Assignment 3 : Multi-label Image Classification

In [0]:

```
from google.colab import drive
drive.mount('/content/gdrive')
```

```
Drive already mounted at /content/gdrive; to attempt to forcibly remount, call
drive.mount("/content/gdrive", force_remount=True).
```

In [0]:

```
import os
os.chdir("gdrive/My Drive/MP-1/MP-3")
```

In [0]:

```
!pip3 install torch torchvision
```

```
Requirement already satisfied: torch in /usr/local/lib/python3.6/dist-packages (0.4.1)
Requirement already satisfied: torchvision in /usr/local/lib/python3.6/dist-packages (0.2.1)
Requirement already satisfied: numpy in /usr/local/lib/python3.6/dist-packages (from torchvision)
(1.14.6)
Requirement already satisfied: pillow>=4.1.1 in /usr/local/lib/python3.6/dist-packages (from
torchvision) (5.3.0)
Requirement already satisfied: six in /usr/local/lib/python3.6/dist-packages (from torchvision)
(1.11.0)
```

In [0]:

```
!pip install --no-cache-dir -I pillow
```

```
Collecting pillow
  Downloading
https://files.pythonhosted.org/packages/62/94/5430ebaa83f91cc7a9f687ff5238e26164a779cca2ef99032322
318/Pillow-5.3.0-cp36-cp36m-manylinux1_x86_64.whl (2.0MB)
    100% |████████████████████████████████| 2.0MB 18.0MB/s
Installing collected packages: pillow
Successfully installed pillow-5.3.0
```

In [0]:

```
!bash download_data.sh
```

In [0]:

```
import os
import numpy as np
import torch
import torch.nn as nn
from torchvision import transforms
from sklearn.metrics import average_precision_score
from PIL import Image, ImageDraw
import matplotlib.pyplot as plt
from kaggle_submission import output_submission_csv
#from classifier import Classifier
from voc_dataloader import VocDataset, VOC_CLASSES
import pickle

%matplotlib inline
%load_ext autoreload
%autoreload 2
```

In this assignment, you train a classifier to do multi-label classificaton on the PASCAL VOC 2007 dataset. The dataset has 20

different class which can appear in any given image. Your classifier will predict whether each class appears in an image. This task is slightly different from exclusive multiclass classification like the ImageNet competition where only a single most appropriate class is predicted for an image.

Reading Pascal Data

Loading Training Data

In the following cell we will load the training data and also apply some transforms to the data. Feel free to apply more transforms for data augmentation which can lead to better performance.

In [0]:

```
# Transforms applied to the training data
normalize = transforms.Normalize(mean=[0.485, 0.456, 0.406],
                                 std= [0.229, 0.224, 0.225])

train_transform = transforms.Compose([

            transforms.RandomHorizontalFlip(),
            #transforms.RandomRotation(45),
            transforms.RandomResizedCrop(224,scale=(0.08, 1.0), ratio=(0.75, 1.3333333333333333), i
nterpolation=2),

            transforms.Resize(227),
            transforms.CenterCrop(227),
            transforms.ToTensor(),
            normalize,


        ])
```

In [0]:

```
ds_train = VocDataset('VOCdevkit_2007/VOC2007/','train',train_transform)
```

Loading Validation Data

We will load the test data for the PASCAL VOC 2007 dataset. Do **NOT** add data augmentation transforms to validation data.

In [0]:

```
# Transforms applied to the testing data
test_transform = transforms.Compose([
            transforms.Resize(227),
            transforms.CenterCrop(227),
            transforms.ToTensor(),
            normalize,
        ])
```

In [0]:

```
ds_val = VocDataset('VOCdevkit_2007/VOC2007/','val',test_transform)
```

In [0]:

```
with open('ds_val.pkl', 'wb') as f:
    pickle.dump(ds_val, f)

with open('ds_train.pkl', 'wb') as f:
    pickle.dump(ds_train, f)
```

Loading data objects saved in pickle!

In [0]:

In [0]:

```
with open('ds_val.pkl', 'rb') as f:
    ds_val = pickle.load(f)

with open('ds_train.pkl', 'rb') as f:
    ds_train = pickle.load(f)
```

saving new transformation

In [0]:

```
ds_train.transform = train_transform
```

updating new transform object into pickle

In [0]:

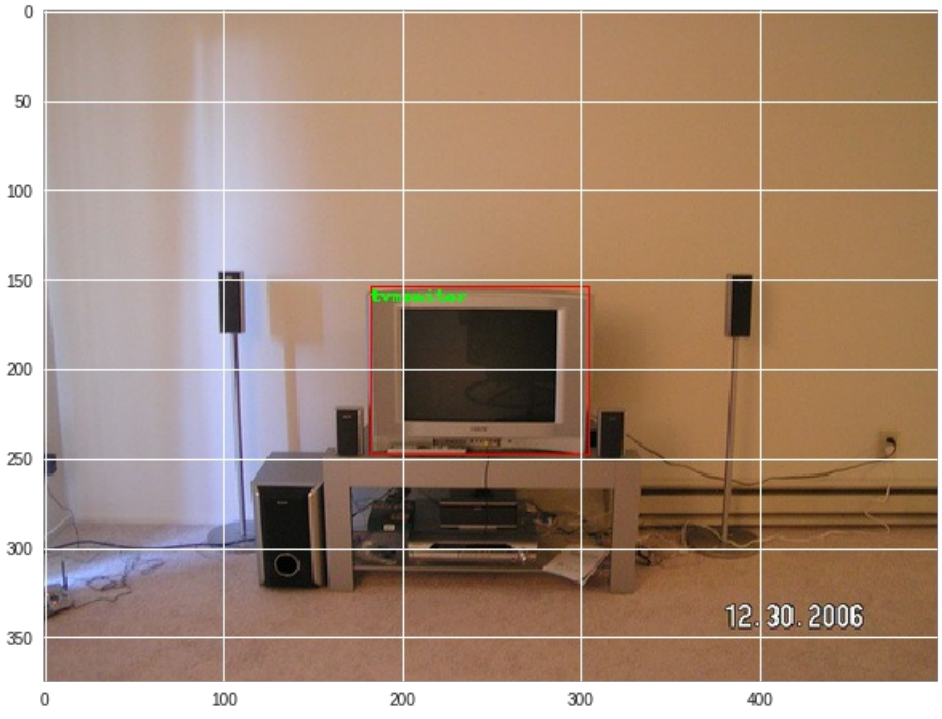
```
with open('ds_train.pkl', 'wb') as f:
    pickle.dump(ds_train, f)
```

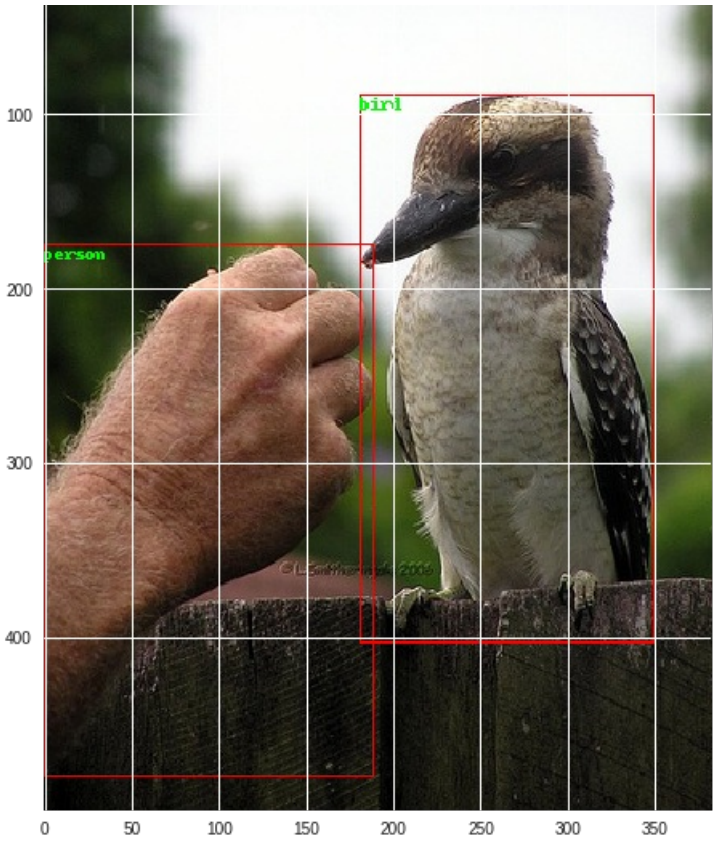
Visualizing the Data

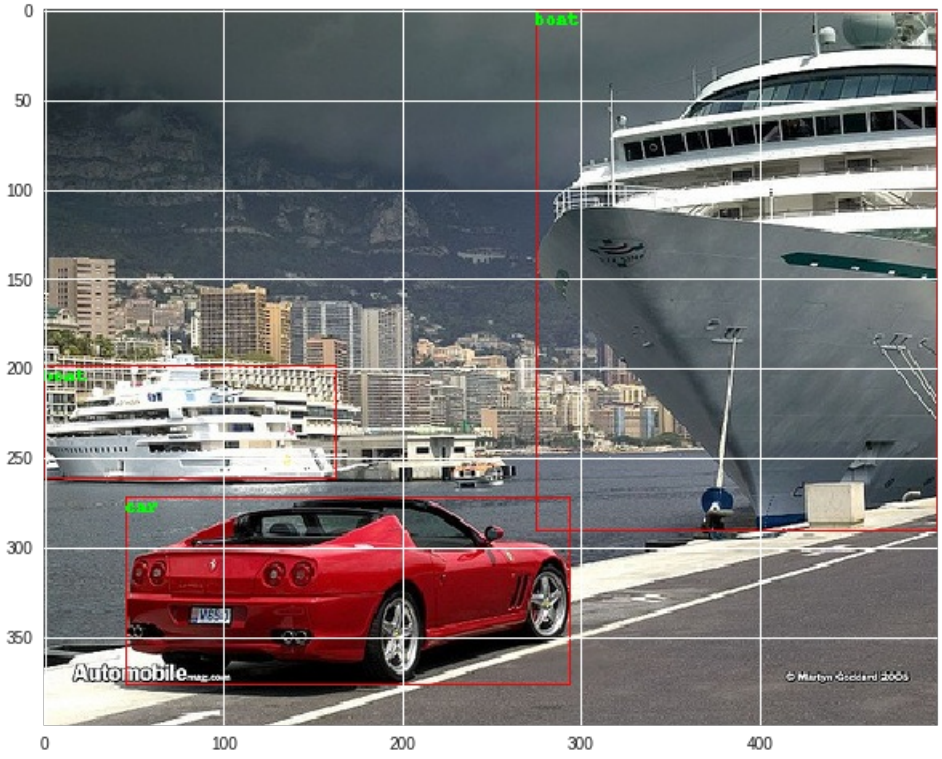
PASCAL VOC has bounding box annotations in addition to class labels. Use the following code to visualize some random examples and corresponding annotations from the train set.

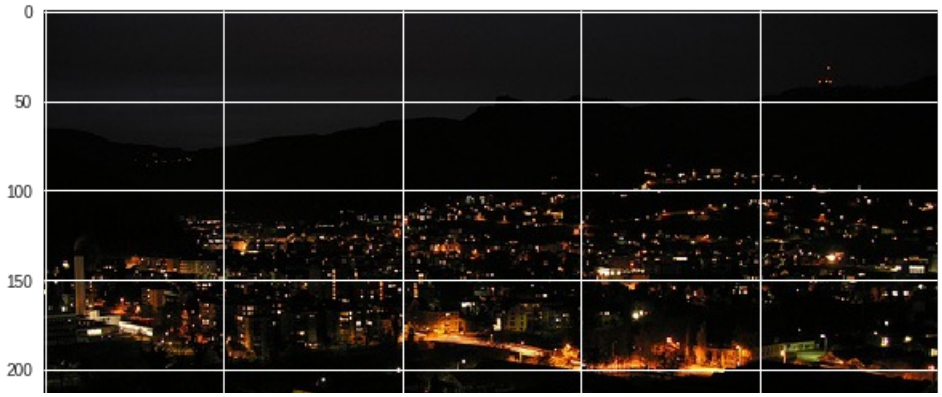
In [0]:

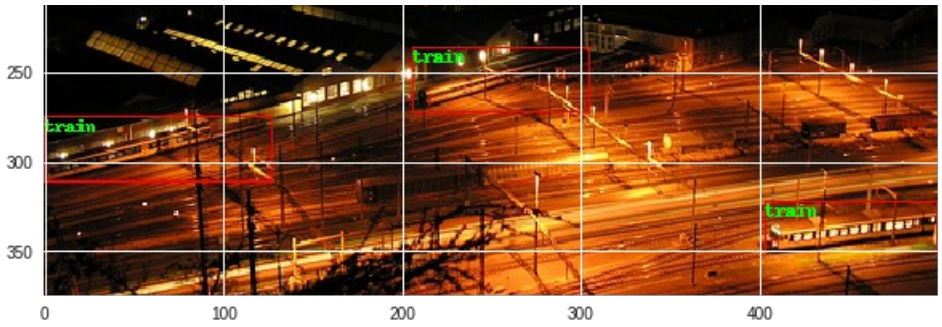
```
for i in range(5):
    idx = np.random.randint(0, len(ds_train.names)+1)
    _imgpath = os.path.join('VOCdevkit_2007/VOC2007/', 'JPEGImages', ds_train.names[idx]+'.jpg')
    img = Image.open(_imgpath).convert('RGB')
    draw = ImageDraw.Draw(img)
    for j in range(len(ds_train.box_indices[idx])):
        obj = ds_train.box_indices[idx][j]
        draw.rectangle(list(obj), outline=(255,0,0))
        draw.text(list(obj[0:2]), ds_train.classes[ds_train.label_order[idx][j]], fill=(0,255,0))
    plt.figure(figsize = (10,10))
    plt.imshow(np.array(img))
```

