COL775: Assignment 1 Part 1

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1 ResNet-Inbuilt Normalizaion

1.1 All Models

All the models trained can be found here Click here

1.2 Parameters

The best model obtained is for the following parameters:

- **num_blocks_in_each**: 2
- **total_layers**: 12
- **batch_size**: 32
- **num_classes**: 25
- **learning_rate**: 0.0001
- **num_epochs**: 50

1.3 Training errors and Loss curves

1.3.1 Loss

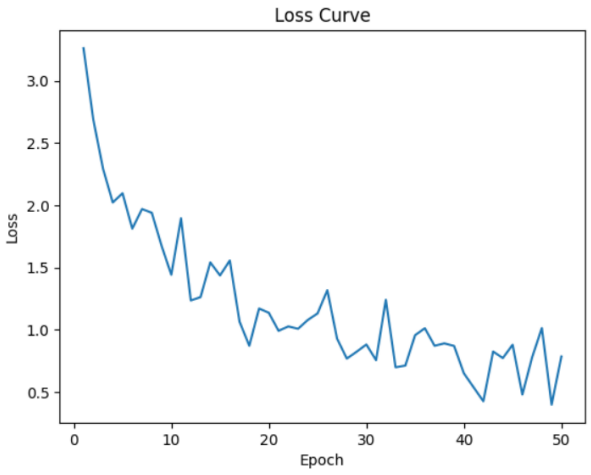

Figure 1: Plot of the effect of loss on the number of epochs of the training

The loss drops at a a normal rate with the start of training as there are some characteristics like color, etc which can be learned by the model. Then the loss decreases slowly as the images are learnt to lead convergence.

1.3.2 Accuracies

```
Accuracy of the network for val: 77.81333333333333 %
Accuracy of for val Asian-Green-Bee-Eater: 87.66666666666667 %
Accuracy of for val Brown-Headed-Barbet: 54.0 %
Accuracy of for val Cattle-Egret: 81.66666666666667 %
Accuracy of for val Common-Kingfisher: 86.33333333333333 %
Accuracy of for val Common-Myna: 72.0 %
Accuracy of for val Common-Rosefinch: 64.33333333333333 %
Accuracy of for val Common-Tailorbird: 58.666666666666664 %
Accuracy of for val Coppersmith-Barbet: 88.33333333333333 %
Accuracy of for val Forest-Wagtail: 78.66666666666667 %
Accuracy of for val Gray-Wagtail: 77.66666666666667 %
Accuracy of for val Hoopoe: 83.33333333333333 %
Accuracy of for val House-Crow: 78.66666666666667 %
Accuracy of for val Indian-Grey-Hornbill: 65.0 %
Accuracy of for val Indian-Peacock: 81.33333333333333 %
Accuracy of for val Indian-Pitta: 86.0 %
Accuracy of for val Indian-Roller: 76.33333333333333 %
Accuracy of for val Jungle-Babbler: 82.0 %
Accuracy of for val Northern-Lapwing: 80.66666666666667 %
Accuracy of for val Red-Wattled-Lapwing: 81.66666666666667 %
Accuracy of for val Ruddy-Shelduck: 86.33333333333333 %
Accuracy of for val Rufous-Treepie: 72.0 %
Accuracy of for val Sarus-Crane: 78.66666666666667 %
Accuracy of for val White-Breasted-Kingfisher: 87.0 %
Accuracy of for val White-Breasted-Waterhen: 71.0 %
Accuracy of for val White-Wagtail: 86.0 %
```

Figure 2: Plot of the effect of loss on the number of epochs of the training

2 ResNet-Batch Normalization

2.1 Training errors and Loss curves

2.1.1 Loss

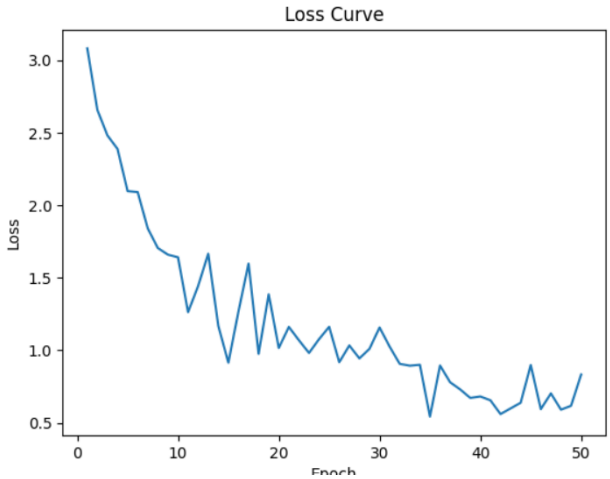

Figure 3: Plot of the effect of loss on the number of epochs of the training

The loss drops at a a normal rate with the start of training as there are some characteristics like color, etc which can be learned by the model. Then the loss decreases slowly as the images are

