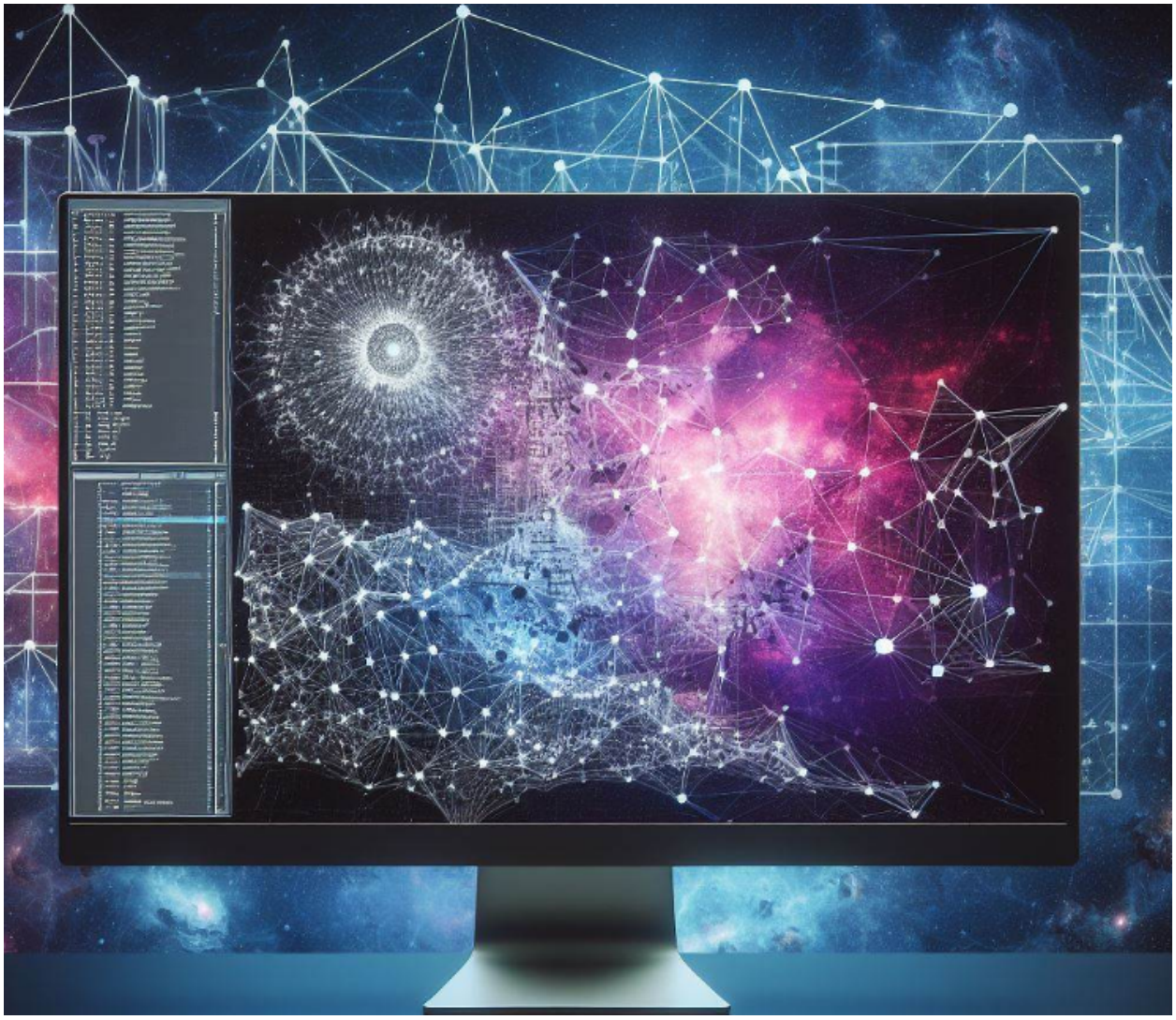

Assignment 6

06.11.2023

—

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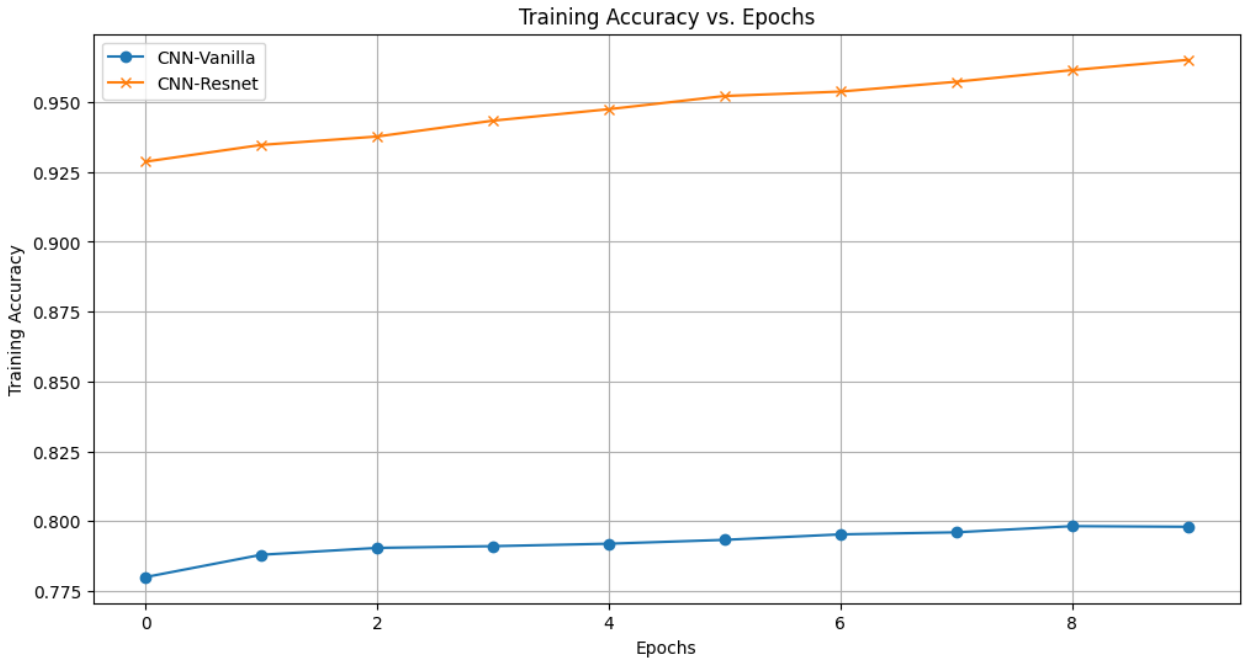
EXPERIMENT 1

```
1563/1563 - 5s - loss: 0.6798 - accuracy: 0.7598 - 5s/epoch - 3ms/step
Epoch 25/30
1563/1563 - 5s - loss: 0.6687 - accuracy: 0.7648 - 5s/epoch - 3ms/step
Epoch 26/30
1563/1563 - 5s - loss: 0.6575 - accuracy: 0.7658 - 5s/epoch - 3ms/step
Epoch 27/30
1563/1563 - 5s - loss: 0.6451 - accuracy: 0.7702 - 5s/epoch - 3ms/step
Epoch 28/30
1563/1563 - 5s - loss: 0.6343 - accuracy: 0.7735 - 5s/epoch - 3ms/step
Epoch 29/30
1563/1563 - 5s - loss: 0.6228 - accuracy: 0.7784 - 5s/epoch - 3ms/step
Epoch 30/30
1563/1563 - 5s - loss: 0.6153 - accuracy: 0.7810 - 5s/epoch - 3ms/step
313/313 - 1s - loss: 1.0621 - accuracy: 0.6630 - 825ms/epoch - 3ms/step
313/313 - 1s - loss: 0.8562 - accuracy: 0.7938 - 1s/epoch - 4ms/step
CNN-Vanilla Accuracy on Test Set: 66.29999876022339%
CNN-Resnet Accuracy on Test Set: 79.37999963760376%
Number of Parameters in CNN-Vanilla: 160202
Number of Parameters in CNN-Resnet: 217290
```