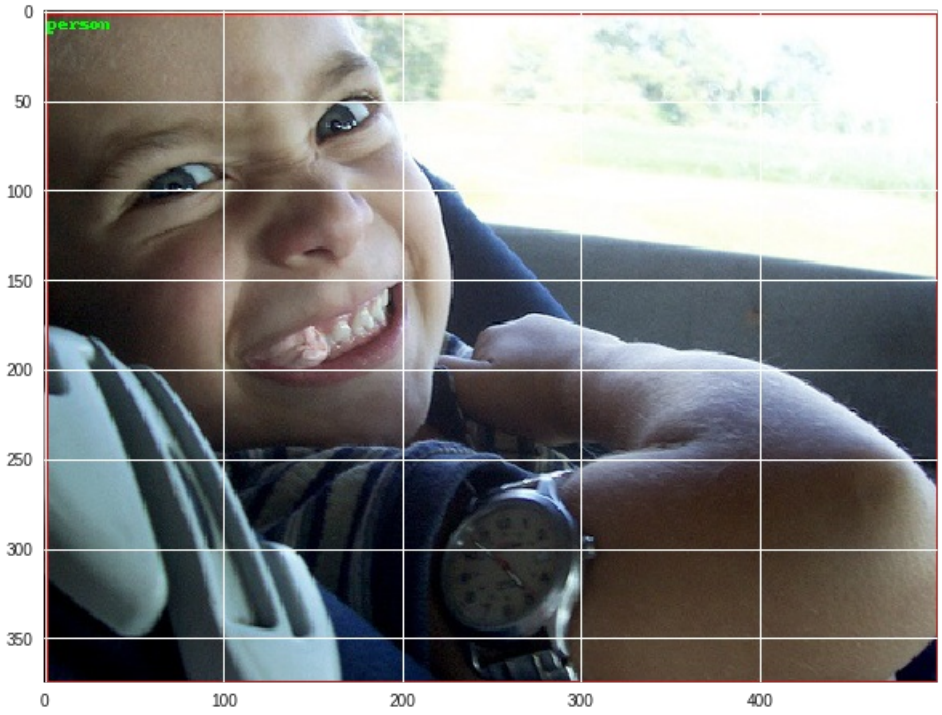



bird
person
0
50
100
150
200
250
300
350
100
200
300
400


boat
car
Automobile
0
100
200
300
400
0
50
100
150
200
250
300
350


0
50
100
150
200





Classification

In [0]:

```
device = torch.device("cuda:0" if torch.cuda.is_available() else "cpu")
```

In [0]:

```
train_loader = torch.utils.data.DataLoader(dataset=ds_train,
                                           batch_size=50,
                                           shuffle=True,
                                           num_workers=0)
```

In [0]:

```
val_loader = torch.utils.data.DataLoader(dataset=ds_val,
                                           batch_size=50,
                                           shuffle=True,
                                           num_workers=1)
```

In [0]:

```
def train_classifier(train_loader, classifier, criterion, optimizer):
    classifier.train()
    loss_ = 0.0
    losses = []
    for i, (images, labels, _) in enumerate(train_loader):
        images, labels = images.to(device), labels.to(device)
        optimizer.zero_grad()
        #print(images.shape)
```

```
        logits = classifier(images)
        loss = criterion(logits, labels)
        loss.backward()
        optimizer.step()
        losses.append(loss)
    return torch.stack(losses).mean().item()
```

In [0]:

```
def test_classifier(test_loader, classifier, criterion, print_ind_classes=True):
    classifier.eval()
    losses = []
    with torch.no_grad():
        y_true = np.zeros((0,21))
        y_score = np.zeros((0,21))
        for i, (images, labels, _) in enumerate(test_loader):
            images, labels = images.to(device), labels.to(device)
            logits = classifier(images)
            y_true = np.concatenate((y_true, labels.cpu().numpy()), axis=0)
            y_score = np.concatenate((y_score, logits.cpu().numpy()), axis=0)
            loss = criterion(logits, labels)
            losses.append(loss)
        aps = []
        # ignore first class which is background
        for i in range(1, y_true.shape[1]):
            ap = average_precision_score(y_true[:, i], y_score[:, i])
            if print_ind_classes:
                print('-------  Class: {:<12}     AP: {:>8.4f}  -------'.format(VOC_CLASSES[i], ap)
            aps.append(ap)

        mAP = np.mean(aps)
        test_loss = np.mean(losses)
        print('mAP: {0:.4f}'.format(mAP))
        print('Avg loss: {}'.format(test_loss))

    return mAP, test_loss, aps
```

Modifying the network

The network you are given as is will allow you to reach around 0.15-0.2 mAP. To meet the benchmark for this assignment you will need to improve the network. There are a variety of different approaches you should try:

- Network architecture changes
  - Number of layers: try adding layers to make your network deeper
  - Batch normalization: adding batch norm between layers will likely give you a significant performance increase
  - Residual connections: as you increase the depth of your network, you will find that having residual connections like those in ResNet architectures will be helpful
- Optimizer: Instead of plain SGD, you may want to add a learning rate schedule, add momentum, or use one of the other optimizers you have learned about like Adam. Check the `torch.optim` package for other optimizers
- Data augmentation: You should use the `torchvision.transforms` module to try adding random resized crops and horizontal flips of the input data. Check `transforms.RandomResizedCrop` and `transforms.RandomHorizontalFlip` for this
- Epochs: Once you have found a generally good hyperparameter setting try training for more epochs
- Loss function: You might want to add weighting to the `MultiLabelSoftMarginLoss` for classes that are less well represented or experiment with a different loss function

In [0]:

```
classifier = Classifier().to(device)
# You can can use this function to reload a network you have already saved previously
#classifier.load_state_dict(torch.load('voc_classifier.pth'))
```

In [0]:

```
import numpy as np
#arr=np.array([1,1,1,3,1,1,1,1,1,4,1,2,1,1,1,3,3,2,1,2,1])
#weight=torch.from_numpy(arr)
#weight=weight.to(device)

criterion = nn.MultiLabelSoftMarginLoss()
```

```
criterion = nn.MultiLabelSoftMarginLoss()
#optimizer = torch.optim.SGD(classifier.parameters(), lr=0.001, momentum=0.92)
optimizer =torch.optim.Adam(classifier.parameters(), lr=0.0001, betas=(0.9, 0.999))
```

In [0]:

```
# Training the Classifier
NUM_EPOCHS = 160
TEST_FREQUENCY = 20

for epoch in range(1, NUM_EPOCHS+1):
    print("Starting epoch number " + str(epoch))
    train_loss = train_classifier(train_loader, classifier, criterion, optimizer)
    print("Loss for Training on Epoch " +str(epoch) + " is "+ str(train_loss))
    if(epoch%TEST_FREQUENCY==0):
        mAP_val, val_loss, _ = test_classifier(val_loader, classifier, criterion)
        print('Evaluating classifier')
        print("Mean Precision Score for Testing on Epoch " +str(epoch) + " is "+ str(mAP_val))
```

```
Starting epoch number 1
Loss for Training on Epoch 1 is 0.38385292887687683
Starting epoch number 2
Loss for Training on Epoch 2 is 0.24156561493873596
Starting epoch number 3
Loss for Training on Epoch 3 is 0.23414763808250427
Starting epoch number 4
Loss for Training on Epoch 4 is 0.22995591163635254
Starting epoch number 5
Loss for Training on Epoch 5 is 0.2261081337928772
Starting epoch number 6
Loss for Training on Epoch 6 is 0.22265003621578217
Starting epoch number 7
Loss for Training on Epoch 7 is 0.21953028440475464
Starting epoch number 8
Loss for Training on Epoch 8 is 0.21649180352687836
Starting epoch number 9
Loss for Training on Epoch 9 is 0.21611854434013367
Starting epoch number 10
Loss for Training on Epoch 10 is 0.21153473854064941
Starting epoch number 11
Loss for Training on Epoch 11 is 0.21422407031059265
Starting epoch number 12
Loss for Training on Epoch 12 is 0.21198274195194244
Starting epoch number 13
Loss for Training on Epoch 13 is 0.20877470076084137
Starting epoch number 14
Loss for Training on Epoch 14 is 0.20792993903160095
Starting epoch number 15
Loss for Training on Epoch 15 is 0.20263825356960297
Starting epoch number 16
Loss for Training on Epoch 16 is 0.20670893788337708
Starting epoch number 17
Loss for Training on Epoch 17 is 0.2019513100385666
Starting epoch number 18
Loss for Training on Epoch 18 is 0.1999925971031189
Starting epoch number 19
Loss for Training on Epoch 19 is 0.20195026695728302
Starting epoch number 20
Loss for Training on Epoch 20 is 0.19764390587806702
-------  Class: aeroplane        AP:   0.4551  -------
-------  Class: bicycle          AP:   0.1495  -------
-------  Class: bird             AP:   0.1625  -------
-------  Class: boat             AP:   0.2465  -------
-------  Class: bottle           AP:   0.1039  -------
-------  Class: bus              AP:   0.1407  -------
-------  Class: car              AP:   0.4428  -------
-------  Class: cat              AP:   0.3232  -------
-------  Class: chair            AP:   0.3801  -------
-------  Class: cow              AP:   0.1171  -------
-------  Class: diningtable      AP:   0.2166  -------
-------  Class: dog              AP:   0.2380  -------
-------  Class: horse            AP:   0.1841  -------
-------  Class: motorbike        AP:   0.1367  -------
-------  Class: person           AP:   0.7349  -------
-------  Class: pottedplant      AP:   0.0840  -------
```

```
-------  Class: sheep            AP:   0.1160  -------
-------  Class: sofa             AP:   0.2341  -------
-------  Class: train            AP:   0.1683  -------
-------  Class: tvmonitor        AP:   0.2190  -------
mAP: 0.2427
Avg loss: 0.20746831595897675
Evaluating classifier
Mean Precision Score for Testing on Epoch 20 is 0.24265638576284307
Starting epoch number 21
Loss for Training on Epoch 21 is 0.19488359987735748
Starting epoch number 22
Loss for Training on Epoch 22 is 0.1984357088804245
Starting epoch number 23
Loss for Training on Epoch 23 is 0.19538426399230957
Starting epoch number 24
Loss for Training on Epoch 24 is 0.19278009235858917
Starting epoch number 25
Loss for Training on Epoch 25 is 0.19236013293266296
Starting epoch number 26
Loss for Training on Epoch 26 is 0.19009003043174744
Starting epoch number 27
Loss for Training on Epoch 27 is 0.19006142020225525
Starting epoch number 28
Loss for Training on Epoch 28 is 0.1866062879562378
Starting epoch number 29
Loss for Training on Epoch 29 is 0.18323169648647308
Starting epoch number 30
Loss for Training on Epoch 30 is 0.18761304020881653
Starting epoch number 31
Loss for Training on Epoch 31 is 0.18799152970314026
Starting epoch number 32
Loss for Training on Epoch 32 is 0.18708433210849762
Starting epoch number 33
Loss for Training on Epoch 33 is 0.18514224886894226
Starting epoch number 34
Loss for Training on Epoch 34 is 0.18272961676120758
Starting epoch number 35
Loss for Training on Epoch 35 is 0.1847359836101532
Starting epoch number 36
Loss for Training on Epoch 36 is 0.18451546132564545
Starting epoch number 37
Loss for Training on Epoch 37 is 0.1818249672651291
Starting epoch number 38
Loss for Training on Epoch 38 is 0.1801609992980957
Starting epoch number 39
Loss for Training on Epoch 39 is 0.17741984128952026
Starting epoch number 40
Loss for Training on Epoch 40 is 0.17924915254116058
-------  Class: aeroplane        AP:   0.5525  -------
-------  Class: bicycle          AP:   0.1795  -------
-------  Class: bird             AP:   0.2234  -------
-------  Class: boat             AP:   0.3542  -------
-------  Class: bottle           AP:   0.1362  -------
-------  Class: bus              AP:   0.1929  -------
-------  Class: car              AP:   0.5882  -------
-------  Class: cat              AP:   0.3785  -------
-------  Class: chair            AP:   0.3914  -------
-------  Class: cow              AP:   0.1538  -------
-------  Class: diningtable      AP:   0.2868  -------
-------  Class: dog              AP:   0.2856  -------
-------  Class: horse            AP:   0.3812  -------
-------  Class: motorbike        AP:   0.3179  -------
-------  Class: person           AP:   0.7387  -------
-------  Class: pottedplant      AP:   0.1518  -------
-------  Class: sheep            AP:   0.2083  -------
-------  Class: sofa             AP:   0.2399  -------
-------  Class: train            AP:   0.4200  -------
-------  Class: tvmonitor        AP:   0.2040  -------
mAP: 0.3192
Avg loss: 0.19188477098941803
Evaluating classifier
Mean Precision Score for Testing on Epoch 40 is 0.31924344041219366
Starting epoch number 41
Loss for Training on Epoch 41 is 0.1799895167350769
Starting epoch number 42
Loss for Training on Epoch 42 is 0.1777503937482834
Starting epoch number 43
```

