Assignment 3
Rohit Makkar 2018087

1- Full implementation along with documentation is in the code.

1- All the global variables have been initialised in the init section.

2- All the functions and their gradients have been implemented in their respective given functions.

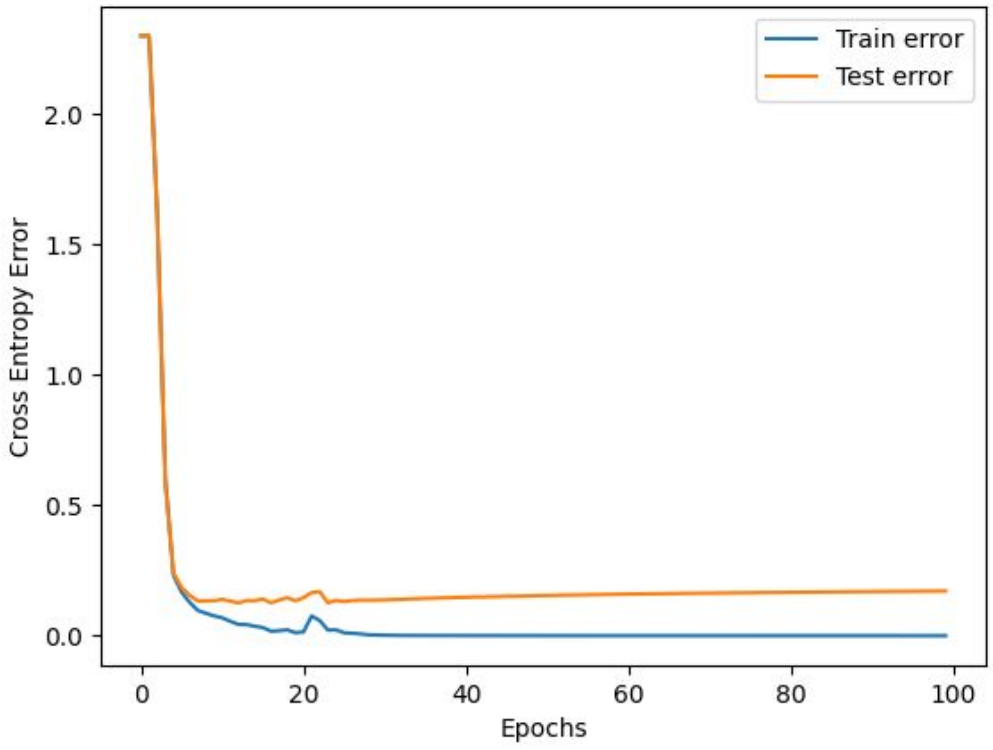
3- All the initialization techniques have been implemented in their respective functions.

4- All these functions have been implemented as per the code structure given in their respective places. Along with that other helper functions like forward, backward etc have been made.