learnt to lead convergence.

2.1.2 Batch sizes 8-128

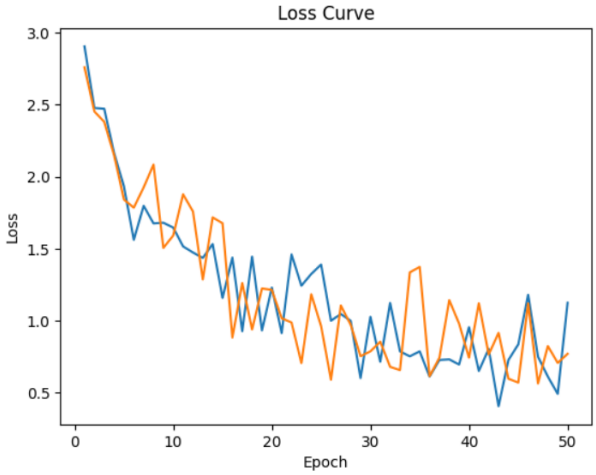

Figure 4: Plot of the effect of loss on the number of epochs of the training

Both batch normalization and group normalization the model with batch size 8 underfits and takes more epochs to decrease the loss, whereas Batch size 128 model converges fast but has a lower test accuracy than batch size 32.

2.1.3 Accuracies

```
Accuracy of the network for val: 80.1378818495186 %
Accuracy of for val Asian-Green-Bee-Eater: 84.85804416403785 %
Accuracy of for val Brown-Headed-Barbet: 61.388888888888886 %
Accuracy of for val Cattle-Egret: 89.27444794952682 %
Accuracy of for val Common-Kingfisher: 88.3076923076923 %
Accuracy of for val Common-Myna: 78.76106194690266 %
Accuracy of for val Common-Rosefinch: 75.6923076923077 %
Accuracy of for val Common-Tailorbird: 72.45508982035928 %
Accuracy of for val Coppersmith-Barbet: 83.38192419825073 %
Accuracy of for val Forest-Wagtail: 74.76635514018692 %
Accuracy of for val Gray-Wagtail: 74.31192660550458 %
Accuracy of for val Hoopoe: 89.85507246376811 %
Accuracy of for val House-Crow: 77.24719101123596 %
Accuracy of for val Indian-Grey-Hornbill: 57.48502994011976 %
Accuracy of for val Indian-Peacock: 84.19452887537994 %
Accuracy of for val Indian-Pitta: 81.79190751445087 %
Accuracy of for val Indian-Roller: 82.4074074074074 %
Accuracy of for val Jungle-Babbler: 84.86646884272997 %
Accuracy of for val Northern-Lapwing: 76.78100263852242 %
Accuracy of for val Red-Wattled-Lapwing: 83.89057750759878 %
Accuracy of for val Ruddy-Shelduck: 87.27272727272727 %
Accuracy of for val Rufous-Treepie: 76.8025078369906 %
Accuracy of for val Sarus-Crane: 86.45533141210375 %
Accuracy of for val White-Breasted-Kingfisher: 89.67391304347827 %
Accuracy of for val White-Breasted-Waterhen: 82.9192546583851 %
Accuracy of for val White-Wagtail: 79.70588235294117 %
```