Loss for Training on Epoch 43 is 0.17584370076656342
Starting epoch number 44
Loss for Training on Epoch 44 is 0.17545920610427856
Starting epoch number 45
Loss for Training on Epoch 45 is 0.18247787654399872
Starting epoch number 46
Loss for Training on Epoch 46 is 0.17807705700397491
Starting epoch number 47
Loss for Training on Epoch 47 is 0.17091944813728333
Starting epoch number 48
Loss for Training on Epoch 48 is 0.17246389389038086
Starting epoch number 49
Loss for Training on Epoch 49 is 0.17336353659629822
Starting epoch number 50
Loss for Training on Epoch 50 is 0.17120380699634552
Starting epoch number 51
Loss for Training on Epoch 51 is 0.17169666290283203
Starting epoch number 52
Loss for Training on Epoch 52 is 0.17053382098674774
Starting epoch number 53
Loss for Training on Epoch 53 is 0.17355826497077942
Starting epoch number 54
Loss for Training on Epoch 54 is 0.17192566394805908
Starting epoch number 55
Loss for Training on Epoch 55 is 0.17133034765720367
Starting epoch number 56
Loss for Training on Epoch 56 is 0.16610555350780487
Starting epoch number 57
Loss for Training on Epoch 57 is 0.16908134520053864
Starting epoch number 58
Loss for Training on Epoch 58 is 0.1676468700170517
Starting epoch number 59
Loss for Training on Epoch 59 is 0.17038646340370178
Starting epoch number 60
Loss for Training on Epoch 60 is 0.16419732570648193
------- Class: aeroplane AP: 0.6068 -------
------- Class: bicycle AP: 0.1277 -------
------- Class: bird AP: 0.2723 -------
------- Class: boat AP: 0.4373 -------
------- Class: bottle AP: 0.1366 -------
------- Class: bus AP: 0.1771 -------
------- Class: car AP: 0.5469 -------
------- Class: cat AP: 0.4010 -------
------- Class: chair AP: 0.4225 -------
------- Class: cow AP: 0.1448 -------
------- Class: diningtable AP: 0.3100 -------
------- Class: dog AP: 0.2858 -------
------- Class: horse AP: 0.4545 -------
------- Class: motorbike AP: 0.3567 -------
------- Class: person AP: 0.7870 -------
------- Class: pottedplant AP: 0.1804 -------
------- Class: sheep AP: 0.1724 -------
------- Class: sofa AP: 0.2753 -------
------- Class: train AP: 0.4651 -------
------- Class: tvmonitor AP: 0.2228 -------
mAP: 0.3391
Avg loss: 0.19850996136665344
Evaluating classifier
Mean Precision Score for Testing on Epoch 60 is 0.3391468675108501
Starting epoch number 61
Loss for Training on Epoch 61 is 0.1608818769454956
Starting epoch number 62
Loss for Training on Epoch 62 is 0.16274918615818024
Starting epoch number 63
Loss for Training on Epoch 63 is 0.16199974715709686
Starting epoch number 64
Loss for Training on Epoch 64 is 0.16202490031719208
Starting epoch number 65
Loss for Training on Epoch 65 is 0.1605551838874817
Starting epoch number 66
Loss for Training on Epoch 66 is 0.16217979788780212
Starting epoch number 67
Loss for Training on Epoch 67 is 0.16307853162288666
Starting epoch number 68
Loss for Training on Epoch 68 is 0.15830865502357483
Starting epoch number 69
Loss for Training on Epoch 69 is 0.1603788584470749

```
Starting epoch number 70
Loss for Training on Epoch 70 is 0.158578559756279
Starting epoch number 71
Loss for Training on Epoch 71 is 0.16084273159503937
Starting epoch number 72
Loss for Training on Epoch 72 is 0.15597794950008392
Starting epoch number 73
Loss for Training on Epoch 73 is 0.15829665958881378
Starting epoch number 74
Loss for Training on Epoch 74 is 0.1620354801416397
Starting epoch number 75
Loss for Training on Epoch 75 is 0.15851882100105286
Starting epoch number 76
Loss for Training on Epoch 76 is 0.15897907316684723
Starting epoch number 77
Loss for Training on Epoch 77 is 0.16004081070423126
Starting epoch number 78
Loss for Training on Epoch 78 is 0.1587800234556198
Starting epoch number 79
Loss for Training on Epoch 79 is 0.1630675047636032
Starting epoch number 80
Loss for Training on Epoch 80 is 0.1649705022573471
-------  Class: aeroplane        AP:   0.6041  -------
-------  Class: bicycle          AP:   0.4191  -------
-------  Class: bird             AP:   0.3901  -------
-------  Class: boat             AP:   0.4513  -------
-------  Class: bottle           AP:   0.1718  -------
-------  Class: bus              AP:   0.2995  -------
-------  Class: car              AP:   0.6507  -------
-------  Class: cat              AP:   0.4314  -------
-------  Class: chair            AP:   0.4823  -------
-------  Class: cow              AP:   0.1777  -------
-------  Class: diningtable      AP:   0.3631  -------
-------  Class: dog              AP:   0.3099  -------
-------  Class: horse            AP:   0.5514  -------
-------  Class: motorbike        AP:   0.4715  -------
-------  Class: person           AP:   0.7970  -------
-------  Class: pottedplant      AP:   0.1701  -------
-------  Class: sheep            AP:   0.1895  -------
-------  Class: sofa             AP:   0.3331  -------
-------  Class: train            AP:   0.6269  -------
-------  Class: tvmonitor        AP:   0.3288  -------
mAP: 0.4110
Avg loss: 0.16709783673286438
Evaluating classifier
Mean Precision Score for Testing on Epoch 80 is 0.41096631307612974
Starting epoch number 81
Loss for Training on Epoch 81 is 0.15545541048049927
Starting epoch number 82
Loss for Training on Epoch 82 is 0.15282070636749268
Starting epoch number 83
Loss for Training on Epoch 83 is 0.15575280785560608
Starting epoch number 84
Loss for Training on Epoch 84 is 0.15288926661014557
Starting epoch number 85
Loss for Training on Epoch 85 is 0.1538861244916916
Starting epoch number 86
Loss for Training on Epoch 86 is 0.15478140115737915
Starting epoch number 87
Loss for Training on Epoch 87 is 0.15645438432693481
Starting epoch number 88
Loss for Training on Epoch 88 is 0.15056195855140686
Starting epoch number 89
Loss for Training on Epoch 89 is 0.15211115777492523
Starting epoch number 90
Loss for Training on Epoch 90 is 0.15307262539863586
Starting epoch number 91
Loss for Training on Epoch 91 is 0.14994275569915771
Starting epoch number 92
Loss for Training on Epoch 92 is 0.14763766527175903
Starting epoch number 93
Loss for Training on Epoch 93 is 0.15007218718528748
Starting epoch number 94
Loss for Training on Epoch 94 is 0.14933981001377106
Starting epoch number 95
Loss for Training on Epoch 95 is 0.1495475023984909
Starting epoch number 96
```

```
Starting epoch number 96
Loss for Training on Epoch 96 is 0.14766447246074677
Starting epoch number 97
Loss for Training on Epoch 97 is 0.1497674435377121
Starting epoch number 98
Loss for Training on Epoch 98 is 0.14634442329406738
Starting epoch number 99
Loss for Training on Epoch 99 is 0.14532841742038727
Starting epoch number 100
Loss for Training on Epoch 100 is 0.14977754652500153
-------  Class: aeroplane        AP:   0.6251  -------
-------  Class: bicycle          AP:   0.3727  -------
-------  Class: bird             AP:   0.4098  -------
-------  Class: boat             AP:   0.4992  -------
-------  Class: bottle           AP:   0.1786  -------
-------  Class: bus              AP:   0.3148  -------
-------  Class: car              AP:   0.6670  -------
-------  Class: cat              AP:   0.4068  -------
-------  Class: chair            AP:   0.4646  -------
-------  Class: cow              AP:   0.1927  -------
-------  Class: diningtable      AP:   0.3380  -------
-------  Class: dog              AP:   0.3175  -------
-------  Class: horse            AP:   0.5806  -------
-------  Class: motorbike        AP:   0.4243  -------
-------  Class: person           AP:   0.8065  -------
-------  Class: pottedplant      AP:   0.1928  -------
-------  Class: sheep            AP:   0.1864  -------
-------  Class: sofa             AP:   0.3233  -------
-------  Class: train            AP:   0.6782  -------
-------  Class: tvmonitor        AP:   0.2823  -------
mAP: 0.4131
Avg loss: 0.17450839281082153
Evaluating classifier
Mean Precision Score for Testing on Epoch 100 is 0.4130648649112308
Starting epoch number 101
Loss for Training on Epoch 101 is 0.14703461527824402
Starting epoch number 102
Loss for Training on Epoch 102 is 0.14874564111232758
Starting epoch number 103
Loss for Training on Epoch 103 is 0.14995060861110687
Starting epoch number 104
Loss for Training on Epoch 104 is 0.14760740101337433
Starting epoch number 105
Loss for Training on Epoch 105 is 0.1484629511833191
Starting epoch number 106
Loss for Training on Epoch 106 is 0.14802870154380798
Starting epoch number 107
Loss for Training on Epoch 107 is 0.14465972781181335
Starting epoch number 108
Loss for Training on Epoch 108 is 0.14385518431663513
Starting epoch number 109
Loss for Training on Epoch 109 is 0.14015229046344757
Starting epoch number 110
Loss for Training on Epoch 110 is 0.14079758524894714
Starting epoch number 111
Loss for Training on Epoch 111 is 0.13926686346530914
Starting epoch number 112
Loss for Training on Epoch 112 is 0.14277470111846924
Starting epoch number 113
Loss for Training on Epoch 113 is 0.13925793766975403
Starting epoch number 114
Loss for Training on Epoch 114 is 0.13894888758659363
Starting epoch number 115
Loss for Training on Epoch 115 is 0.13727203011512756
Starting epoch number 116
Loss for Training on Epoch 116 is 0.13745437562465668
Starting epoch number 117
Loss for Training on Epoch 117 is 0.13910537958145142
Starting epoch number 118
Loss for Training on Epoch 118 is 0.14063622057437897
Starting epoch number 119
Loss for Training on Epoch 119 is 0.13987873494625092
Starting epoch number 120
Loss for Training on Epoch 120 is 0.14659708738327026
-------  Class: aeroplane        AP:   0.6527  -------
-------  Class: bicycle          AP:   0.4198  -------
-------  Class: bird             AP:   0.4318  -------
-------  Class: boat             AP:   0.5141  -------
```

```
-------  Class: boat             AP:   0.5141  -------
-------  Class: bottle           AP:   0.1823  -------
-------  Class: bus              AP:   0.4045  -------
-------  Class: car              AP:   0.6746  -------
-------  Class: cat              AP:   0.4210  -------
-------  Class: chair            AP:   0.5182  -------
-------  Class: cow              AP:   0.2190  -------
-------  Class: diningtable      AP:   0.4023  -------
-------  Class: dog              AP:   0.3482  -------
-------  Class: horse            AP:   0.5932  -------
-------  Class: motorbike        AP:   0.5758  -------
-------  Class: person           AP:   0.8114  -------
-------  Class: pottedplant      AP:   0.1979  -------
-------  Class: sheep            AP:   0.2071  -------
-------  Class: sofa             AP:   0.3562  -------
-------  Class: train            AP:   0.6335  -------
-------  Class: tvmonitor        AP:   0.3221  -------
mAP: 0.4443
Avg loss: 0.16878525912761688
Evaluating classifier
Mean Precision Score for Testing on Epoch 120 is 0.44428469202422327
Starting epoch number 121
Loss for Training on Epoch 121 is 0.14666177332401276
Starting epoch number 122
Loss for Training on Epoch 122 is 0.14224708080291748
Starting epoch number 123
Loss for Training on Epoch 123 is 0.13649596273899078
Starting epoch number 124
Loss for Training on Epoch 124 is 0.1372068226337433
Starting epoch number 125
Loss for Training on Epoch 125 is 0.13836292922496796
Starting epoch number 126
Loss for Training on Epoch 126 is 0.1384437531232834
Starting epoch number 127
Loss for Training on Epoch 127 is 0.13939239084720612
Starting epoch number 128
Loss for Training on Epoch 128 is 0.13615871965885162
Starting epoch number 129
Loss for Training on Epoch 129 is 0.13926725089550018
Starting epoch number 130
Loss for Training on Epoch 130 is 0.13693054020404816
Starting epoch number 131
Loss for Training on Epoch 131 is 0.1412055939435959
Starting epoch number 132
Loss for Training on Epoch 132 is 0.140755757689476
Starting epoch number 133
Loss for Training on Epoch 133 is 0.14216697216033936
Starting epoch number 134
Loss for Training on Epoch 134 is 0.1419692486524582
Starting epoch number 135
Loss for Training on Epoch 135 is 0.1417274922132492
Starting epoch number 136
Loss for Training on Epoch 136 is 0.13119544088840485
Starting epoch number 137
Loss for Training on Epoch 137 is 0.13721832633018494
Starting epoch number 138
Loss for Training on Epoch 138 is 0.13484768569469452
Starting epoch number 139
Loss for Training on Epoch 139 is 0.1341766119003296
Starting epoch number 140
Loss for Training on Epoch 140 is 0.13460035622119904
-------  Class: aeroplane        AP:   0.6402  -------
-------  Class: bicycle          AP:   0.4639  -------
-------  Class: bird             AP:   0.3887  -------
-------  Class: boat             AP:   0.4563  -------
-------  Class: bottle           AP:   0.1748  -------
-------  Class: bus              AP:   0.4263  -------
-------  Class: car              AP:   0.6542  -------
-------  Class: cat              AP:   0.4263  -------
-------  Class: chair            AP:   0.4874  -------
-------  Class: cow              AP:   0.2060  -------
-------  Class: diningtable      AP:   0.3885  -------
-------  Class: dog              AP:   0.3424  -------
-------  Class: horse            AP:   0.6279  -------
-------  Class: motorbike        AP:   0.5562  -------
-------  Class: person           AP:   0.8162  -------
-------  Class: pottedplant      AP:   0.2424  -------
-------  Class: sheep            AP:   0.1856  -------
```

```
-------  Class: sheep            AP:   0.1696  -------
-------  Class: sofa             AP:   0.3467  -------
-------  Class: train            AP:   0.6578  -------
-------  Class: tvmonitor        AP:   0.3311  -------
mAP: 0.4410
Avg loss: 0.17453141510486603
Evaluating classifier
Mean Precision Score for Testing on Epoch 140 is 0.44095223223215035
Starting epoch number 141
Loss for Training on Epoch 141 is 0.14334529638290405
Starting epoch number 142
Loss for Training on Epoch 142 is 0.1432388424873352
Starting epoch number 143
Loss for Training on Epoch 143 is 0.13403095304965973
Starting epoch number 144
Loss for Training on Epoch 144 is 0.12924863398075104
Starting epoch number 145
Loss for Training on Epoch 145 is 0.13110597431659698
Starting epoch number 146
Loss for Training on Epoch 146 is 0.13122375309467316
Starting epoch number 147
Loss for Training on Epoch 147 is 0.13466192781925201
Starting epoch number 148
Loss for Training on Epoch 148 is 0.13344396650791168
Starting epoch number 149
Loss for Training on Epoch 149 is 0.1255396157503128
Starting epoch number 150
Loss for Training on Epoch 150 is 0.12805941700935364
Starting epoch number 151
Loss for Training on Epoch 151 is 0.12832264602184296
Starting epoch number 152
Loss for Training on Epoch 152 is 0.13213442265987396
Starting epoch number 153
Loss for Training on Epoch 153 is 0.1343706250190735
Starting epoch number 154
Loss for Training on Epoch 154 is 0.1291821151971817
Starting epoch number 155
Loss for Training on Epoch 155 is 0.1294546127319336
Starting epoch number 156
Loss for Training on Epoch 156 is 0.12573006749153137
Starting epoch number 157
Loss for Training on Epoch 157 is 0.12180715799331665
Starting epoch number 158
Loss for Training on Epoch 158 is 0.12842108309268951
Starting epoch number 159
Loss for Training on Epoch 159 is 0.12860669195652008
Starting epoch number 160
Loss for Training on Epoch 160 is 0.1276235282421112
-------  Class: aeroplane        AP:   0.6507  -------
-------  Class: bicycle          AP:   0.4945  -------
-------  Class: bird             AP:   0.4569  -------
-------  Class: boat             AP:   0.4502  -------
-------  Class: bottle           AP:   0.1726  -------
-------  Class: bus              AP:   0.4076  -------
-------  Class: car              AP:   0.6372  -------
-------  Class: cat              AP:   0.4293  -------
-------  Class: chair            AP:   0.5074  -------
-------  Class: cow              AP:   0.2073  -------
-------  Class: diningtable      AP:   0.4145  -------
-------  Class: dog              AP:   0.3388  -------
-------  Class: horse            AP:   0.6250  -------
-------  Class: motorbike        AP:   0.5547  -------
-------  Class: person           AP:   0.8235  -------
-------  Class: pottedplant      AP:   0.2342  -------
-------  Class: sheep            AP:   0.2146  -------
-------  Class: sofa             AP:   0.3321  -------
-------  Class: train            AP:   0.6640  -------
-------  Class: tvmonitor        AP:   0.3520  -------
mAP: 0.4484
Avg loss: 0.18069632351398468
Evaluating classifier
Mean Precision Score for Testing on Epoch 160 is 0.4483512501245811
```

In [0]:

```
# Save the clssifier network
# Suggestion: you can save checkpoints of your network during training and reload them later
```

```
# Suggestion: You can save checkpoints of your network during training and reload them later
torch.save(classifier.state_dict(), './voc_classifier.pth')
```

In [0]:

```
print(classifier.state_dict())
```

In [0]:

```
from PIL import Image
def register_extension(id, extension):
    Image.EXTENSION[extension.lower()] = id.upper()
    Image.register_extension = register_extension
def register_extensions(id, extensions):
    for extension in extensions: register_extension(id, extension)
    Image.register_extensions = register_extensions
```

