

Assignment 10

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Model

- i) No. of hidden layers = 3
- ii) Size of each hidden layer = 48
- iii) Activation Function : Relu
- iv) Loss Function: Cross Entropy
- v) Regularisation: L2
- vi) Optimiser: Adam

Parameters:

- i) Learning Rate=0.001
- ii) Number of epoch=100
- iii) batchsize=50
- iv) Patience =10

Version:

Tensor flow: 1.14.0

Python:3.6.10

Result:

Training:

```
python3 assignment10.py --train
```

First 5 Epochs:

```
Epoch 1
Train_loss: 0.9381282302431628 Train_accuracy: 84.58 %
Validation loss: 0.4351971745491028 Validation Accuracy: 83.86 %
Epoch 2
Train_loss: 0.6904413761807581 Train_accuracy: 86.216 %
Validation loss: 0.39708736538887024 Validation Accuracy: 85.33 %
Epoch 3
Train_loss: 0.6089900458464054 Train_accuracy: 87.176 %
Validation loss: 0.3784921169281006 Validation Accuracy: 85.95 %
Epoch 4
Train_loss: 0.5547150826248654 Train_accuracy: 88.002 %
Validation loss: 0.36543163657188416 Validation Accuracy: 86.49 %
Epoch 5
Train_loss: 0.5136542136609323 Train_accuracy: 88.43 %
Validation loss: 0.3557310104370117 Validation Accuracy: 86.75 %
```

Last 5 Epochs:

```
Epoch 28
Train_loss: 0.32104339200673015 Train_accuracy: 91.022 %
Validation loss: 0.35452431440353394 Validation Accuracy: 87.22 %
Epoch 29
Train_loss: 0.31940943785690995 Train_accuracy: 91.182 %
Validation loss: 0.3523317575454712 Validation Accuracy: 87.37 %
Epoch 30
Train_loss: 0.31670108244178485 Train_accuracy: 91.51 %
Validation loss: 0.3432985246181488 Validation Accuracy: 87.76 %
Epoch 31
Train_loss: 0.31374809408876186 Train_accuracy: 91.502 %
Validation loss: 0.3451034724712372 Validation Accuracy: 87.59 %
Epoch 32
Train_loss: 0.31291480474103883 Train_accuracy: 91.398 %
Validation loss: 0.35063686966896057 Validation Accuracy: 87.55 %
Early Stopping.
Using Epoch 22
Validation Accuracy 88.21 %
```

Testing:

Result using Neural Network:

```
python3 assignment10.py --test
Test Accuracy: 87.36 %
```

Result using Logistic Regression:

```
$ python3 assignment10.py --layer=1
```

```
Using layer 1 as input
*****
Accuracy of logistic regression classifier on test set: 86.37 %
```

```
$ python3 assignment10.py --layer=2
```

```
Using layer 2 as input
*****
Accuracy of logistic regression classifier on test set: 87.59 %
```

```
python3 assignment10.py --layer=3
Using layer 3 as input
*****
Accuracy of logistic regression classifier on test set: 88.02 %
```

Inference:

Neural Network achieves similar accuracy compared to that of logistic regression after layer 1. Increasing the layer or number of neurones might not help significantly in increasing the accuracy but using convolution neural network may help to improve the accuracy further.