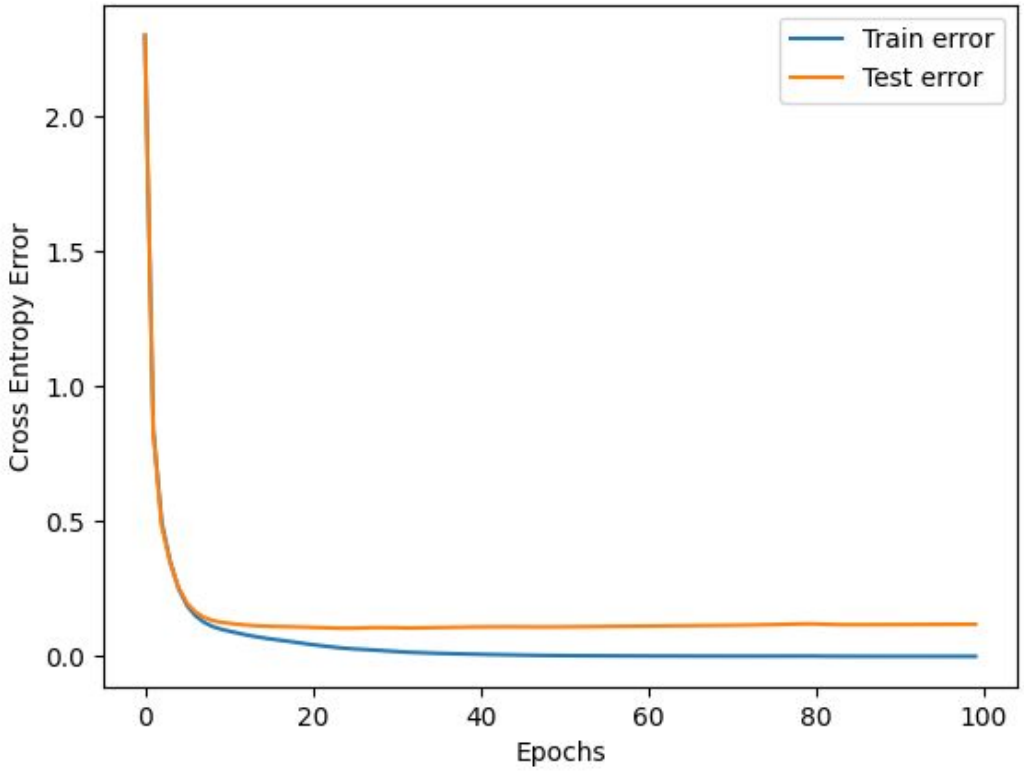
2-

A- Accuracy for relu: 97.59, Accuracy for tanh: 97.12 , Accuracy for Linear: 91.16 , Accuracy for sigmoid: 96.15.