In [0]:

```
model=classifier.state_dict()
import copy
saved_trainer = copy.deepcopy(model)
```

In [0]:

```
with open("my_trainer_object.pkl", "wb") as output_file:
    pickle.dump(saved_trainer, output_file)
```

In [0]:

```
with open("my_trainer_object.pkl", "rb") as output_file:
    save=pickle.load(output_file)
```

In [0]:

```
classifier.load_state_dict(save)
```

In [0]:

```
print(classifier.state_dict())
```

```
OrderedDict([('conv1.weight', tensor([[[[-0.1117, -0.0383,  0.0684,  0.0720, -0.0262],
          [ 0.0078,  0.0090, -0.0697,  0.0699,  0.0398],
          [-0.0088, -0.1016,  0.0252, -0.0899,  0.0363],
          [-0.0366,  0.0949, -0.0356,  0.0668, -0.0041],
          [ 0.1052, -0.1277, -0.0693,  0.0860, -0.0291]],

         [[-0.1325,  0.0210,  0.0239, -0.0083, -0.1161],
          [ 0.0555, -0.0319, -0.1209,  0.0572,  0.1050],
          [-0.0648,  0.0540,  0.0229,  0.0453,  0.0617],
          [ 0.0773, -0.0152, -0.0646, -0.0707,  0.0854],
          [ 0.0098, -0.0726,  0.0754, -0.0134,  0.0997]],

         [[-0.1052,  0.0369,  0.0233,  0.0727, -0.0143],
          [ 0.0763, -0.0173,  0.0092,  0.0013,  0.0429],
          [-0.0337, -0.0533,  0.0319, -0.0662,  0.0623],
          [-0.0624, -0.0025, -0.0958,  0.0822,  0.1082],
          [-0.0852,  0.0996, -0.0935, -0.0849,  0.0323]]],


        [[[-0.0416,  0.0010,  0.0267, -0.0810, -0.0012],
          [ 0.0086,  0.0752,  0.0813, -0.0711,  0.1102],
          [-0.1137, -0.0021, -0.0228, -0.0501, -0.0295],
          [-0.0746, -0.0710,  0.0951,  0.1035, -0.0740],
          [-0.0737, -0.1071,  0.0047, -0.0243, -0.0388]],

         [[ 0.0093,  0.1223, -0.0154,  0.1012, -0.0338],
          [ 0.1070,  0.0383,  0.1284, -0.0143,  0.0890],
          [-0.0834, -0.0682, -0.0363, -0.0532,  0.0075],
          [ 0.0078, -0.0139,  0.0492,  0.0115, -0.0510],
```

```
  [-0.0395, -0.0346,  0.0939,  0.0836,  0.0451]],

 [[ 0.0846, -0.0461, -0.0194, -0.0226,  0.0745],
  [-0.0333, -0.0277,  0.0898, -0.0624, -0.0802],
  [-0.0310,  0.0668, -0.0869,  0.0536,  0.0770],
  [-0.0635, -0.0356,  0.0482,  0.0399,  0.0037],
  [-0.0424, -0.0400, -0.0220, -0.0206, -0.0895]]],


[[[-0.0135,  0.0615, -0.0656, -0.0045, -0.0999],
  [-0.0143,  0.0621,  0.0553,  0.0071,  0.0306],
  [ 0.1045, -0.0555,  0.0927,  0.0301,  0.0274],
  [-0.0221,  0.0630,  0.0025,  0.0137,  0.0676],
  [ 0.1115,  0.1037, -0.0736,  0.0321, -0.0942]],

 [[-0.1013, -0.0218, -0.0929,  0.0574, -0.0475],
  [-0.1089, -0.0951,  0.0673, -0.0964,  0.0480],
  [-0.0994, -0.0303, -0.0208, -0.0741, -0.0585],
  [ 0.0022,  0.0568,  0.0071, -0.0186, -0.0402],
  [-0.0000,  0.0438, -0.0908,  0.0912,  0.0357]],

 [[-0.0416, -0.0504,  0.0158, -0.0826,  0.1085],
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  [-0.0559,  0.0397, -0.0268, -0.0239,  0.0047],
  [ 0.0832,  0.1108,  0.0809,  0.1205,  0.0592],
  [-0.0190, -0.0290,  0.0075, -0.0681,  0.0069]]],


...,


[[[ 0.0820,  0.1206, -0.0019, -0.0630, -0.0073],
  [-0.0369,  0.0872, -0.0166,  0.0385, -0.0998],
  [ 0.0299, -0.0947, -0.0038, -0.0883,  0.0437],
  [-0.0762,  0.0338, -0.0017, -0.0262, -0.1063],
  [-0.0750,  0.0328,  0.1014,  0.0228,  0.0714]],

 [[ 0.0086,  0.0295, -0.0363,  0.0085, -0.0351],
  [ 0.1097, -0.0565, -0.0394,  0.0111,  0.0212],
  [ 0.0441, -0.0530, -0.1128, -0.0164, -0.0925],
  [ 0.0706, -0.1073,  0.0108, -0.1250,  0.0077],
  [-0.0709,  0.0660, -0.0498, -0.0374, -0.0130]],

 [[ 0.0273,  0.0700, -0.0694,  0.0427,  0.0681],
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  [ 0.0660, -0.0439, -0.0666,  0.0786, -0.0986],
  [ 0.0361,  0.0039, -0.0084, -0.1055, -0.0265],
  [-0.0647,  0.1105, -0.0296,  0.0292, -0.0169]]],


[[[ 0.0070, -0.0554,  0.0251,  0.0367,  0.1141],
  [ 0.0093,  0.0111, -0.0709, -0.0829, -0.0384],
  [-0.0018, -0.0277, -0.0380,  0.1009,  0.0850],
  [-0.0206, -0.0645, -0.1065, -0.0550,  0.0105],
  [ 0.0639,  0.0793,  0.0519, -0.0561,  0.0520]],

 [[ 0.0145,  0.0419,  0.0929,  0.0819,  0.0458],
  [-0.0417,  0.0155, -0.0961, -0.0081, -0.0893],
  [-0.0109,  0.0876, -0.1124, -0.1325,  0.0590],
  [-0.0550, -0.1237, -0.0761, -0.1295, -0.0175],
  [ 0.0988, -0.1085, -0.0082, -0.0837, -0.0877]],

 [[ 0.1108, -0.0941, -0.0810,  0.0369, -0.0765],
  [-0.0814,  0.0906, -0.0735, -0.0814, -0.0469],
  [-0.0437,  0.0273,  0.0512, -0.0761,  0.0389],
  [ 0.0016,  0.0777, -0.0639,  0.0555,  0.0711],
  [ 0.0536,  0.0015,  0.0252,  0.0246,  0.1154]]],


[[[ 0.0023, -0.0562,  0.0702, -0.1079, -0.0474],
  [ 0.0234,  0.0029,  0.0860, -0.0004, -0.0883],
  [ 0.0099, -0.0417, -0.0609,  0.0539,  0.0233],
  [ 0.0751,  0.0253, -0.0175, -0.0415, -0.0891],
  [-0.0850, -0.0678,  0.0745,  0.0597, -0.0410]],

 [[-0.0448, -0.0602,  0.0237, -0.1277,  0.0539],
  [-0.0969, -0.0505,  0.0097,  0.0986, -0.0480],
```

```
          [-0.0714, -0.0512,  0.0332,  0.0911,  0.0482],
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         [[-0.0359,  0.0505, -0.0456, -0.0854, -0.0548],
          [-0.0805, -0.0040,  0.0628,  0.0100, -0.0233],
          [ 0.0727, -0.0192,  0.0238, -0.1240,  0.0483],
          [ 0.0052,  0.1049,  0.0688,  0.0626, -0.0492],
          [ 0.0811, -0.0230, -0.0080, -0.0862,  0.0499]]]], device='cuda:0')), ('conv1.bias', tensor([ 0.0381,  0.0611, -0.0277, -0.0595,  0.0988, -0.0596, -0.0686, -0.0568,
        -0.0863, -0.0678,  0.0456, -0.0050,  0.0717,  0.0757,  0.0874, -0.0907,
        -0.0931,  0.0101,  0.0144,  0.0931,  0.1148, -0.0413,  0.0245,  0.0745,
         0.0565, -0.0101,  0.0014, -0.0643,  0.0633,  0.1015, -0.1070,  0.0911],
       device='cuda:0')), ('conv1_bn.weight', tensor([0.5735, 0.3667, 0.4259, 0.7143, 0.2196, 0.7226, 0.9366, 0.7213, 0.7883,
        0.7855, 0.7495, 0.7693, 0.1116, 0.4845, 0.7984, 0.5589, 0.6922, 0.7276,
        0.2417, 0.7547, 0.6929, 0.9592, 0.0954, 0.0442, 0.7201, 0.1408, 0.0648,
        0.6891, 0.2569, 0.0832, 0.0392, 0.0401], device='cuda:0')), ('conv1_bn.bias', tensor([ 0.0387, -0.0468,  0.0004,  0.0342, -0.0048, -0.0013,  0.0847, -0.0528,
         0.0138, -0.0294, -0.0246,  0.0052, -0.0431,  0.0414, -0.0181,  0.0479,
        -0.0107,  0.0388,  0.0517, -0.0214,  0.0084, -0.0466, -0.0126, -0.0122,
         0.0017, -0.0071,  0.0038,  0.0297,  0.0320, -0.0416, -0.0268,  0.0024],
       device='cuda:0')), ('conv1_bn.running_mean', tensor([ 0.0398,  0.0825, -0.0025, -0.0224,  0.1341, -0.0632, -0.0684, -0.1408,
        -0.0324, -0.0220,  0.0363,  0.0011, -0.2769,  0.0637,  0.0138, -0.0916,
        -0.1751,  0.0086,  0.0247,  0.1880,  0.1747,  0.0095, -0.2763,  0.1038,
        -0.0197, -0.0124,  0.0186, -0.0643,  0.0779,  0.2000,  0.0197,  0.1042],
       device='cuda:0')), ('conv1_bn.running_var', tensor([0.0554, 0.0796, 0.1485, 0.0924, 0.0789, 0.1132, 0.0158, 0.8077, 0.1170,
        0.1024, 0.2274, 0.0788, 2.8782, 0.0298, 0.1518, 0.0168, 0.2631, 0.0287,
        0.0569, 0.3429, 0.2245, 0.1531, 1.9393, 0.2293, 0.2023, 0.0830, 0.0782,
        0.0113, 0.0438, 0.2454, 0.4163, 0.0707], device='cuda:0')),
('conv1_bn.num_batches_tracked', tensor(8160, device='cuda:0')), ('conv2.weight', tensor([[[[-0.0083, -0.0250,  0.0285,  0.0206, -0.0149],
          [ 0.0187, -0.0410, -0.0091,  0.0340, -0.0159],
          [-0.0329, -0.0098,  0.0342,  0.0132,  0.0164],
          [-0.0205, -0.0003, -0.0172, -0.0143,  0.0175],
          [-0.0011, -0.0414,  0.0331,  0.0198, -0.0290]],

         [[ 0.0314, -0.0223, -0.0047, -0.0096,  0.0068],
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          [ 0.0043,  0.0057, -0.0124, -0.0031,  0.0185],
          [ 0.0011, -0.0055, -0.0221,  0.0291,  0.0196],
          [-0.0329,  0.0045, -0.0237, -0.0118,  0.0015]],

         [[ 0.0425,  0.0347, -0.0129,  0.0020, -0.0056],
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          [ 0.0019,  0.0365,  0.0209, -0.0136, -0.0012],
          [ 0.0235,  0.0306, -0.0063,  0.0371, -0.0028],
          [-0.0076,  0.0309, -0.0074, -0.0306, -0.0256]],

         ...,

         [[ 0.0399, -0.0175,  0.0068,  0.0445,  0.0216],
          [ 0.0413,  0.0127, -0.0202,  0.0260,  0.0353],
          [ 0.0298,  0.0240,  0.0404, -0.0269, -0.0024],
          [-0.0055, -0.0272,  0.0149, -0.0210, -0.0233],
          [ 0.0161,  0.0148,  0.0033,  0.0334,  0.0348]],

         [[ 0.0319, -0.0038,  0.0378, -0.0170,  0.0383],
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          [ 0.0037,  0.0303, -0.0252,  0.0117, -0.0267],
          [-0.0221, -0.0295,  0.0153,  0.0251,  0.0084]],

         [[ 0.0367,  0.0180,  0.0283,  0.0100, -0.0217],
          [-0.0134,  0.0011,  0.0037,  0.0116,  0.0279],
          [ 0.0022,  0.0067,  0.0143,  0.0233,  0.0077],
          [-0.0046, -0.0088, -0.0321,  0.0031, -0.0163],
          [ 0.0328,  0.0038,  0.0167, -0.0198,  0.0053]]],


        [[[ 0.0132,  0.0144, -0.0462, -0.0314, -0.0458],
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          [ 0.0068,  0.0496,  0.0299,  0.0279,  0.0274],
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```

```
  [ ...,  ...,  ...,  ...,  ...]],

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  [-0.0117,  0.0021,  0.0036,  0.0031, -0.0121],
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  [ 0.0138,  0.0011,  0.0132, -0.0143,  0.0292]],

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  [ 0.0095,  0.0338,  0.0271,  0.0277,  0.0073],
  [-0.0189, -0.0139, -0.0277, -0.0065,  0.0099],
  [-0.0145,  0.0182, -0.0425, -0.0493, -0.0394],
  [-0.0158, -0.0187, -0.0230, -0.0505, -0.0387]],

 ...,

 [[ 0.0252, -0.0221, -0.0322,  0.0008, -0.0037],
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  [-0.0056, -0.0041,  0.0173, -0.0285,  0.0242],
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 [[ 0.0291, -0.0453, -0.0269, -0.0204,  0.0012],
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  [ 0.0019, -0.0093, -0.0356, -0.0365, -0.0045],
  [ 0.0095,  0.0071,  0.0086,  0.0278, -0.0033],
  [ 0.0540,  0.0266, -0.0148,  0.0357,  0.0008]],

 [[ 0.0032,  0.0030,  0.0042, -0.0015, -0.0300],
  [-0.0242,  0.0257,  0.0168,  0.0363,  0.0002],
  [-0.0314,  0.0392,  0.0165,  0.0489,  0.0194],
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  [ 0.0095, -0.0337, -0.0468,  0.0387,  0.0169],
  [-0.0497, -0.0328,  0.0038,  0.0139, -0.0230],
  [-0.0332, -0.0233, -0.0394,  0.0241,  0.0256]],

 [[ 0.0228, -0.0098,  0.0005,  0.0319,  0.0349],
  [-0.0163,  0.0216, -0.0015, -0.0115,  0.0261],
  [-0.0178, -0.0262,  0.0213, -0.0149, -0.0283],
  [ 0.0195, -0.0162, -0.0104, -0.0309,  0.0003],
  [-0.0365, -0.0204, -0.0288, -0.0210,  0.0133]],

