EEG-Dataset Training - Report

Data

EEG Dataset from : https://github.com/PerforMance308/EEG_Dataset
EEG Dataset has 310 attributes and belong to one of 3 categorical classes
Training dataset has 84,420 records and testing dataset has 58,128 records

Tools Used

Python
Tensorflow (Python Framework)
Keras (Python Framework)
Numpy (Python Framework)
Spyder (IDE)

Method

Autoencoder was developed using Fully connected neural network to reduce dimension from 310 to 100. Mean square error was used to calculate error rate and Adam an adaptive learning rate optimization algorithm of Stochastic Gradient Descent was used to adjust weights and bias. Relu was used as activation function in all layers

Layer (type)	Output Shape	Param #
input_30 (InputLayer)	[(None, 310)]	0
dense_124 (Dense)	(None, 205)	63755
dense_125 (Dense)	(None, 100)	20600
dense_126 (Dense)	(None, 205)	20705
dense_127 (Dense)	(None, 310)	63860

Total params: 168,920
Trainable params: 168,920
Non-trainable params: 0

Classifier was developed using another Fully connected neural network consisting of 3 hidden layers having relu activation function and 1 output layer having softmax activation. Cross

entropy was used to calculate error and adam was used for learning. Input was normalized to reduce execution time.

Layer (type)	Output Shape	Param #
input_31 (InputLayer)	[(None, 100)]	0
batch_normalization_2 (Batch	(None, 100)	400
dense_128 (Dense)	(None, 70)	7070
dense_129 (Dense)	(None, 40)	2840
dense_130 (Dense)	(None, 10)	410
dense_131 (Dense)	(None, 3)	33

Total params: 10,753
Trainable params: 10,553
Non-trainable params: 200

Both neural network was trained for 15 epochs.

Result

Initially classifier was trained without reducing dimension

```
time taken by Classifier :  2981.25
Classification accuracy on Testing data :  34.32080924855491 %
Classification accuracy on training data :  34.57711442786069 %
```

Without the encoded input classifier performed really badly after only 15 epochs. Accuracy was only 34% which can also be achieved by random probability. This means that there was very little to no learning.

Classifier was trained again after reducing dimension of input by Autoencoder.

```
time taken by encoder :  5011.59375
time taken by Classifier :  425.515625
Classification accuracy on Testing data :  70.23293421414809 %
Classification accuracy on training data :  97.81094527363184 %
```

Classifier took less time to train 15 epochs. Testing accuracy was around 70% and Training accuracy was around 98% which means there is some overfitting.