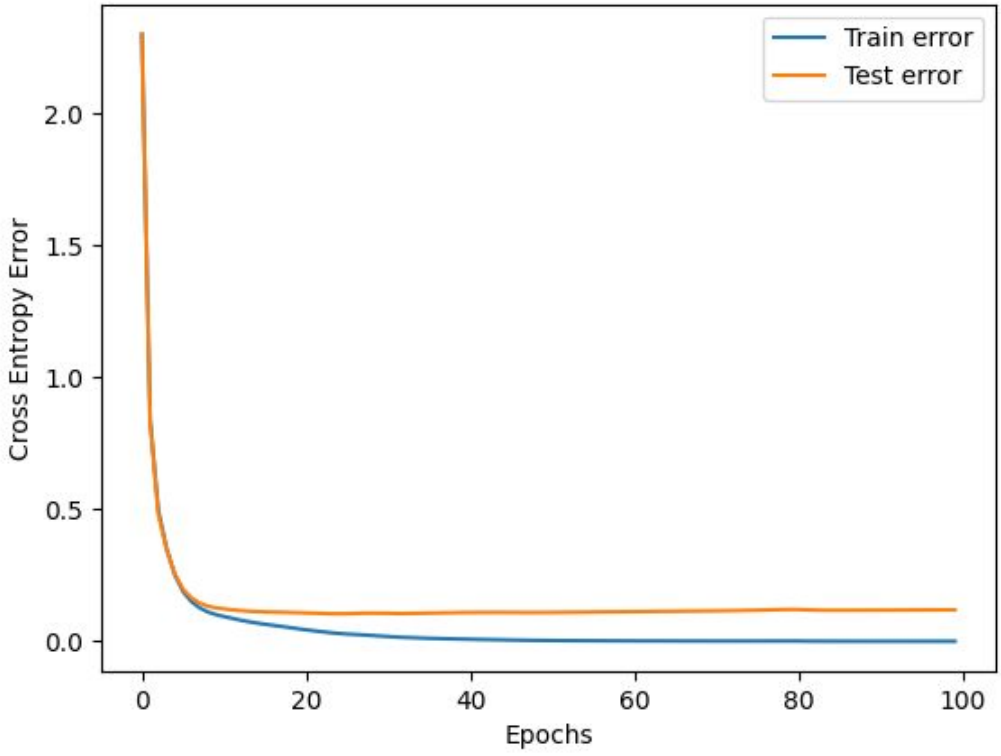
B- **Relu:**



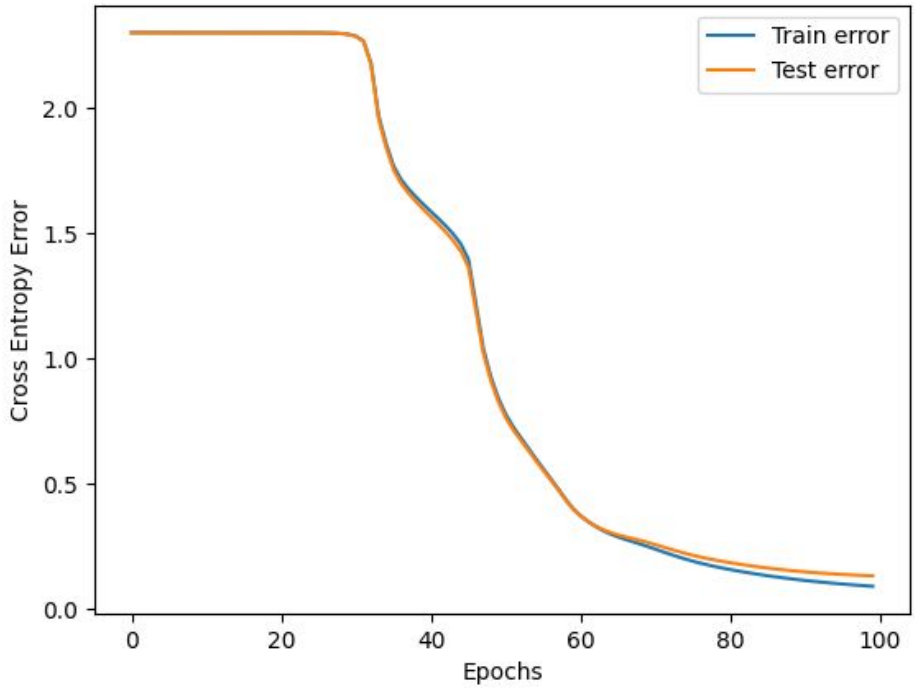
Tanh:


Train error
Test error
Cross Entropy Error
2.0
1.5
1.0
0.5
0.0
0
20
