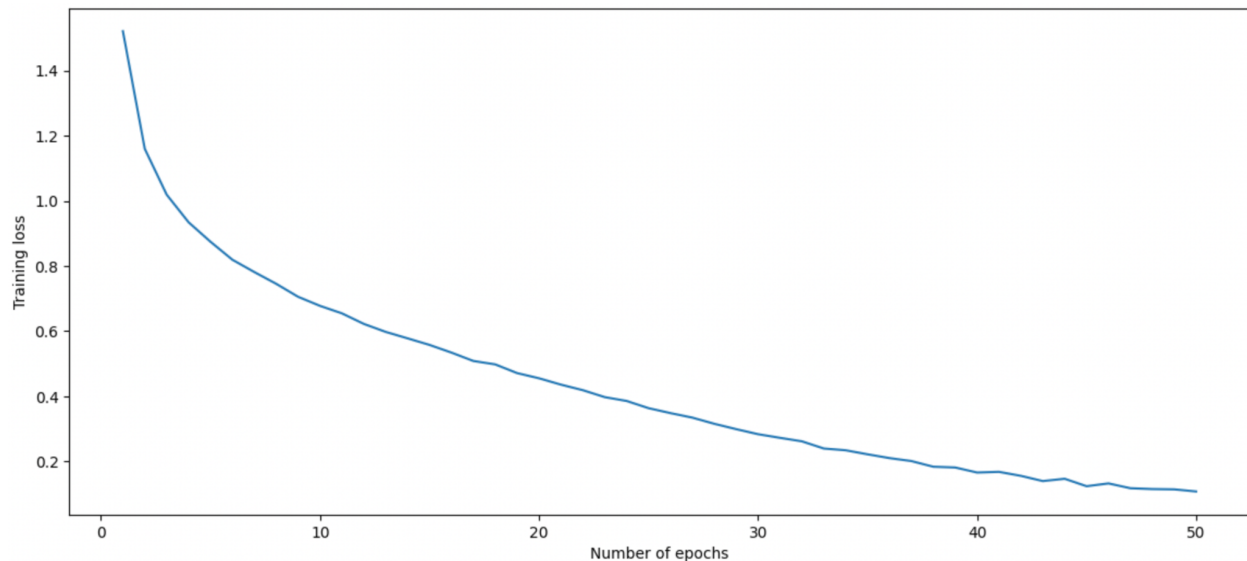


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Experiment -1 :-

For CNN-Vanilla.

Test set accuracy = 72.02 %



For CNN-ResNet.

Test set accuracy = 94.32%.

(as it was taking long time , I run for 20 epochs only).

Experiment -2:-

Study the effect of data normalisation

Data with normalisation give better accuracy than non-normalised data.

Experiment -3:-

Study the effect of Different Optimizers

Lowest accuracy was seen in stochastic gradient descent.

Then further increase with MiniBatch with no Momentum,

Increase while using momentum .9.

The best result come with Adam Optimizer.

```
Epoch 1 (SGD): Loss 2.2728783724558017
Epoch 2 (SGD): Loss 2.205529226366516
Finished training ResNet (SGD) in 814.21 seconds.
ResNet (SGD) Test Accuracy: 22.46%
Epoch 1 (MiniBatchNoMomentum): Loss 2.2707829341254273
Epoch 2 (MiniBatchNoMomentum): Loss 2.188151051626181
Finished training ResNet (MiniBatchNoMomentum) in 810.44 seconds.
ResNet (MiniBatchNoMomentum) Test Accuracy: 20.63%
Epoch 1 (MiniBatchWithMomentum): Loss 2.058178792829099
Epoch 2 (MiniBatchWithMomentum): Loss 1.6839746456316975
Finished training ResNet (MiniBatchWithMomentum) in 802.30 seconds.
ResNet (MiniBatchWithMomentum) Test Accuracy: 38.8%
Epoch 1 (Adam): Loss 1.411453812933334
Epoch 2 (Adam): Loss 0.9711482338893139
Finished training ResNet (Adam) in 785.39 seconds.
ResNet (Adam) Test Accuracy: 67.29%
```

Experiment 4:-

Study of network Depth ;

a) *Four* level Resnet block with two fully-connected layers;

```
Epoch 1: Loss 1.3547961874996
Epoch 2: Loss 0.9531640161943558
Finished training ResNet in 803.83 seconds.
ResNet Test Accuracy: 68.34%
```

```
Total params: 325,162
Trainable params: 325,162
Non-trainable params: 0
```

- b) Three level Resnet blocks with *four* fully connected layers

```
Epoch 1: Loss 1.5057427139233446  
Epoch 2: Loss 1.0547767982763403  
Finished training ResNet in 816.76 seconds.  
ResNet Test Accuracy: 65.29%
```

```
Total params: 358,186  
Trainable params: 358,186  
Non-trainable params: 0
```

Clearly First one is better option.

NOTE- Here shown accuracy is for 2 epoch only.