-third-assignment`