The best accuracy is for CNN resnet model which is 79.37



EXPERIMENT 2

```
Epoch 1/10
196/196 - 104s - loss: 1.7401 - accuracy: 0.3654 - 104s/epoch - 532ms/step
Epoch 2/10
196/196 - 55s - loss: 1.3503 - accuracy: 0.5161 - 55s/epoch - 282ms/step
Epoch 3/10
196/196 - 54s - loss: 1.2192 - accuracy: 0.5670 - 54s/epoch - 278ms/step
Epoch 4/10
196/196 - 54s - loss: 1.1282 - accuracy: 0.6045 - 54s/epoch - 274ms/step
Epoch 5/10
196/196 - 55s - loss: 1.0501 - accuracy: 0.6327 - 55s/epoch - 279ms/step
Epoch 6/10
196/196 - 59s - loss: 1.0079 - accuracy: 0.6495 - 59s/epoch - 299ms/step
Epoch 7/10
196/196 - 54s - loss: 0.9510 - accuracy: 0.6699 - 54s/epoch - 277ms/step
Epoch 8/10
196/196 - 55s - loss: 0.9053 - accuracy: 0.6871 - 55s/epoch - 280ms/step
Epoch 9/10
196/196 - 56s - loss: 0.8671 - accuracy: 0.6988 - 56s/epoch - 287ms/step
Epoch 10/10
196/196 - 61s - loss: 0.8260 - accuracy: 0.7144 - 61s/epoch - 309ms/step
Epoch 1/10
196/196 - 50s - loss: 3.3127 - accuracy: 0.1008 - 50s/epoch - 257ms/step
Epoch 2/10
196/196 - 52s - loss: 2.3026 - accuracy: 0.0977 - 52s/epoch - 266ms/step
Epoch 3/10
196/196 - 50s - loss: 2.3020 - accuracy: 0.0990 - 50s/epoch - 255ms/step
Epoch 4/10
196/196 - 49s - loss: 2.1224 - accuracy: 0.2030 - 49s/epoch - 250ms/step
Epoch 5/10
196/196 - 49s - loss: 1.7696 - accuracy: 0.3429 - 49s/epoch - 248ms/step
Epoch 6/10
196/196 - 50s - loss: 1.6335 - accuracy: 0.3996 - 50s/epoch - 254ms/step
Epoch 7/10
196/196 - 49s - loss: 1.5352 - accuracy: 0.4403 - 49s/epoch - 249ms/step
Epoch 8/10
196/196 - 49s - loss: 1.4675 - accuracy: 0.4668 - 49s/epoch - 251ms/step
Epoch 9/10
196/196 - 50s - loss: 1.4361 - accuracy: 0.4806 - 50s/epoch - 254ms/step
Epoch 10/10
196/196 - 49s - loss: 1.3845 - accuracy: 0.4995 - 49s/epoch - 248ms/step
313/313 - 4s - loss: 0.9328 - accuracy: 0.6716 - 4s/epoch - 14ms/step
313/313 - 3s - loss: 1.4242 - accuracy: 0.4882 - 3s/epoch - 11ms/step
CNN-Vanilla Accuracy with Data Normalization: 67.15999841690063%
CNN-Vanilla Accuracy without Data Normalization: 48.820000886917114%
```

CNN Vanilla accuracy with data noramlization is 67.16%

EXPERIMENT 3

```
196/196 - 22s - loss: 1.0077 - accuracy: 0.6490 - 22s/epoch - 112ms/step
Epoch 6/10
196/196 - 23s - loss: 0.9349 - accuracy: 0.6757 - 23s/epoch - 119ms/step
Epoch 7/10
196/196 - 23s - loss: 0.8852 - accuracy: 0.6923 - 23s/epoch - 119ms/step
Epoch 8/10
196/196 - 23s - loss: 0.8284 - accuracy: 0.7123 - 23s/epoch - 118ms/step
Epoch 9/10
196/196 - 23s - loss: 0.7767 - accuracy: 0.7317 - 23s/epoch - 119ms/step
Epoch 10/10
196/196 - 22s - loss: 0.7382 - accuracy: 0.7444 - 22s/epoch - 112ms/step
313/313 - 3s - loss: 0.8863 - accuracy: 0.6953 - 3s/epoch - 11ms/step
Stochastic Gradient Descent Accuracy with Data Normalization: 15.080000460147858%
Mini-batch Gradient Descent (No Momentum) Accuracy with Data Normalization: 21.459999680519104%
Mini-batch Gradient Descent (Momentum 0.9) Accuracy with Data Normalization: 43.25999915599823%
ADAM Optimizer Accuracy with Data Normalization: 69.52999830245972%
```

Adam Optimizer gives the best accuracy that is 69.53%