 [[-0.0098,  0.0196, -0.0345,  0.0081,  0.0107],
  [ 0.0043, -0.0536, -0.0429, -0.0517,  0.0033],
  [-0.0317, -0.0588, -0.0158, -0.0528,  0.0259],
  [-0.0431, -0.0058, -0.0170,  0.0079,  0.0083],
  [-0.0123,  0.0058, -0.0329,  0.0147,  0.0324]],

 ...,

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  [ 0.0093, -0.0048, -0.0322, -0.0100, -0.0103],
  [-0.0114, -0.0010,  0.0349, -0.0070, -0.0267],
  [-0.0147, -0.0346, -0.0188, -0.0086,  0.0128]],

 [[-0.0101, -0.0123, -0.0120, -0.0284, -0.0253],
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  [-0.0065, -0.0375, -0.0222,  0.0330,  0.0170],
  [-0.0159, -0.0131,  0.0157,  0.0161,  0.0293],
  [ 0.0127, -0.0047,  0.0246,  0.0019,  0.0001]],

 [[ 0.0048, -0.0223, -0.0173, -0.0134,  0.0141],
  [-0.0039,  0.0163,  0.0178, -0.0114, -0.0380],
  [-0.0217, -0.0059, -0.0376, -0.0230,  0.0162],
  [ 0.0292,  0.0192, -0.0240, -0.0135, -0.0201],
  [ 0.0121, -0.0166, -0.0426, -0.0362, -0.0204]]],


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[[[-0.0230,  0.0353,  0.0245, -0.0355,  0.0198],
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  [-0.0099, -0.0240,  0.0146, -0.0282, -0.0196],
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  [ 0.0031,  0.0218, -0.0182,  0.0096,  0.0308]],

 [[ 0.0315, -0.0049, -0.0095, -0.0232, -0.0373],
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  [ 0.0307,  0.0322, -0.0046,  0.0097,  0.0036],
  [ 0.0170,  0.0231, -0.0282,  0.0192, -0.0078],
  [ 0.0133, -0.0308, -0.0031,  0.0197, -0.0160]],

 ...,

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  [ 0.0042,  0.0024, -0.0115, -0.0244,  0.0113],
  [-0.0180,  0.0058, -0.0151, -0.0024,  0.0030],
  [ 0.0013, -0.0402, -0.0106, -0.0130, -0.0409],
  [-0.0303, -0.0179, -0.0230, -0.0199,  0.0118]],

 [[ 0.0306,  0.0183, -0.0307, -0.0130, -0.0256],
  [-0.0060, -0.0085, -0.0283, -0.0027, -0.0158],
  [-0.0301, -0.0088, -0.0152, -0.0142,  0.0003],
  [ 0.0135, -0.0311, -0.0471, -0.0020, -0.0141],
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 [[ 0.0073, -0.0142,  0.0339, -0.0308,  0.0175],
  [ 0.0138, -0.0298,  0.0198, -0.0122,  0.0167],
  [-0.0220, -0.0040, -0.0013,  0.0094,  0.0045],
  [ 0.0008, -0.0123, -0.0367,  0.0097, -0.0053],
  [ 0.0050, -0.0334, -0.0442, -0.0198, -0.0224]]],


[[[ 0.0052, -0.0133,  0.0383,  0.0268, -0.0207],
  [-0.0109,  0.0334, -0.0064, -0.0233, -0.0254],
  [ 0.0225, -0.0300,  0.0067, -0.0227,  0.0151],
  [-0.0244, -0.0208, -0.0121, -0.0190, -0.0131],
  [-0.0180,  0.0066, -0.0154,  0.0132, -0.0042]],

 [[ 0.0145,  0.0060,  0.0036,  0.0224, -0.0347],
  [-0.0319,  0.0279, -0.0005,  0.0083,  0.0031],
  [-0.0302, -0.0415, -0.0219,  0.0072,  0.0102],
  [ 0.0001, -0.0184, -0.0187,  0.0096,  0.0070],
  [-0.0402, -0.0506,  0.0017,  0.0166, -0.0360]],

 [[-0.0359, -0.0454, -0.0297,  0.0332, -0.0072],
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  [ 0.0320, -0.0281, -0.0100, -0.0125, -0.0174],
  [ 0.0346,  0.0173,  0.0312,  0.0047,  0.0005],
  [ 0.0383,  0.0317, -0.0237, -0.0004,  0.0402]],

 ...,

 [[ 0.0312, -0.0124, -0.0116, -0.0183, -0.0351],
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  [ 0.0269, -0.0400, -0.0412, -0.0032,  0.0156],
  [-0.0225,  0.0010, -0.0293,  0.0092, -0.0027],
  [-0.0160,  0.0141, -0.0524, -0.0447, -0.0124]],

 [[-0.0095, -0.0063, -0.0094, -0.0002, -0.0105],
  [-0.0401,  0.0313, -0.0184, -0.0220, -0.0029],
  [ 0.0188,  0.0159,  0.0071, -0.0206,  0.0142],
  [-0.0395, -0.0222, -0.0118, -0.0432, -0.0214],
  [-0.0376, -0.0028, -0.0149, -0.0146, -0.0507]],

 [[ 0.0003, -0.0256, -0.0141,  0.0434, -0.0086],
  [-0.0065, -0.0179, -0.0144,  0.0269, -0.0165],
  [-0.0184,  0.0217, -0.0011,  0.0031,  0.0304],
  [-0.0045,  0.0004, -0.0245, -0.0229,  0.0147],
  [ 0.0264, -0.0240, -0.0155,  0.0282, -0.0157]]],
```

```
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          [-0.0059,  0.0420,  0.0450, -0.0173, -0.0123],
          [ 0.0004,  0.0310,  0.0389,  0.0153, -0.0154],
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         [[ 0.0227, -0.0097,  0.0291,  0.0210,  0.0159],
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          [ 0.0429,  0.0139,  0.0327, -0.0281, -0.0265],
          [ 0.0364,  0.0215, -0.0124,  0.0204,  0.0041],
          [ 0.0115, -0.0217, -0.0294, -0.0080,  0.0030]],

         [[-0.0013,  0.0192,  0.0154,  0.0073,  0.0036],
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          [ 0.0453,  0.0326,  0.0516,  0.0434,  0.0321],
          [-0.0201, -0.0010,  0.0266,  0.0522,  0.0436],
          [-0.0092, -0.0084,  0.0452,  0.0414,  0.0139]],

         ...,

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          [-0.0241, -0.0108, -0.0393,  0.0026, -0.0183],
          [-0.0096, -0.0306, -0.0229,  0.0197,  0.0085],
          [-0.0036, -0.0295,  0.0278, -0.0027,  0.0089]],

         [[ 0.0244,  0.0283,  0.0348, -0.0269,  0.0091],
          [-0.0062, -0.0192,  0.0047, -0.0219,  0.0208],
          [ 0.0084,  0.0429,  0.0182,  0.0205,  0.0107],
          [ 0.0215,  0.0331,  0.0354, -0.0293,  0.0048],
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         [[ 0.0191,  0.0261, -0.0027, -0.0118,  0.0252],
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          [-0.0221,  0.0234, -0.0011, -0.0229, -0.0170],
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          [-0.0114, -0.0279, -0.0005,  0.0084, -0.0002]]]], device='cuda:0')), ('conv2.bias', tensor([-0.0329, -0.0190, -0.0035, -0.0087,  0.0272, -0.0122, -0.0171,  0.0028,
        -0.0249,  0.0112,  0.0042,  0.0278,  0.0267, -0.0352, -0.0001, -0.0211,
         0.0071,  0.0070,  0.0168,  0.0310, -0.0164,  0.0264, -0.0109, -0.0072,
        -0.0079, -0.0058, -0.0032,  0.0136, -0.0012,  0.0090, -0.0129, -0.0193,
         0.0063,  0.0100, -0.0279, -0.0278, -0.0051, -0.0141,  0.0153, -0.0010,
        -0.0221, -0.0258, -0.0253,  0.0165,  0.0190, -0.0308, -0.0158,  0.0201,
         0.0138,  0.0085,  0.0034,  0.0115, -0.0149, -0.0090,  0.0285,  0.0153,
         0.0003,  0.0059, -0.0336,  0.0040,  0.0286,  0.0300,  0.0222, -0.0296],
       device='cuda:0')), ('conv2_bn.weight', tensor([0.5243, 0.9142, 0.6366, 0.2765, 0.6375, 0.7431, 0.0798, 0.4566, 0.1851,
        0.2931, 0.6286, 0.4646, 0.8127, 0.5795, 0.8807, 0.5380, 0.7072, 0.4262,
        0.0377, 0.1207, 0.7565, 0.7231, 0.7009, 0.0495, 0.5928, 0.5178, 0.7923,
        0.2856, 0.5032, 0.6817, 0.4434, 0.8622, 0.6865, 0.2926, 0.3185, 0.5599,
        0.6613, 0.6795, 0.8405, 0.2020, 0.1078, 0.4785, 0.1885, 0.1268, 0.6912,
        0.0676, 0.0691, 0.9399, 0.2217, 0.7959, 0.8452, 0.5605, 0.1397, 0.4489,
        0.4939, 0.7077, 0.4050, 0.7349, 0.3480, 0.8540, 0.6507, 0.6619, 0.0692,
        0.3360], device='cuda:0')), ('conv2_bn.bias', tensor([-0.0223, -0.0178, -0.0165, -0.0180, -0.0314, -0.0181, -0.0233, -0.0064,
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        -0.0329, -0.0164, -0.0357, -0.0226, -0.0402, -0.0114, -0.0353, -0.0212,
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        -0.0244, -0.0437, -0.0070, -0.0387, -0.0202, -0.0186, -0.0237, -0.0304],
       device='cuda:0')), ('conv2_bn.running_mean', tensor([-0.2958, -0.2646, -0.3654, -0.5392,  0.3974,  0.0065,  0.7984, -0.2033,
         0.3217, -0.3061, -0.2939, -0.2597, -0.1432,  0.0804, -0.3012, -0.1514,
         0.1360, -0.3587, -0.3173, -0.0089, -0.5034,  0.1930, -0.3156,  0.0664,
        -0.4284, -0.3035, -0.2120, -0.4497,  0.5616, -0.2300, -0.0835, -0.3604,
        -0.2400, -0.4203,  0.4153,  0.4558, -0.4340, -0.4993, -0.0171, -0.3412,
        -0.2523, -0.7652, -0.1984, -0.2426, -0.5655, -0.0508, -0.4544,  0.0229,
        -0.2810, -0.2331, -0.2479, -0.2308, -0.1414, -0.6321, -0.4323, -0.4556,
         0.1658,  0.4135, -0.5175, -0.3011, -0.1338, -0.2105,  0.4852,  0.5545],
       device='cuda:0')), ('conv2_bn.running_var', tensor([0.1635, 0.1210, 0.2374, 0.3369, 0.1443, 0.5569, 0.2300, 0.1417, 0.1057,
        0.1613, 0.1723, 0.1296, 0.1610, 0.1691, 0.2162, 0.1438, 0.1327, 0.2918,
        0.1665, 0.1055, 0.2297, 0.2135, 0.1279, 0.1275, 0.3499, 0.2123, 0.1732,
        0.2386, 0.2259, 0.0935, 0.0994, 0.1598, 0.1719, 0.2556, 0.3350, 0.3815,
        0.2924, 0.3197, 0.1513, 0.1875, 0.1659, 0.2965, 0.1072, 0.1130, 0.2062,
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```
        0.2924, 0.3197, 0.1515, 0.1875, 0.1659, 0.2905, 0.1672, 0.1150, 0.2002,
        0.0809, 0.3647, 0.1855, 0.1759, 0.2119, 0.1480, 0.2188, 0.0903, 0.2558,
        0.2165, 0.1705, 0.4177, 0.1013, 0.2348, 0.2536, 0.0730, 0.1550, 0.1818,
        0.3084], device='cuda:0')), ('conv2_bn.num_batches_tracked', tensor(8160, device='cuda:0'))
, ('conv3.weight', tensor([[[[-0.0170,  0.0291, -0.0172, -0.0010,  0.0258],
          [ 0.0168, -0.0073, -0.0222,  0.0067,  0.0301],
          [ 0.0265, -0.0195,  0.0197,  0.0041, -0.0033],
          [-0.0148, -0.0002,  0.0091, -0.0179,  0.0245],
          [ 0.0057, -0.0076,  0.0166,  0.0053, -0.0069]],

         [[ 0.0208,  0.0317,  0.0122,  0.0290,  0.0221],
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          [-0.0174,  0.0219,  0.0246,  0.0094,  0.0331],
          [ 0.0087, -0.0186, -0.0316, -0.0083,  0.0204],
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         [[-0.0022, -0.0168,  0.0149, -0.0215, -0.0078],
          [-0.0032,  0.0064,  0.0087,  0.0234,  0.0209],
          [-0.0017, -0.0250,  0.0135,  0.0179,  0.0090],
          [ 0.0098,  0.0077,  0.0270,  0.0303,  0.0070],
          [-0.0242, -0.0107,  0.0258, -0.0109, -0.0126]],

         ...,

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          [-0.0135, -0.0175, -0.0076,  0.0030,  0.0020],
          [ 0.0009, -0.0102, -0.0247, -0.0326, -0.0450],
          [ 0.0208, -0.0200, -0.0263,  0.0014, -0.0519]],

         [[-0.0165, -0.0145, -0.0206, -0.0195,  0.0223],
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  [-0.0102, -0.0125, -0.0048,  0.0160, -0.0039]],

 [[-0.0128, -0.0171, -0.0245, -0.0065,  0.0142],
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  [-0.0255,  0.0054, -0.0221,  0.0216, -0.0229]]],


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r([ 0.0093,  0.0220,  0.0009, -0.0003,  0.0137,  0.0156, -0.0189,  0.0025,
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       device='cuda:0')), ('conv3_bn.running_mean', tensor([-0.6313, -0.0841,  0.2167, -0.5382,  0.
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        -0.4403, -0.9598, -0.4775, -0.2454,  0.0253,  0.9488, -0.8265, -0.4819,
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       device='cuda:0')), ('conv3_bn.running_var', tensor([0.3805, 0.2030, 0.1639, 0.2643, 0.1084,
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        0.1941, 0.1090, 0.1913, 0.2675, 0.2003, 0.1719, 0.2552, 0.1025, 0.1798,
        0.2799, 0.1437, 0.0890, 0.1760, 0.1067], device='cuda:0')),
('conv3_bn.num_batches_tracked', tensor(8160, device='cuda:0')), ('conv4.weight', tensor([[[[ 0.00
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          [[-0.0099, -0.0315,  0.0311],
           [ 0.0152,  0.0526, -0.0036],
           [-0.0026, -0.0381,  0.0217]],

          [[-0.0335, -0.0086,  0.0375],
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           [-0.0121,  0.0211,  0.0236]]],