40
60
80
100
Epochs

Linear:


Train error
Test error
Cross Entropy Error
2.0
1.5
1.0
0.5
0.0
0
20
40
60
80
100
Epochs

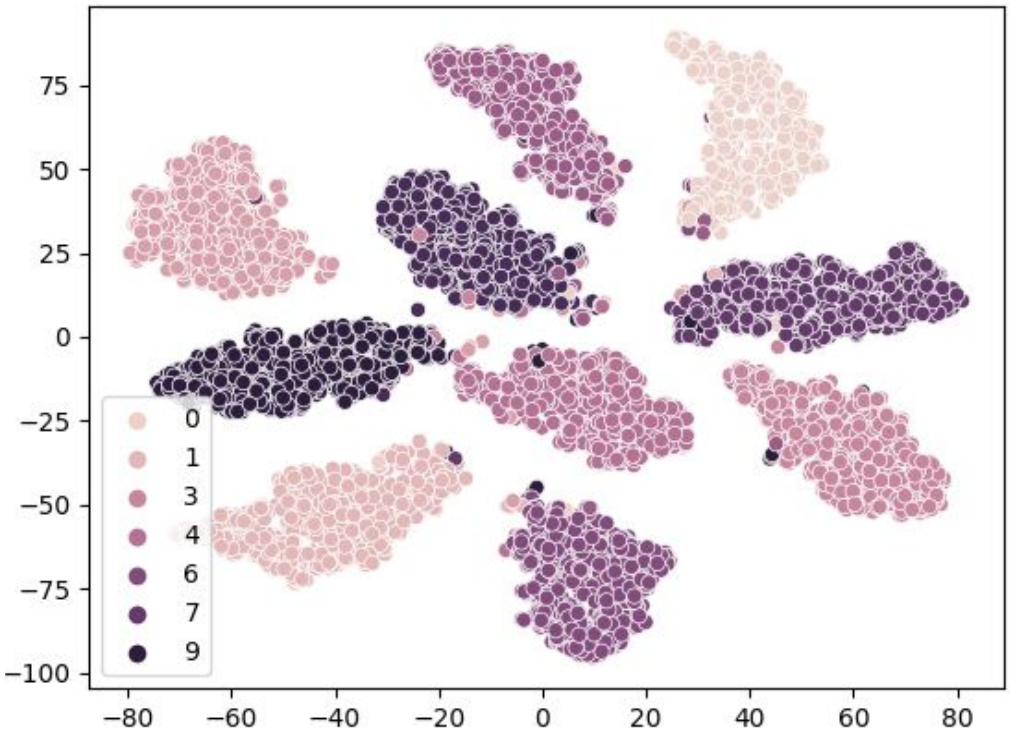
Sigmoid:



