Project 2
Deep Learning by PyTorch

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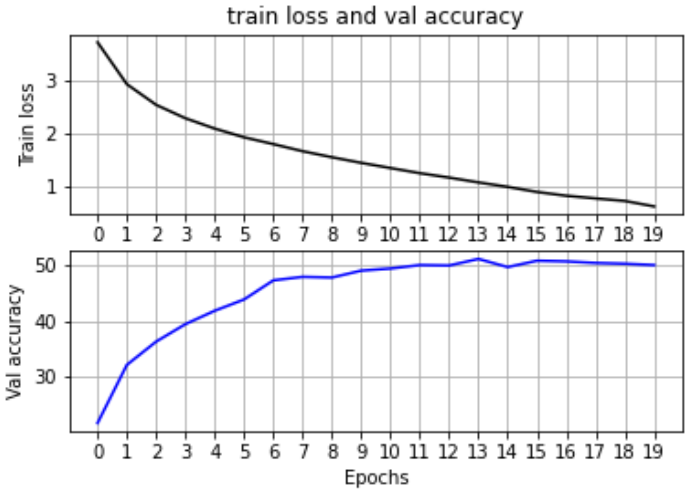
Late days used : 1
Part 1 BaseNet

Layer	Layer type	Kernel size	In | Out dim	In | Out channels
1	conv2d	3	32 | 28	3 | 64
2	batchNorm2d		28 | 28	
3	conv2d	3	28 | 24	64 | 128
4	batchNorm2d		24 | 24	
5	conv2d	3	24 | 20	128 | 256
6	maxPool2d	2	20 | 10	
7	batchNorm2d		10 | 10	
8	conv2d	3	10 | 6	256 | 512
9	batchNorm2d		6 | 6	
10	linear		2048 | 256	
11	relu		256 | 256	
12	batchNorm1d		256 | 256	
13	linear		256 | 128	
14	relu		128 | 128	
15	batchNorm1d		128 | 128	
16	linear		128 | 50	
17	relu		50 | 50	
18	batchNorm1d		50 | 50	
19	linear		50 | 100	

The modified network above 2 additional conv2d layers with normalization after each convolution layers. It also adds two linear layers and normalization. The new model above improve the accuracy from approximately 20% to 50 %, which is a 30% increase.

Results :



Part 2 ResNet

After fine-tuning the network by modifying the hyper parameters and changing the linear layer, there is a significant improve in training and test accuracy. Achieving around 80% in former, and 57% in the latter. The hyper parameters that are used are as follows :

- Epochs = 50
- Learning rate = 0.001
- Batch size =32

The data was also augmented so it resized to 256 pixels, and randomly cropped, flip rotate and normalize with the following mean and std = (mean=[0.485, 0.456, 0.406],
std=[0.229, 0.224, 0.225])

Screenshots of the results are below :

```
TRAINING Epoch 25/50 Loss 0.0470 Accuracy 0.7033
TRAINING Epoch 26/50 Loss 0.0470 Accuracy 0.7117
TRAINING Epoch 27/50 Loss 0.0452 Accuracy 0.7157
TRAINING Epoch 28/50 Loss 0.0435 Accuracy 0.7323
TRAINING Epoch 29/50 Loss 0.0424 Accuracy 0.7323
TRAINING Epoch 30/50 Loss 0.0411 Accuracy 0.7430
TRAINING Epoch 31/50 Loss 0.0393 Accuracy 0.7593
TRAINING Epoch 32/50 Loss 0.0395 Accuracy 0.7520
TRAINING Epoch 33/50 Loss 0.0378 Accuracy 0.7643
TRAINING Epoch 34/50 Loss 0.0371 Accuracy 0.7767
TRAINING Epoch 35/50 Loss 0.0368 Accuracy 0.7687
TRAINING Epoch 36/50 Loss 0.0357 Accuracy 0.7797
TRAINING Epoch 37/50 Loss 0.0335 Accuracy 0.7867
TRAINING Epoch 38/50 Loss 0.0333 Accuracy 0.7970
TRAINING Epoch 39/50 Loss 0.0322 Accuracy 0.8030
TRAINING Epoch 40/50 Loss 0.0322 Accuracy 0.8020
TRAINING Epoch 41/50 Loss 0.0321 Accuracy 0.8027
TRAINING Epoch 42/50 Loss 0.0309 Accuracy 0.8057
TRAINING Epoch 43/50 Loss 0.0294 Accuracy 0.8200
TRAINING Epoch 44/50 Loss 0.0293 Accuracy 0.8193
TRAINING Epoch 45/50 Loss 0.0286 Accuracy 0.8190
TRAINING Epoch 46/50 Loss 0.0285 Accuracy 0.8290
TRAINING Epoch 47/50 Loss 0.0281 Accuracy 0.8270
TRAINING Epoch 48/50 Loss 0.0272 Accuracy 0.8293
TRAINING Epoch 49/50 Loss 0.0259 Accuracy 0.8367
TRAINING Epoch 50/50 Loss 0.0271 Accuracy 0.8313
Finished Training
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```

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[338] test(model, criterion)

      Test Loss: 0.0517 Test Accuracy 0.5645
```

class: 130.Tree_Sparrow predicted: 130.Tree_Sparrow

class: 110.Geococcyx predicted: 110.Geococcyx

class: 117.Clay_colored_Sparrow predicted: 031.Black_billed_Cuckoo

class: 114.Black_throated_Sparrow predicted: 111.Loggerhead_Shrike

class: 015.Lazuli_Bunting predicted: 014.Indigo_Bunting

class: 058.Pigeon_Guillemot predicted: 106.Horned_Puffin

class: 111.Loggerhead_Shrike predicted: 111.Loggerhead_Shrike

class: 076.Dark_eyed_Junco predicted: 076.Dark_eyed_Junco