Figure 5: Plot of the effect of loss on the number of epochs of the training

3 ResNet-Group Normalization

3.1 Training errors and Loss curves

3.1.1 Loss

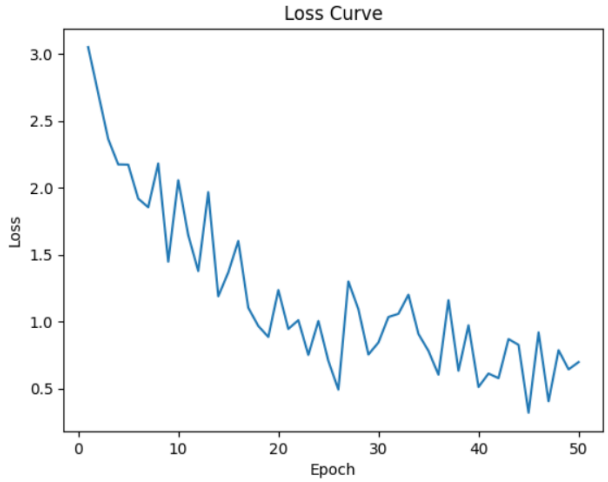

Figure 6: Plot of the effect of loss on the number of epochs of the training

The loss drops at a a normal rate with the start of training as there are some characteristics like color, etc which can be learned by the model. Then the loss decreases slowly as the images are learnt to lead convergence.

3.1.2 Accuracies

```
Accuracy of the network for val: 82.31308688933792 %
Accuracy of for val Asian-Green-Bee-Eater: 94.3217665615142 %
Accuracy of for val Brown-Headed-Barbet: 75.83333333333333 %
Accuracy of for val Cattle-Egret: 91.16719242902208 %
Accuracy of for val Common-Kingfisher: 93.53846153846153 %
Accuracy of for val Common-Myna: 78.76106194690266 %
Accuracy of for val Common-Rosefinch: 71.6923076923077 %
Accuracy of for val Common-Tailorbird: 85.02994011976048 %
Accuracy of for val Coppersmith-Barbet: 78.42565597667638 %
Accuracy of for val Forest-Wagtail: 67.91277258566979 %
Accuracy of for val Gray-Wagtail: 82.87461773700306 %
Accuracy of for val Hoopoe: 80.8695652173913 %
Accuracy of for val House-Crow: 76.12359550561797 %
Accuracy of for val Indian-Grey-Hornbill: 62.275449101796404 %
Accuracy of for val Indian-Peacock: 88.75379939209726 %
Accuracy of for val Indian-Pitta: 87.86127167630057 %
Accuracy of for val Indian-Roller: 88.27160493827161 %
Accuracy of for val Jungle-Babbler: 85.45994065281899 %
Accuracy of for val Northern-Lapwing: 91.2928759894459 %
Accuracy of for val Red-Wattled-Lapwing: 75.98784194528875 %
Accuracy of for val Ruddy-Shelduck: 89.0909090909091 %
Accuracy of for val Rufous-Treepie: 79.62382445141066 %
Accuracy of for val Sarus-Crane: 95.96541786743516 %
Accuracy of for val White-Breasted-Kingfisher: 95.65217391304348 %
Accuracy of for val White-Breasted-Waterhen: 54.96894409937888 %
Accuracy of for val White-Wagtail: 83.52941176470588 %
```

Figure 7: Plot of the effect of loss on the number of epochs of the training

4 ResNet-Instance Normalizaion

4.1 Training errors and Loss curves

4.1.1 Loss

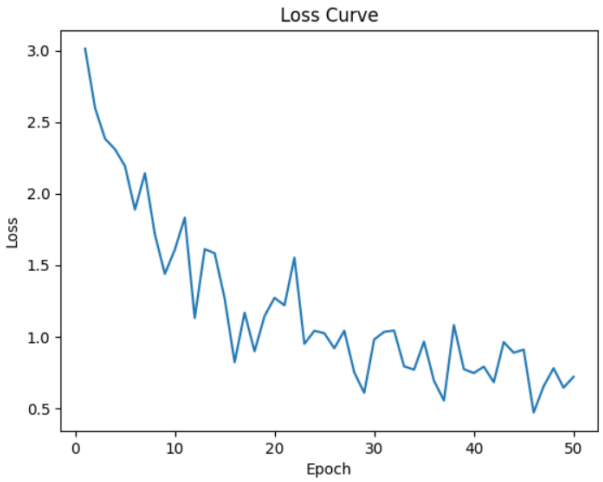

Figure 8: Plot of the effect of loss on the number of epochs of the training

The loss drops at a a normal rate with the start of training as there are some characteristics like color, etc which can be learned by the model. Then the loss decreases slowly as the images are learnt to lead convergence.