         [[[ 0.0305,  0.0664,  0.0343],
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           [-0.0458,  0.0622,  0.0125]],

          [[-0.0385,  0.0334,  0.0226],
           [-0.0611,  0.0215, -0.0003],
           [-0.0088, -0.0506,  0.0536]],

          [[ 0.0259, -0.0177, -0.0173],
           [-0.0360,  0.0476, -0.0281],
           [-0.0146,  0.0257,  0.0420]],

          ...,

          [[ 0.0567, -0.0239, -0.0271],
           [ 0.0416, -0.0139, -0.0624],
           [ 0.0246, -0.0627, -0.0314]],

          [[ 0.0080,  0.0398, -0.0094],
           [-0.0424, -0.0305, -0.0613],
           [ 0.0577,  0.0128,  0.0315]],

          [[ 0.0296,  0.0402,  0.0717],
           [-0.0692, -0.0112,  0.0339],
           [ 0.0459,  0.0478, -0.0042]]]], device='cuda:0')), ('conv4.bias', tensor([ 0.0496,  0.008
2, -0.0308,  0.0526,  0.0087, -0.0079,  0.0392, -0.0174,
         0.0213,  0.0253,  0.0097,  0.0468, -0.0489, -0.0025,  0.0140, -0.0331,
         0.0536,  0.0543,  0.0198, -0.0148,  0.0176, -0.0259, -0.0310,  0.0553,
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         0.0223, -0.0202, -0.0251,  0.0395, -0.0167, -0.0522, -0.0385, -0.0258,
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       device='cuda:0')), ('conv4_bn.weight', tensor([0.4675, 0.1948, 0.3481, 0.7562, 0.5113, 0.158
9, 0.7162, 0.5178, 1.0016,
         0.1335, 0.5650, 0.2057, 0.3942, 0.5628, 0.8956, 0.8043, 0.3952, 0.5657,
         0.9636, 0.8389, 0.9474, 0.5757, 0.9608, 0.2627, 0.4821, 0.5975, 0.1158,
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         0.4727, 0.5521, 0.6838, 0.3100, 0.9552, 0.9525, 0.3127, 0.4344, 0.6637,
         0.8290, 0.4810, 0.0287, 0.7037, 0.8898, 0.4920, 0.1737, 0.6259, 0.0562,
         0.5315, 0.7383, 0.3112, 0.6892, 0.4596, 0.9562, 0.2869, 0.9803, 0.5836,
         0.4839], device='cuda:0')), ('conv4_bn.bias', tensor([-0.0146, -0.0273, -0.0208, -0.0229,
-0.0118, -0.0162,  0.0152, -0.0309,
         -0.0323, -0.0040, -0.0192, -0.0097, -0.0154, -0.0354, -0.0091, -0.0249,
         -0.0267, -0.0265, -0.0531, -0.0224, -0.0431, -0.0239, -0.0001, -0.0083,
          0.0020, -0.0079, -0.0221, -0.0079, -0.0037, -0.0013, -0.0248, -0.0131,
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         -0.0424, -0.0010,  0.0088, -0.0015, -0.0424, -0.0548, -0.0227, -0.0120,
         -0.0251, -0.0317, -0.0109, -0.0100, -0.0306, -0.0169, -0.0318, -0.0262,
         -0.0399, -0.0122, -0.0363, -0.0256, -0.0140, -0.0199, -0.0101, -0.0151],
       device='cuda:0')), ('conv4_bn.running_mean', tensor([-0.3773,  0.2934, -0.2924,  0.0717,  0.
0090, -0.3154, -0.4189, -0.0419,
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          0.7078, -0.0220, -0.2629,  0.3396, -0.2997,  0.0874, -0.0478,  0.0665,
          0.1041, -0.5877,  0.5271, -0.4020, -0.2050, -0.3616,  0.5055, -0.0770,
         -0.5221, -0.1362,  0.9304, -0.0909,  1.1701, -0.4391, -0.0651, -0.2678,
         -0.2339, -0.2667, -0.3418, -0.2399, -0.0637,  0.4180, -0.1231, -0.6772,
          0.2089, -0.5070, -0.2707, -0.2476, -0.2973, -0.6817, -0.0880, -0.0373,
          0.5925, -0.1812,  0.8351, -0.2172, -0.1398, -0.0538, -0.2268, -0.0176],
       device='cuda:0')), ('conv4_bn.running_var', tensor([0.1458, 0.1424, 0.1175, 0.1552, 0.1372,
0.1502, 0.1024, 0.2236, 0.0829,
```

```
        0.1088, 0.1783, 0.1132, 0.1955, 0.1230, 0.1738, 0.1800, 0.1178, 0.1500,
        0.1497, 0.1129, 0.1107, 0.2257, 0.1236, 0.0868, 0.1710, 0.1961, 0.2321,
        0.0919, 0.0998, 0.1294, 0.2538, 0.1270, 0.2605, 0.1395, 0.2848, 0.1472,
        0.1762, 0.1380, 0.1288, 0.1027, 0.1814, 0.1081, 0.1017, 0.1334, 0.1278,
        0.1765, 0.0887, 0.1957, 0.1897, 0.1402, 0.2809, 0.1605, 0.1365, 0.2320,
        0.1141, 0.1188, 0.2603, 0.1100, 0.2426, 0.1464, 0.1036, 0.1035, 0.1405,
        0.0999], device='cuda:0')), ('conv4_bn.num_batches_tracked', tensor(8160, device='cuda:0'))
, ('conv5.weight', tensor([[[[-0.0263,  0.0319,  0.0196],
          [ 0.0164,  0.0338, -0.0059],
          [-0.0073,  0.0056,  0.0422]],

         [[ 0.0052,  0.0202, -0.0202],
          [ 0.0529,  0.0241,  0.0389],
          [ 0.0576,  0.0323, -0.0212]],

         [[-0.0400, -0.0254, -0.0110],
          [ 0.0077, -0.0241,  0.0366],
          [-0.0107, -0.0288,  0.0608]],

         ...,

         [[-0.0374,  0.0236,  0.0132],
          [ 0.0203, -0.0166, -0.0449],
          [ 0.0166,  0.0426, -0.0525]],

         [[ 0.0154,  0.0000, -0.0417],
          [-0.0163,  0.0113,  0.0172],
          [-0.0405,  0.0292, -0.0224]],

         [[-0.0065, -0.0002, -0.0079],
          [-0.0519,  0.0238,  0.0100],
          [-0.0180,  0.0212, -0.0067]]],


        [[[ 0.0016, -0.0445,  0.0194],
          [-0.0532, -0.0426, -0.0065],
          [-0.0196, -0.0293,  0.0413]],

         [[ 0.0235,  0.0229, -0.0066],
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          [ 0.0453,  0.0067, -0.0146]],

         [[-0.0376, -0.0016,  0.0357],
          [ 0.0294,  0.0258,  0.0020],
          [ 0.0388,  0.0129, -0.0234]],

         ...,

         [[-0.0344,  0.0048, -0.0260],
          [ 0.0062, -0.0064,  0.0444],
          [ 0.0362,  0.0072,  0.0516]],

         [[ 0.0169,  0.0421,  0.0087],
          [ 0.0271,  0.0372, -0.0152],
          [-0.0173, -0.0120,  0.0006]],

         [[ 0.0278,  0.0061,  0.0007],
          [-0.0165,  0.0328, -0.0388],
          [ 0.0286,  0.0122,  0.0338]]],


        [[[-0.0103, -0.0257,  0.0279],
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          [-0.0070,  0.0396,  0.0388]],

         [[-0.0031,  0.0208,  0.0036],
          [-0.0037, -0.0215,  0.0134],
          [-0.0253,  0.0136, -0.0298]],

         [[ 0.0298, -0.0184,  0.0202],
          [ 0.0388, -0.0076, -0.0357],
          [-0.0471, -0.0291, -0.0259]],

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 [[ 0.0355, -0.0058,  0.0278],
  [ 0.0058, -0.0274, -0.0155],
  [-0.0218,  0.0027,  0.0277]],

 [[-0.0445, -0.0466, -0.0383],
  [-0.0334, -0.0351, -0.0415],
  [ 0.0216, -0.0259, -0.0023]]],


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[[[-0.0397, -0.0224,  0.0203],
  [-0.0023, -0.0323,  0.0105],
  [ 0.0199, -0.0213, -0.0229]],

 [[-0.0109, -0.0176, -0.0336],
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  [-0.0223, -0.0140,  0.0081]],

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  [ 0.0230,  0.0417, -0.0147],
  [-0.0287, -0.0387, -0.0077]],

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  [-0.0331, -0.0259, -0.0015]],

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  [-0.0393,  0.0419,  0.0288],
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  [ 0.0286, -0.0006, -0.0146]],

 [[ 0.0056, -0.0187, -0.0430],
  [-0.0104,  0.0056,  0.0325],
  [-0.0549, -0.0455,  0.0102]],

 [[-0.0022,  0.0206,  0.0137],
  [-0.0050,  0.0175, -0.0073],
  [-0.0448,  0.0152,  0.0069]],

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  [-0.0018, -0.0339,  0.0125]],

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  [ 0.0164, -0.0156, -0.0333]],

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  [-0.0282, -0.0235,  0.0060]]],


[[[ 0.0199, -0.0041, -0.0145],
  [-0.0242,  0.0162,  0.0314],
  [-0.0188,  0.0097, -0.0293]],

 [[-0.0301, -0.0367,  0.0234],
  [ 0.0130,  0.0359, -0.0425],
  [ 0.0287,  0.0215, -0.0114]],

 [[ 0.0156, -0.0105, -0.0405],
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          [-0.0070,  0.0195, -0.0123]],

         [[ 0.0131,  0.0305,  0.0316],
          [-0.0170, -0.0120,  0.0156],
          [-0.0380, -0.0037,  0.0313]],

         [[-0.0166,  0.0314,  0.0370],
          [-0.0009,  0.0127, -0.0047],
          [-0.0395, -0.0364,  0.0006]]]], device='cuda:0')), ('conv5.bias', tensor([ 0.0185,  0.010
9,  0.0073, -0.0115,  0.0131, -0.0042,  0.0104,  0.0123,
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        -0.0318,  0.0259,  0.0146,  0.0307,  0.0174,  0.0354,  0.0083,  0.0047,
         0.0017, -0.0028, -0.0107, -0.0134, -0.0317, -0.0129, -0.0069, -0.0285,
        -0.0385,  0.0375,  0.0390,  0.0363, -0.0327, -0.0140,  0.0049, -0.0051,
         0.0317, -0.0369,  0.0089,  0.0373,  0.0022, -0.0166, -0.0184,  0.0264,
        -0.0257,  0.0091, -0.0136, -0.0167, -0.0200,  0.0345, -0.0137,  0.0348,
        -0.0023,  0.0199, -0.0252, -0.0119, -0.0207, -0.0377,  0.0097,  0.0050,
         0.0004, -0.0265, -0.0355, -0.0205,  0.0009, -0.0028,  0.0016, -0.0397,
        -0.0349, -0.0296, -0.0033,  0.0025, -0.0020,  0.0014, -0.0314,  0.0109,
         0.0409, -0.0193,  0.0361, -0.0094,  0.0247, -0.0351,  0.0262,  0.0240],
       device='cuda:0')), ('conv5_bn.weight', tensor([0.1914, 0.6326, 0.5565, 0.0260, 0.3462, 0.864
1, 0.0913, 0.7189, 0.4358,
        0.4206, 0.2959, 0.8930, 0.1044, 0.5596, 0.3438, 0.9657, 0.8241, 0.9159,
        0.2390, 0.0523, 0.9919, 0.8096, 0.5451, 0.2202, 0.5772, 0.1811, 0.8201,
        0.7122, 0.2239, 0.9177, 0.6009, 0.7310, 0.0757, 0.3645, 0.2180, 0.6446,
        0.4765, 0.0508, 0.5639, 0.4533, 0.5949, 0.7924, 0.4402, 0.8657, 0.6077,
        0.6641, 0.1788, 0.5645, 0.6665, 0.6100, 0.8155, 0.2965, 0.1882, 0.3560,
        0.7946, 0.6833, 0.6208, 0.8982, 0.3480, 0.7259, 0.2056, 0.7423, 0.5996,
        0.7795, 0.8425, 0.1776, 0.9334, 0.1019, 0.6558, 0.1860, 0.0980, 0.3488,
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        0.9826, 0.7975, 0.5168, 0.9337, 0.6523, 0.5699, 0.4591, 0.0695, 0.8304,
        0.3332, 0.6313, 0.0609, 0.8055, 0.5335, 0.5663, 0.0435, 0.2585, 0.4396,
        0.3782, 0.1199, 0.6890, 0.3308, 0.3365, 0.7483, 0.1488, 0.4072, 0.9667,
        0.1745, 0.1979, 0.8085, 0.9495, 0.5789, 0.0739, 0.0776, 0.6586, 0.9262,
        0.5146, 0.8824, 0.7877, 0.9515, 0.5118, 0.0708, 0.3991, 0.0342, 0.2946,
        0.6027, 0.9830], device='cuda:0')), ('conv5_bn.bias', tensor([-0.0293, -0.0135, -0.0347, -
0.0096, -0.0107, -0.0335, -0.0184, -0.0126,
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        -0.0312, -0.0090, -0.0179, -0.0275, -0.0147, -0.0258, -0.0256, -0.0254,
        -0.0362, -0.0146, -0.0201, -0.0285, -0.0103, -0.0082, -0.0231, -0.0041],
       device='cuda:0')), ('conv5_bn.running_mean', tensor([ 0.1646,  0.1269, -0.2383, -0.2719, -
0.6361,  0.3352,  0.1633,  0.1409,
        -0.1130, -0.1683, -0.0352, -0.6037, -0.2060,  0.0971,  0.6402, -0.3334,
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        -0.3461, -0.2922,  0.2136, -0.4114,  0.2293, -0.0604, -0.0642,  0.1784,
        -0.1609, -0.2261,  0.3608, -0.3755,  0.6179, -0.2497, -0.1206,  0.0405,
```