C- In the output layer Softmax function should be in every case because it only gives the values ranging from 0 to 1, where sum of values of all perceptrons =1 thereby making it act as the probability whereas none of the other functions have such property.

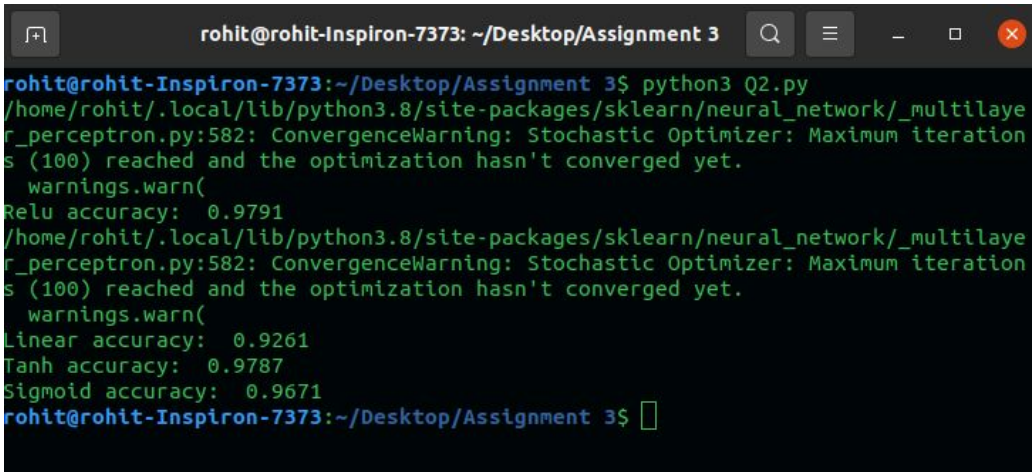
D- The total number of layers are 5, and the hidden layers are 3 with perceptrons 265,128,64 in each hidden layer respectively.

E- tSNE Plot



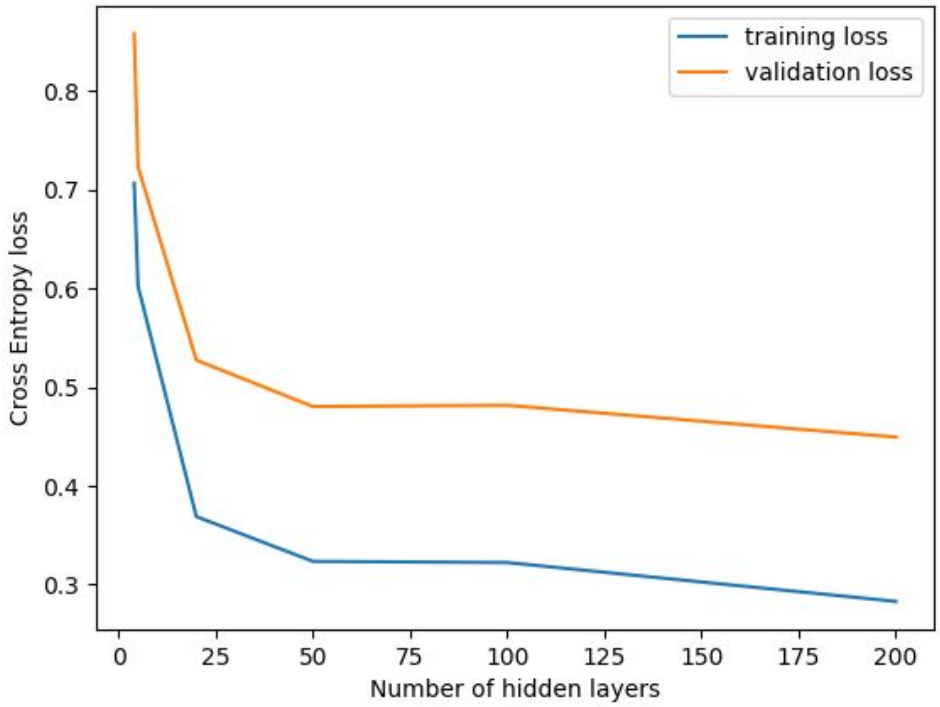
F- Sklearn Accuracy for Linear: 92.61 , Accuracy of sigmoid: 96.71 , Accuracy of tanh: 97.87 , Accuracy of relu: 97.91.