4.1.2 Accuracies

```
$ python ass1IN.py
Accuracy of the network for val: 79.87638179008677 %
Accuracy of for val Asian-Green-Bee-Eater: 83.59621451104101 %
Accuracy of for val Brown-Headed-Barbet: 78.05555555555556 %
Accuracy of for val Cattle-Egret: 83.28075709779179 %
Accuracy of for val Common-Kingfisher: 92.92307692307692 %
Accuracy of for val Common-Myna: 86.13569321533923 %
Accuracy of for val Common-Rosefinch: 62.15384615384615 %
Accuracy of for val Common-Tailorbird: 53.59281437125748 %
Accuracy of for val Coppersmith-Barbet: 77.25947521865889 %
Accuracy of for val Forest-Wagtail: 68.53582554517133 %
Accuracy of for val Gray-Wagtail: 83.79204892966361 %
Accuracy of for val Hoopoe: 86.08695652173913 %
Accuracy of for val House-Crow: 73.59550561797752 %
Accuracy of for val Indian-Grey-Hornbill: 64.37125748502994 %
Accuracy of for val Indian-Peacock: 84.4984802431611 %
Accuracy of for val Indian-Pitta: 90.17341040462428 %
Accuracy of for val Indian-Roller: 87.96296296296296 %
Accuracy of for val Jungle-Babbler: 65.8753709198813 %
Accuracy of for val Northern-Lapwing: 76.78100263852242 %
Accuracy of for val Red-Wattled-Lapwing: 88.75379939209726 %
Accuracy of for val Ruddy-Shelduck: 90.3030303030303 %
Accuracy of for val Rufous-Treepie: 89.65517241379311 %
Accuracy of for val Sarus-Crane: 86.1671469740634 %
Accuracy of for val White-Breasted-Kingfisher: 95.3804347826087
Accuracy of for val White-Breasted-Waterhen: 70.4968944099379 %
Accuracy of for val White-Wagtail: 76.76470588235294 %
[cs1210106@khas008 ~/scratch/ass1]
$ python ass1IN.py
Accuracy of the network for val: 76.61333333333333 %
```

Figure 9: Plot of the effect of loss on the number of epochs of the training

5 ResNet-Layer Normalizaion

5.1 Training errors and Loss curves

5.1.1 Loss

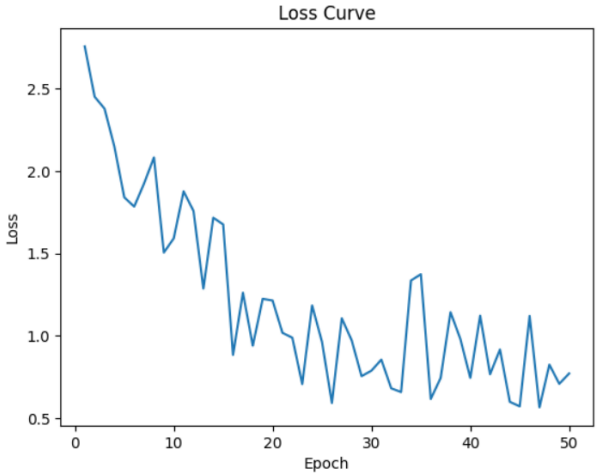

Figure 10: Plot of the effect of loss on the number of epochs of the training

The loss drops at a a normal rate with the start of training as there are some characteristics like color, etc which can be learned by the model. Then the loss decreases slowly as the images are learnt to lead convergence.