```
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        -0.2087, -0.4738, -0.4351,  0.8298,  0.1607,  0.0225,  0.4925,  0.0310,
        -0.1882, -0.1762, -0.2893,  0.2583, -0.1693, -0.6033, -0.4129,  0.0012,
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       device='cuda:0')), ('conv5_bn.running_var', tensor([0.0752, 0.1060, 0.1027, 0.0864, 0.1363,
0.1276, 0.1812, 0.0934, 0.0955,
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        0.1303, 0.1017, 0.1531, 0.1172, 0.0982, 0.0658, 0.0949, 0.1092, 0.1136,
        0.1150, 0.1034, 0.1047, 0.0657, 0.1181, 0.0892, 0.0894, 0.1012, 0.1794,
        0.1390, 0.2030, 0.1742, 0.1011, 0.1120, 0.1770, 0.2379, 0.2054, 0.1492,
        0.1202, 0.1000, 0.1029, 0.1352, 0.1406, 0.0858, 0.1272, 0.1134, 0.0730,
        0.0897, 0.1157, 0.2621, 0.2098, 0.1513, 0.2220, 0.1005, 0.1064, 0.1253,
        0.1231, 0.1180, 0.1142, 0.1645, 0.0966, 0.1162, 0.1306, 0.1179, 0.1391,
        0.0857, 0.1884, 0.2151, 0.0809, 0.1400, 0.1067, 0.0942, 0.0865, 0.1165,
        0.0830, 0.0976, 0.0942, 0.1401, 0.0632, 0.1040, 0.1381, 0.0822, 0.0975,
        0.1358, 0.0847, 0.1262, 0.1021, 0.0934, 0.1199, 0.1032, 0.1076, 0.1158,
        0.1255, 0.1567, 0.1344, 0.0992, 0.1414, 0.1412, 0.1369, 0.1142, 0.1571,
        0.0830, 0.0784, 0.1021, 0.0948, 0.1596, 0.1397, 0.0977, 0.1228, 0.1164,
        0.1280, 0.0879, 0.0907, 0.1257, 0.1431, 0.1222, 0.1876, 0.1438, 0.2421,
        0.1901, 0.1399], device='cuda:0')), ('conv5_bn.num_batches_tracked', tensor(8160, device='c
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          [ 0.0003, -0.0248, -0.0099]],

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          [ 0.0442,  0.0004,  0.0099]],

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          [-0.0344, -0.0163, -0.0270],
          [-0.0026, -0.0228, -0.0316]]],


        [[[ 0.0276, -0.0215, -0.0267],
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          [ 0.0040,  0.0312,  0.0045]],

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          [ 0.0105,  0.0056, -0.0133]],

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         [[ 0.0272, -0.0010,  0.0130],
          [ 0.0105, -0.0262, -0.0101],
          [-0.0278,  0.0102, -0.0091]],

         [[-0.0174, -0.0323, -0.0078],
          [-0.0110, -0.0117, -0.0450],
          [-0.0064, -0.0314, -0.0224]],

         [[ 0.0041, -0.0347, -0.0249],
          [-0.0152, -0.0382,  0.0040],
          [-0.0315, -0.0328, -0.0475]]],


        [[[-0.0160, -0.0322, -0.0042],
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  [ 0.0153,  0.0235, -0.0328],
  [ 0.0164,  0.0105,  0.0141]],

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 [[-0.0059, -0.0143, -0.0092],
  [ 0.0193,  0.0208,  0.0297],
  [ 0.0186,  0.0034,  0.0193]],

 [[-0.0174, -0.0125, -0.0088],
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  [ 0.0388,  0.0156, -0.0068]],

 [[ 0.0117,  0.0146,  0.0086],
  [ 0.0173, -0.0080, -0.0112],
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[[[ 0.0038,  0.0241, -0.0052],
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  [-0.0374, -0.0240, -0.0021]],

 [[-0.0076,  0.0173,  0.0248],
  [-0.0243,  0.0195,  0.0288],
  [-0.0118, -0.0088, -0.0115]],

 [[-0.0239, -0.0332, -0.0188],
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  [-0.0056, -0.0174, -0.0249]],

 [[-0.0222,  0.0085,  0.0198],
  [ 0.0120, -0.0267, -0.0080],
  [-0.0356, -0.0344,  0.0103]],

 [[ 0.0410,  0.0387,  0.0391],
  [ 0.0163,  0.0106,  0.0227],
  [ 0.0142,  0.0196,  0.0208]]],


[[[-0.0290, -0.0265, -0.0303],
  [-0.0268,  0.0149, -0.0300],
  [ 0.0099, -0.0265,  0.0358]],

 [[ 0.0007,  0.0227, -0.0000],
  [ 0.0282,  0.0362, -0.0187],
  [ 0.0301,  0.0102,  0.0332]],

 [[-0.0102, -0.0304, -0.0202],
  [ 0.0277, -0.0177, -0.0101],
  [ 0.0169,  0.0184, -0.0295]],

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 [[-0.0407, -0.0070,  0.0117],
  [-0.0197,  0.0115,  0.0030],
  [-0.0254, -0.0137,  0.0084]],

 [[-0.0088,  0.0197,  0.0097],
  [ 0.0096, -0.0043, -0.0425],
  [ 0.0090, -0.0048, -0.0185]],

 [[-0.0008, -0.0161, -0.0061],
```

```
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          [-0.0246, -0.0128, -0.0092]]],


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          [ 0.0129,  0.0148,  0.0013]],

         [[-0.0161, -0.0015,  0.0120],
          [-0.0521, -0.0203, -0.0050],
          [-0.0228,  0.0001, -0.0218]],

         [[ 0.0060,  0.0364, -0.0024],
          [ 0.0058, -0.0282,  0.0164],
          [ 0.0155,  0.0056,  0.0063]],

         ...,

         [[-0.0340, -0.0100, -0.0094],
          [ 0.0113, -0.0062, -0.0069],
          [-0.0303,  0.0190, -0.0301]],

         [[-0.0337, -0.0191, -0.0278],
          [-0.0198,  0.0287,  0.0310],
          [ 0.0044, -0.0051, -0.0136]],

         [[ 0.0137,  0.0218, -0.0264],
          [ 0.0340,  0.0066, -0.0152],
          [ 0.0399,  0.0189,  0.0198]]]], device='cuda:0')), ('conv6.bias', tensor([-0.0258,  0.014
0,  0.0233,  0.0185,  0.0011, -0.0167, -0.0280,  0.0085,
         0.0115,  0.0280,  0.0228, -0.0030, -0.0207, -0.0171,  0.0044,  0.0266,
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         0.0073,  0.0153, -0.0031, -0.0250, -0.0004,  0.0115, -0.0272,  0.0130,
         0.0064, -0.0039,  0.0072, -0.0239, -0.0172,  0.0234, -0.0172, -0.0025,
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       device='cuda:0')), ('conv6_bn.weight', tensor([0.6751, 0.6988, 0.2303, 0.5104, 0.1604, 0.021
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        0.4040, 0.6583, 0.5257, 0.9485, 0.9495, 0.0503, 0.3467, 0.8910, 0.6006,
        0.0145, 0.9990, 0.6189, 0.6586, 0.6502, 0.5065, 0.4543, 0.9037, 0.6151,
        0.1337, 0.7185, 0.5335, 0.0661, 0.5675, 0.7426, 0.5587, 0.3582, 0.2712,
        0.2053, 0.3666, 0.3219, 0.4313, 0.3917, 0.7930, 0.5646, 0.2135, 0.8685,
        0.1679, 0.1223, 0.9973, 0.4314, 0.9183, 0.4401, 0.7347, 0.6721, 0.4092,
        0.1497], device='cuda:0')), ('conv6_bn.bias', tensor([-0.0377, -0.0317, -0.0294,  0.0069,
-0.0197, -0.0059,  0.0127,  0.0095,
        -0.0167, -0.0252,  0.0136, -0.0325, -0.0219,  0.0060,  0.0035, -0.0412,
         0.0037,  0.0069,  0.0034, -0.0209,  0.0165, -0.0320,  0.0037,  0.0152,
        -0.0132, -0.0302, -0.0308, -0.0112,  0.0059, -0.0100, -0.0084, -0.0185,
        -0.0436,  0.0024, -0.0170, -0.0428,  0.0191, -0.0070,  0.0145, -0.0236,
         0.0076, -0.0284, -0.0102, -0.0074,  0.0001,  0.0009, -0.0069, -0.0284,
        -0.0085, -0.0148, -0.0216, -0.0211, -0.0108, -0.0181,  0.0032,  0.0152,
        -0.0085, -0.0004, -0.0241, -0.0182, -0.0355, -0.0042, -0.0131, -0.0074],
       device='cuda:0')), ('conv6_bn.running_mean', tensor([ 0.2457, -1.0438,  0.0412, -0.3612, -
0.4698, -0.5011, -0.2927, -0.3666,
        -0.3926,  0.0140, -0.1420, -0.6286, -0.2723,  0.1918,  0.0879, -0.2651,
         0.1141, -0.0454, -0.2030, -0.0023, -0.1630,  0.0583, -0.5851, -0.1581,
        -0.8256, -0.0753,  0.0693, -0.0902, -0.1789, -0.2789, -0.1769, -0.1547,
        -0.0505, -0.0512, -0.0901,  0.2905, -0.3211, -1.0213, -0.1464,  0.1255,
        -0.4407, -0.5202, -0.2091, -0.2207,  0.0130,  0.0023, -0.6206, -0.4912,
        -0.6979,  0.1789,  0.1390,  0.0557, -0.4986,  0.5272, -0.1649,  0.2437,
         0.0269,  0.0718, -0.4540, -0.0252, -0.4000,  0.0692, -0.5773, -0.4310],
       device='cuda:0')), ('conv6_bn.running_var', tensor([0.1370, 0.1886, 0.1308, 0.1326, 0.1130,
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        0.0977, 0.2303, 0.1449, 0.1322, 0.1579, 0.0967, 0.0804, 0.2247, 0.1066,
        0.0920, 0.2018, 0.1589, 0.1800, 0.1256, 0.2258, 0.2568, 0.1093, 0.1658,
        0.1596, 0.0875, 0.2357, 0.2223, 0.1492, 0.1632, 0.1596, 0.0992, 0.1792,
        0.3051, 0.1442, 0.2666, 0.1673, 0.1868, 0.0976, 0.1195, 0.1911, 0.1611,
        0.2071, 0.1648, 0.1325, 0.1776, 0.1307, 0.1157, 0.0924, 0.1590, 0.1057,
        0.1692, 0.1926, 0.1539, 0.1768, 0.1454, 0.1759, 0.1424, 0.1718, 0.1756,
        0.1621], device='cuda:0')), ('conv6_bn.num_batches_tracked', tensor(8160, device='cuda:0'))
, ('conv7.weight', tensor([[[[ 0.0108,  0.0033,  0.0119, -0.0111,  0.0104],
          [ 0.0161, -0.0280, -0.0250, -0.0237,  0.0111],
          [ 0.0031,  0.0080,  0.0167,  0.0081, -0.0019],
          [ 0.0134,  0.0163, -0.0134,  0.0191,  0.0058],
          [-0.0249,  0.0069,  0.0053, -0.0101,  0.0237]],
```

```
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  [-0.0027, -0.0162, -0.0157, -0.0052,  0.0151],
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  [ 0.0189,  0.0163, -0.0067, -0.0200, -0.0270]],

 [[ 0.0340,  0.0294,  0.0095,  0.0041,  0.0229],
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 [[ 0.0312,  0.0052,  0.0110, -0.0176, -0.0124],
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  [-0.0059, -0.0008,  0.0148,  0.0035, -0.0021]]],


[[[-0.0278, -0.0189, -0.0001,  0.0078,  0.0058],
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  [-0.0037,  0.0197,  0.0054, -0.0147,  0.0132],
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[[[-0.0101,  0.0143,  0.0036,  0.0237,  0.0108],
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  [-0.0043, -0.0123,  0.0212,  0.0107,  0.0002]],

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  [-0.0066, -0.0071, -0.0208, -0.0052,  0.0213],
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  [-0.0217,  0.0084,  0.0031, -0.0017, -0.0257]],

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  [-0.0312, -0.0287, -0.0060,  0.0107,  0.0114],
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  [ 0.0291, -0.0017,  0.0343,  0.0180,  0.0097],
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[[[ 0.0146, -0.0106,  0.0314,  0.0084,  0.0063],
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  [-0.0066, -0.0289, -0.0044,  0.0021,  0.0064],
  [-0.0346, -0.0415,  0.0047, -0.0069, -0.0293]],

 ...,

 [[ 0.0082,  0.0041, -0.0172, -0.0011, -0.0012],
  [-0.0286, -0.0218,  0.0123,  0.0283,  0.0157],
  [-0.0211, -0.0027,  0.0270,  0.0274,  0.0247],
  [ 0.0065, -0.0080,  0.0258,  0.0105, -0.0240],
  [-0.0138, -0.0087,  0.0200,  0.0173,  0.0178]],

 [[ 0.0017,  0.0286,  0.0106,  0.0318,  0.0270],
  [ 0.0231,  0.0275, -0.0030, -0.0161,  0.0162],
  [ 0.0076, -0.0128,  0.0093, -0.0083,  0.0174],
  [ 0.0197, -0.0110,  0.0140,  0.0051,  0.0147],
  [-0.0071,  0.0218,  0.0024,  0.0122, -0.0210]],

 [[-0.0253,  0.0061,  0.0039,  0.0189, -0.0090],
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  [-0.0126,  0.0051,  0.0109,  0.0023,  0.0058],
  [-0.0089, -0.0002,  0.0024, -0.0050, -0.0253],
  [ 0.0174,  0.0121,  0.0116,  0.0162,  0.0262]]],
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            [-0.0197,  0.0210, -0.0211,  0.0126,  0.0097],
            [ 0.0175, -0.0298,  0.0207,  0.0038,  0.0226],
            [-0.0257,  0.0031, -0.0101,  0.0199,  0.0228],
            [-0.0008,  0.0214,  0.0069,  0.0174,  0.0204]],

           [[-0.0019,  0.0001, -0.0237, -0.0137,  0.0221],
            [-0.0057,  0.0054, -0.0145, -0.0123,  0.0290],
            [-0.0072, -0.0206, -0.0106, -0.0159, -0.0157],
            [-0.0039,  0.0419,  0.0016,  0.0301,  0.0364],
            [ 0.0458,  0.0337,  0.0323,  0.0084,  0.0011]],

           [[-0.0050,  0.0097, -0.0112,  0.0077,  0.0087],
            [ 0.0302,  0.0221, -0.0071, -0.0212, -0.0049],
            [ 0.0116,  0.0035, -0.0128, -0.0257,  0.0022],
            [ 0.0068, -0.0203, -0.0134, -0.0182,  0.0080],
            [ 0.0189, -0.0216, -0.0219, -0.0170, -0.0241]],

           ...,

           [[-0.0133,  0.0077,  0.0121, -0.0194, -0.0050],
            [-0.0042, -0.0073,  0.0096,  0.0046,  0.0133],
            [-0.0079,  0.0097,  0.0051, -0.0239, -0.0108],
            [-0.0233, -0.0069, -0.0052, -0.0077,  0.0066],
            [-0.0276, -0.0181, -0.0096,  0.0043,  0.0186]],

           [[ 0.0119, -0.0045, -0.0089,  0.0061,  0.0007],
            [-0.0084, -0.0101, -0.0193,  0.0012, -0.0227],
            [ 0.0083,  0.0050, -0.0331, -0.0105, -0.0244],
            [ 0.0233,  0.0053, -0.0208,  0.0067, -0.0168],
            [-0.0118, -0.0133,  0.0058,  0.0095,  0.0014]],

           [[ 0.0390,  0.0006,  0.0045,  0.0024,  0.0007],
            [ 0.0380,  0.0140, -0.0007,  0.0197,  0.0199],
            [ 0.0333,  0.0126,  0.0276, -0.0037,  0.0015],
            [ 0.0128,  0.0159, -0.0054,  0.0051,  0.0158],
            [ 0.0254,  0.0217,  0.0326,  0.0286, -0.0147]]],