The accuracy for each model in both the cases is comparable.



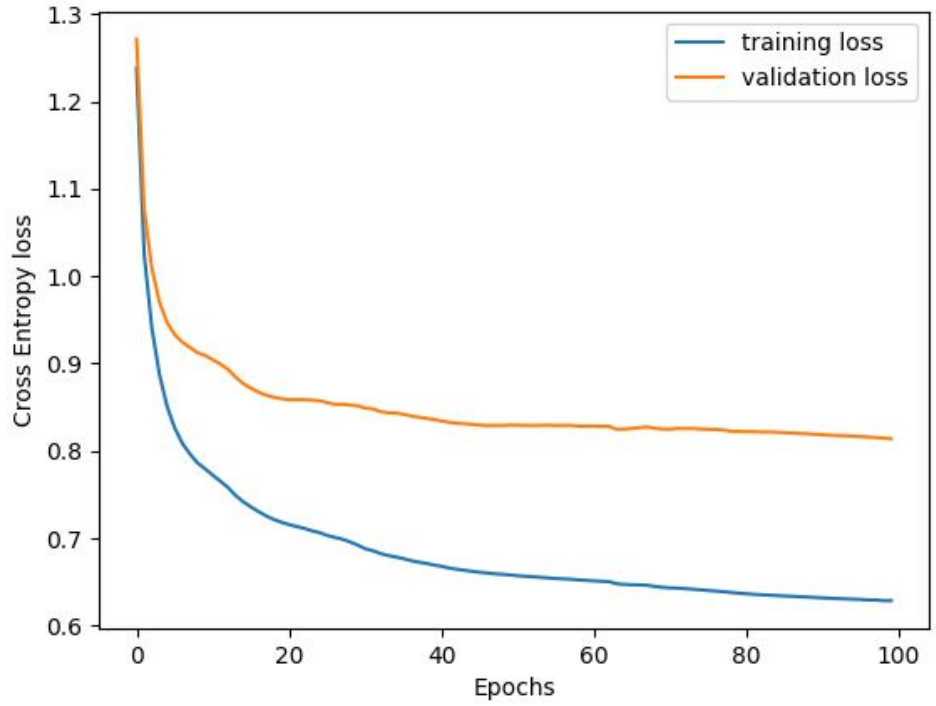
3-

A- i-

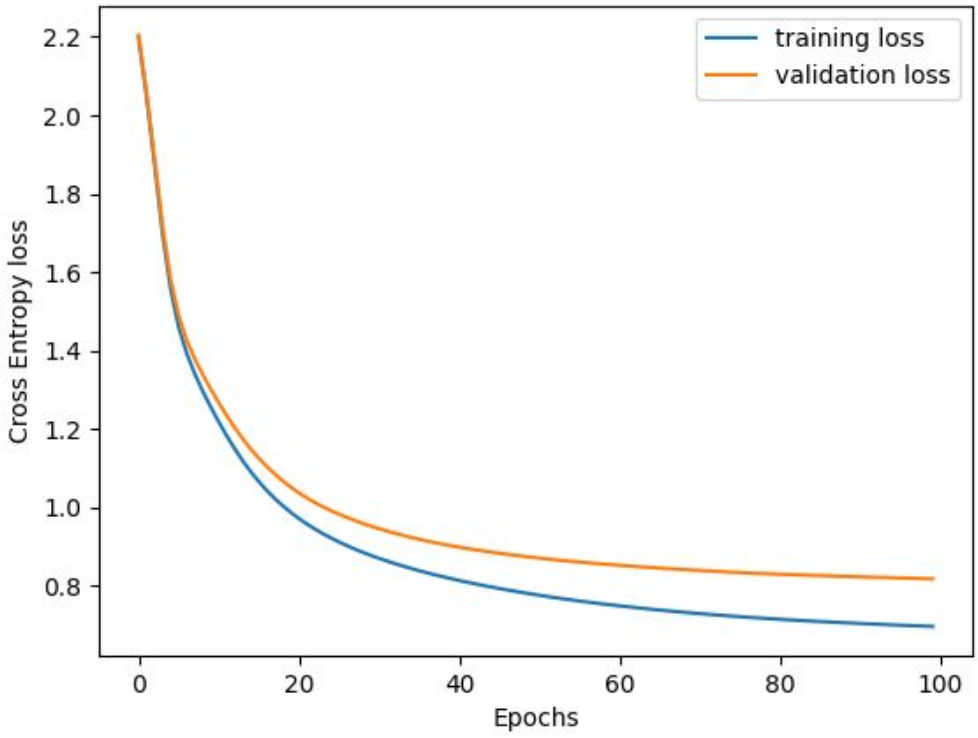


Ii- With the increase in the number of hidden layers, the Cross entropy loss decreases as with more number of perceptrons, the model will be able to predict much more complex relations between features and the labels.

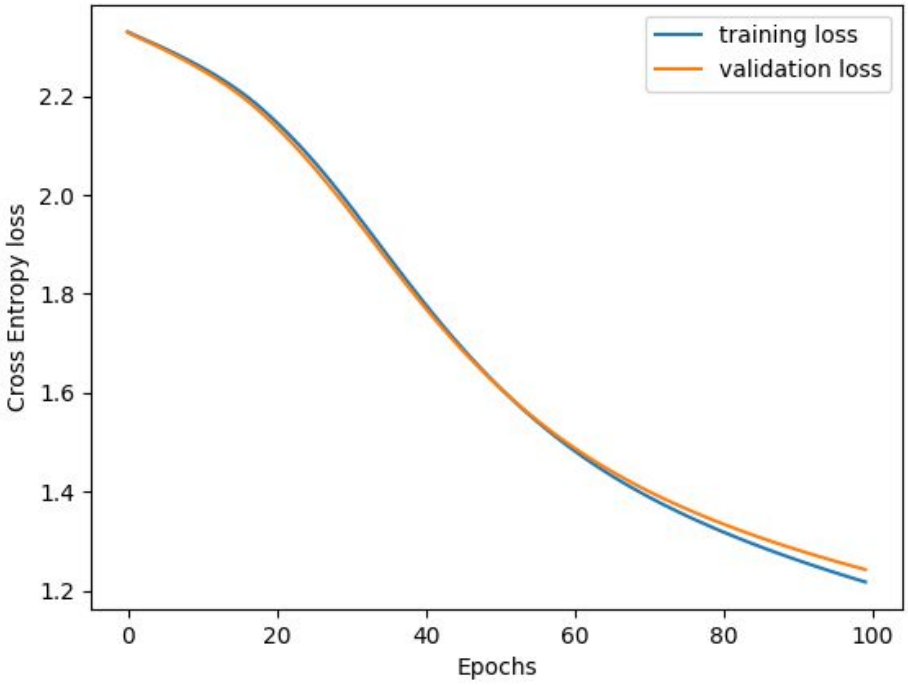
B- alpha=0.1



alpha=0.01



alpha=0.001



B- with the decreasing values of alpha, the convergence rate also decreases making the loss curve to converge after more number of epochs.