5.1.2 Accuracies

```
Accuracy of the network for val: 71.28 %
Accuracy of for val Asian-Green-Bee-Eater: 93.66666666666667 %
Accuracy of for val Brown-Headed-Barbet: 79.66666666666667 %
Accuracy of for val Cattle-Egret: 75.66666666666667 %
Accuracy of for val Common-Kingfisher: 85.33333333333333 %
Accuracy of for val Common-Myna: 78.33333333333333 %
Accuracy of for val Common-Rosefinch: 40.666666666666664 %
Accuracy of for val Common-Tailorbird: 45.333333333333336 %
Accuracy of for val Coppersmith-Barbet: 84.33333333333333 %
Accuracy of for val Forest-Wagtail: 63.333333333333336 %
Accuracy of for val Gray-Wagtail: 75.33333333333333 %
Accuracy of for val Hoopoe: 78.0 %
Accuracy of for val House-Crow: 68.33333333333333 %
Accuracy of for val Indian-Grey-Hornbill: 43.0 %
Accuracy of for val Indian-Peacock: 72.0 %
Accuracy of for val Indian-Pitta: 88.66666666666667 %
Accuracy of for val Indian-Roller: 87.0 %
Accuracy of for val Jungle-Babbler: 75.33333333333333 %
Accuracy of for val Northern-Lapwing: 61.666666666666664 %
Accuracy of for val Red-Wattled-Lapwing: 80.33333333333333 %
Accuracy of for val Ruddy-Shelduck: 81.33333333333333 %
Accuracy of for val Rufous-Treepie: 56.333333333333336 %
Accuracy of for val Sarus-Crane: 71.66666666666667 %
Accuracy of for val White-Breasted-Kingfisher: 89.0 %
Accuracy of for val White-Breasted-Waterhen: 47.0 %
Accuracy of for val White-Wagtail: 60.666666666666664 %
```

Figure 11: Plot of the effect of loss on the number of epochs of the training

6 ResNet-No Normalizaion

6.1 Training errors and Loss curves

6.1.1 Loss

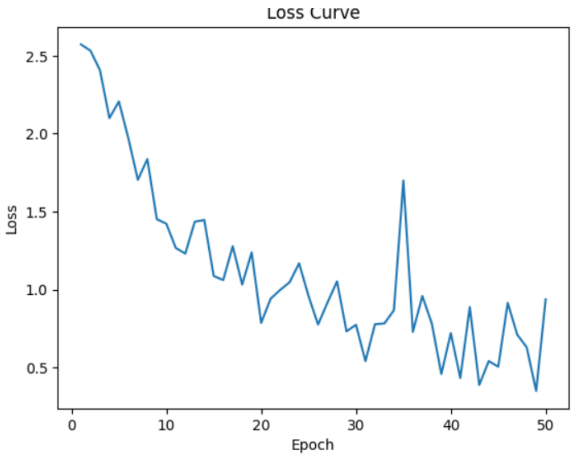

Figure 12: Plot of the effect of loss on the number of epochs of the training

The loss drops at a a normal rate with the start of training as there are some characteristics like color, etc which can be learned by the model. Then the loss decreases slowly as the images are learnt to lead convergence.

7 ResNet-BatchInstance Normalizaion

7.1 Training errors and Loss curves

7.1.1 Loss

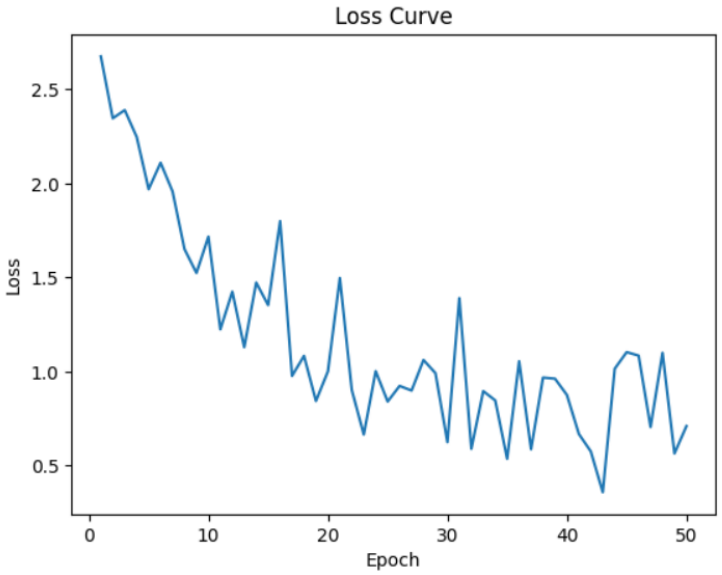

Figure 13: Plot of the effect of loss on the number of epochs of the training

The loss drops at a a normal rate with the start of training as there are some characteristics like color, etc which can be learned by the model. Then the loss decreases slowly as the images are learnt to lead convergence.