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CMPT 412: Assignment 2

## Part 1:

Q1:

```
self.conv1 = nn.Conv2d(3, 64, 3, stride = 1, padding =1)
self.norm1 = nn.BatchNorm2d(64)

self.conv2 = nn.Conv2d(64, 64, 3, stride = 1, padding =1)
self.norm2 = nn.BatchNorm2d(64)

self.conv3 = nn.Conv2d(64, 128, 3, stride = 1, padding =1)
self.norm3 = nn.BatchNorm2d(128)

self.conv4 = nn.Conv2d(128, 128, 3, stride = 1, padding =1)
self.norm4 = nn.BatchNorm2d(128)


self.conv5 = nn.Conv2d(128, 256, 3, stride = 1, padding =1)
self.norm5 = nn.BatchNorm2d(256)


self.conv6 = nn.Conv2d(256, 256, 3, stride = 1, padding =1)
self.norm6 = nn.BatchNorm2d(256)
```

Layer No.	Layer type	Kernel size	Input   output dimension	Input   output channel
1	Conv2d	3	32   32	3   64
2	norm	-	32   32	-
3	Relu	-	32   32	-
4	Conv2d	3	32   32	64   64
5	Norm	-	32   32	-
6	Relu	-	32   32	-
7	Conv2d	3	32   32	64   128
8	Norm	-	32   32	-
9	Relu	-	32   32	-
10	Maxpool2d	2	32   16	-
11	Conv2d	3	16   16	128   128
12	Norm	-	16   16	-
13	Relu	-	16   16	-
14	Conv2d	3	16   16	128   256
15	Norm	-	16   16	-
16	Relu	-	16   16	-
17	Conv2d	3	16   16	256   256
18	Norm	-	16   16	-
19	Relu	-	16   16	-
20	Maxpool2d	2	16   8	-

Q2:

The best accuracy I got was 63%

68	cloud427		0.63700	3	41m
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Your Best Entry 

Your submission scored 0.63400, which is not an improvement of your best score. Keep trying!

The name that I have used in Kaggle is Cloud427

Q3:

Improvement:

```
train_transform = transforms.Compose([
    transforms.RandomHorizontalFlip(),
    transforms.ToTensor(),
    transforms.Normalize((0.5, 0.5, 0.5), (0.5, 0.5, 0.5))
])
```


- 1) by using `transforms.RandomHorizontalFlip()` this improve the accuracy by a bit
- 2) by adding more convolutional layer with RELU, normalization and pooling every 2 cony layers dramatically increases the accuracy of the program


## Part 2:

Q1:

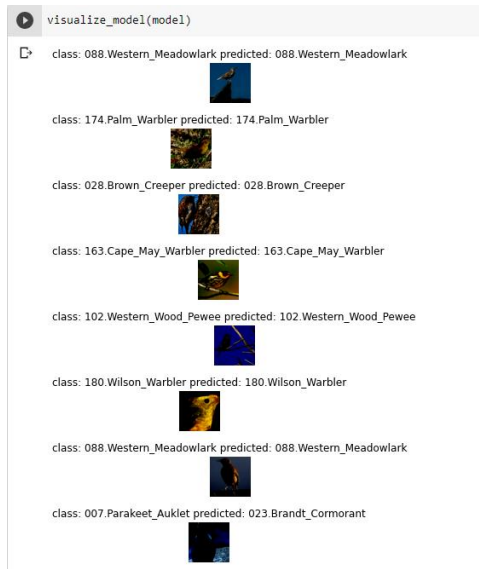
```
TRAINING Epoch 46/50 Loss 0.0717 Accuracy 0.8755
TRAINING Epoch 47/50 Loss 0.0689 Accuracy 0.8797
TRAINING Epoch 48/50 Loss 0.0710 Accuracy 0.8727
TRAINING Epoch 49/50 Loss 0.0606 Accuracy 0.8973
TRAINING Epoch 50/50 Loss 0.0702 Accuracy 0.8790
Finished Training
```

Train-accuracy = 87.90%

 `test(model, criterion)`

 Test Loss: 0.2338 Test Accuracy 0.5865

Test-accuracy = 58.65%



Q2:

```
NUM_EPOCHS = 50
LEARNING_RATE = 0.001
BATCH_SIZE = 8
RESNET_LAST_ONLY = False
```

Hyperparameter setting:

- Batch-size = 8
- Learning-rate = 0.001
- Resnet-last-only = False
- Number of epochs = 50

## References:

<https://discuss.pytorch.org/t/example-on-how-to-use-batch-norm/216/2>

<https://pytorch.org/docs/stable/generated/torch.nn.Conv2d.html>

this assignment was helped by Jiangpei Chen