          [[[-0.0289, -0.0236,  0.0024,  0.0161,  0.0186],
            [-0.0013, -0.0099, -0.0025,  0.0384,  0.0392],
            [ 0.0120, -0.0132,  0.0210,  0.0005,  0.0127],
            [ 0.0039, -0.0174,  0.0002, -0.0096, -0.0018],
            [-0.0012, -0.0184,  0.0073,  0.0112, -0.0155]],

           [[ 0.0196,  0.0106,  0.0342,  0.0165,  0.0107],
            [ 0.0162,  0.0005,  0.0205, -0.0180, -0.0140],
            [-0.0018,  0.0012,  0.0114, -0.0114, -0.0114],
            [ 0.0210, -0.0106, -0.0200, -0.0057,  0.0089],
            [-0.0275, -0.0137,  0.0291, -0.0159, -0.0096]],

           [[-0.0037,  0.0028, -0.0214, -0.0153, -0.0044],
            [-0.0076,  0.0045, -0.0079, -0.0012,  0.0078],
            [-0.0163,  0.0109,  0.0162, -0.0103,  0.0037],
            [ 0.0240, -0.0117,  0.0149,  0.0106, -0.0286],
            [-0.0092,  0.0112,  0.0305,  0.0296,  0.0092]],

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           [[-0.0215, -0.0296, -0.0198,  0.0132, -0.0057],
            [-0.0107, -0.0284, -0.0098, -0.0233,  0.0095],
            [ 0.0186,  0.0200, -0.0198,  0.0045,  0.0081],
            [ 0.0121,  0.0238,  0.0146,  0.0069,  0.0311],
            [-0.0134,  0.0170,  0.0290,  0.0097,  0.0009]],

           [[-0.0215,  0.0126,  0.0055,  0.0049, -0.0154],
            [ 0.0046,  0.0164,  0.0128,  0.0013, -0.0185],
            [-0.0145,  0.0162,  0.0049,  0.0136,  0.0092],
            [-0.0230,  0.0279,  0.0092,  0.0285,  0.0086],
            [-0.0232,  0.0142,  0.0106, -0.0103,  0.0266]],

           [[ 0.0057,  0.0198,  0.0141, -0.0032, -0.0309],
            [-0.0217,  0.0151, -0.0020, -0.0210, -0.0308],
            [-0.0144, -0.0190,  0.0108, -0.0044, -0.0378],
            [-0.0128,  0.0069,  0.0075, -0.0297, -0.0097],
            [ 0.0190, -0.0062,  0.0018, -0.0086,  0.0193]]]], device='cuda:0')), ('conv7.bias', tensc
r([ 0.0100,  0.0142, -0.0061, -0.0228,  0.0169, -0.0248,  0.0145,  0.0224,
```

```
        -0.0235, -0.0075,  0.0202,  0.0100,  0.0000, -0.0237, -0.0115,  0.0149,
         0.0068, -0.0104,  0.0174, -0.0115, -0.0201, -0.0127,  0.0025,  0.0003,
         0.0089, -0.0123,  0.0230, -0.0068, -0.0095,  0.0135, -0.0157, -0.0033,
         0.0075,  0.0065,  0.0154,  0.0150,  0.0124,  0.0215,  0.0004,  0.0050,
         0.0016, -0.0037, -0.0250,  0.0198,  0.0138, -0.0022, -0.0160,  0.0007,
         0.0156,  0.0165,  0.0130,  0.0016, -0.0204, -0.0011, -0.0145, -0.0155,
         0.0021, -0.0132, -0.0005, -0.0091, -0.0109, -0.0151,  0.0176,  0.0241,
         0.0011, -0.0010,  0.0113,  0.0241, -0.0202,  0.0091,  0.0083, -0.0249,
         0.0152, -0.0173,  0.0188,  0.0117,  0.0080,  0.0143, -0.0056, -0.0234,
        -0.0147, -0.0181, -0.0207,  0.0041,  0.0144, -0.0103,  0.0164, -0.0206,
         0.0113,  0.0085, -0.0025, -0.0191,  0.0002,  0.0182, -0.0012,  0.0156,
        -0.0211,  0.0055,  0.0061, -0.0130, -0.0119, -0.0188, -0.0185, -0.0059,
         0.0036, -0.0139, -0.0130, -0.0071, -0.0207, -0.0192, -0.0241,  0.0193,
        -0.0007, -0.0040, -0.0041,  0.0152, -0.0065, -0.0026,  0.0073, -0.0184,
         0.0107,  0.0132, -0.0117,  0.0242,  0.0160,  0.0244, -0.0111, -0.0249],
       device='cuda:0')), ('conv7_bn.weight', tensor([0.6614, 0.4155, 0.9904, 0.3792, 0.7880, 0.752
6, 0.4111, 0.9713, 0.5663,
        0.6527, 0.1365, 0.5185, 0.9057, 0.9388, 0.1845, 0.0719, 0.0809, 0.0717,
        0.5204, 0.3690, 0.4020, 0.7467, 0.8893, 0.1712, 0.5951, 0.9172, 0.4815,
        0.5541, 0.2510, 0.3909, 0.3932, 0.4466, 0.6359, 0.0393, 0.7426, 0.9332,
        0.8662, 0.3551, 0.7460, 0.4015, 0.6886, 0.5012, 0.1008, 0.2294, 0.3195,
        0.8532, 0.8472, 0.1624, 0.8710, 0.9044, 0.8649, 0.8986, 0.2568, 0.2410,
        0.0663, 0.9058, 0.3119, 0.8452, 0.7440, 0.8052, 0.5288, 0.4167, 0.3906,
        0.1816, 0.8933, 0.3376, 0.4249, 0.1075, 0.8108, 0.9500, 0.8477, 0.6723,
        0.8316, 0.0805, 0.8031, 0.4995, 0.7180, 0.3398, 0.5978, 0.6673, 0.7559,
        0.6617, 0.6499, 0.9034, 0.8272, 0.4201, 0.6790, 0.8351, 0.7727, 0.7906,
        0.6372, 0.7390, 0.8721, 0.9232, 0.6296, 0.2807, 0.3719, 0.9308, 0.7221,
        0.4371, 0.1032, 0.1858, 0.1179, 0.1657, 0.5710, 0.1181, 0.1225, 0.7445,
        0.1390, 0.4018, 0.1109, 0.5613, 0.5336, 0.8294, 0.8589, 0.1047, 0.1803,
        0.2644, 0.2803, 0.1447, 0.9477, 0.8822, 0.6214, 0.2961, 0.8770, 0.6787,
        0.6169, 0.4554], device='cuda:0')), ('conv7_bn.bias', tensor([-0.0570, -0.0516, -0.0557, -
0.0539, -0.0756, -0.0724, -0.0347, -0.0642,
        -0.0375, -0.0813, -0.0306, -0.0579, -0.0555, -0.0672, -0.0520, -0.0305,
        -0.0438, -0.0408, -0.0368, -0.0551, -0.0574, -0.0526, -0.0727, -0.0454,
        -0.0678, -0.0877, -0.0601, -0.0446, -0.0363, -0.0642, -0.0469, -0.0474,
        -0.0707, -0.0228, -0.0400, -0.0492, -0.0625, -0.0502, -0.0649, -0.0439,
        -0.0760, -0.0786, -0.0336, -0.0480, -0.0522, -0.0675, -0.0629, -0.0296,
        -0.0575, -0.0423, -0.0645, -0.0536, -0.0441, -0.0272, -0.0249, -0.0598,
        -0.0372, -0.0566, -0.0628, -0.0498, -0.0415, -0.0447, -0.0564, -0.0300,
        -0.0577, -0.0542, -0.0397, -0.0398, -0.0511, -0.0722, -0.0608, -0.0699,
        -0.0353, -0.0234, -0.0367, -0.0420, -0.0541, -0.0420, -0.0490, -0.0267,
        -0.0542, -0.0368, -0.0585, -0.0762, -0.0526, -0.0479, -0.0512, -0.0483,
        -0.0567, -0.0447, -0.0552, -0.0307, -0.1032, -0.0679, -0.0670, -0.0506,
        -0.0547, -0.0584, -0.0714, -0.0453, -0.0324, -0.0527, -0.0421, -0.0541,
        -0.0517, -0.0396, -0.0511, -0.0361, -0.0353, -0.0385, -0.0409, -0.0392,
        -0.0509, -0.0603, -0.0379, -0.0456, -0.0301, -0.0472, -0.0513, -0.0342,
        -0.0485, -0.0672, -0.0605, -0.0469, -0.0671, -0.0533, -0.0676, -0.0377],
       device='cuda:0')), ('conv7_bn.running_mean', tensor([ 0.0085, -0.6893, -0.3168, -0.2323, -0
.0634, -1.1945,  0.3922,  0.6649,
        -0.2367,  0.5537,  0.3511,  0.4410,  0.1140,  0.4734, -0.0603, -1.6170,
        -1.6945,  0.1783, -1.7040,  1.6515,  1.0635, -0.4377, -1.0317, -0.2911,
        -0.5559, -0.5542,  0.0999, -0.2247, -1.8667,  0.2837, -0.2611,  1.2784,
        -0.5555,  0.9236, -1.6844, -1.0301, -0.5494,  1.0526,  0.7149, -0.5787,
        -0.1166, -0.0847,  1.0920,  1.1684,  0.4965, -0.9148, -1.8205,  1.6150,
        -0.8575, -1.5323, -0.4999, -0.2554,  1.0102, -1.1762,  0.5680,  0.2824,
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        -3.7384, -0.6104, -1.8464,  1.0430, -0.1539, -0.8480,  1.3419, -2.9317,
         1.0828,  1.9544,  0.1923,  0.4396,  0.5137, -0.9347,  0.6975, -1.2235,
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        -0.7358,  1.8443, -0.1811, -1.2620, -0.8410,  0.6542,  2.3954, -0.4087,
         0.3686,  1.4950,  1.3186, -1.3282, -2.1248, -0.6441,  2.8355, -1.2551,
         1.9055, -1.7239, -1.5197,  0.6691,  1.3010,  1.4019,  0.4985,  0.7026,
        -1.5255, -1.5002,  2.0425,  0.2324,  0.3264, -0.2769,  0.7101, -0.4580],
       device='cuda:0')), ('conv7_bn.running_var', tensor([0.4435, 0.5521, 0.5112, 0.4202, 0.4538,
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        0.5023, 0.4140, 0.4578, 0.3872, 0.4425, 0.4335, 0.5180, 0.6718, 0.3827,
        1.0202, 0.7502, 0.5896, 0.4525, 0.5268, 0.3919, 0.4676, 0.5174, 0.3992,
        0.5704, 0.6242, 0.5040, 0.4594, 0.5113, 0.5238, 0.4610, 0.6170, 0.4337,
        0.5798, 0.4642, 0.3879, 0.5180, 0.3824, 0.5408, 0.3666, 0.4121, 0.3826,
        0.4854, 0.6412, 0.4833, 0.3557, 0.4407, 0.6083, 0.4757, 0.5656, 0.4563,
        0.3867, 0.5755, 0.5076, 0.5334, 0.4591, 0.5147, 0.6899, 0.4919, 0.4565,
        0.6037, 0.4268, 0.4650, 0.5465, 0.4962, 0.4759, 0.3920, 0.4966, 0.5041,
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        0.6211, 0.5407, 0.4022, 0.4433, 0.4926, 0.5182, 0.5843, 0.4942, 0.6217,
        0.4092, 0.5874, 0.4978, 0.6066, 0.5312, 0.5285, 0.4141, 0.7758, 0.4435,
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```

```
        0.9401, 0.6387, 0.7066, 0.5298, 0.5353, 0.6009, 0.8468, 0.5280, 0.4843,
        0.5738, 0.4740, 0.4224, 0.5765, 0.5370, 0.6869, 0.4617, 0.5459, 0.4267,
        0.5735, 0.6179], device='cuda:0')), ('conv7_bn.num_batches_tracked', tensor(8160, device='c
uda:0')), ('conv8.weight', tensor([[[[-0.0141,  0.0049, -0.0139],
          [ 0.0172, -0.0058, -0.0118],
          [ 0.0261, -0.0008,  0.0341]],

         [[-0.0292, -0.0089,  0.0266],
          [-0.0313,  0.0044,  0.0220],
          [ 0.0124, -0.0224, -0.0285]],

         [[ 0.0514,  0.0420,  0.0464],
          [ 0.0572,  0.0022,  0.0257],
          [-0.0063,  0.0288, -0.0015]],

         ...,

         [[-0.0352, -0.0171, -0.0044],
          [-0.0317, -0.0045, -0.0205],
          [ 0.0072,  0.0009,  0.0167]],

         [[ 0.0137, -0.0160, -0.0011],
          [ 0.0215,  0.0287, -0.0096],
          [-0.0226,  0.0203, -0.0239]],

         [[ 0.0197,  0.0106,  0.0126],
          [ 0.0060, -0.0309, -0.0058],
          [-0.0449, -0.0465, -0.0452]]],


        [[[-0.0249,  0.0237,  0.0206],
          [-0.0184, -0.0203,  0.0366],
          [-0.0272, -0.0178,  0.0311]],

         [[ 0.0116, -0.0005,  0.0146],
          [ 0.0143, -0.0120,  0.0163],
          [ 0.0166, -0.0018,  0.0279]],

         [[ 0.0030,  0.0032, -0.0044],
          [ 0.0046, -0.0086,  0.0094],
          [ 0.0250,  0.0131,  0.0174]],

         ...,

         [[-0.0006,  0.0027,  0.0103],
          [-0.0069, -0.0073, -0.0295],
          [ 0.0224,  0.0063, -0.0188]],

         [[-0.0227,  0.0129,  0.0022],
          [-0.0226, -0.0044,  0.0142],
          [ 0.0146, -0.0066, -0.0078]],

         [[ 0.0263,  0.0328,  0.0389],
          [ 0.0076,  0.0202, -0.0169],
          [ 0.0017,  0.0288,  0.0295]]],


        [[[-0.0357, -0.0117,  0.0097],
          [ 0.0038,  0.0110, -0.0203],
          [ 0.0113, -0.0168,  0.0192]],

         [[-0.0031, -0.0099, -0.0265],
          [ 0.0176, -0.0129,  0.0271],
          [-0.0044,  0.0067,  0.0089]],

         [[ 0.0287,  0.0050,  0.0236],
          [ 0.0132,  0.0180, -0.0022],
          [ 0.0305,  0.0063,  0.0375]],

         ...,

         [[-0.0116, -0.0080,  0.0243],
          [-0.0073, -0.0077,  0.0229],
          [ 0.0232,  0.0009,  0.0353]],

         [[-0.0080,  0.0098,  0.0106],
          [-0.0168, -0.0125,  0.0113]
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  [ 0.0100,  0.0125,  0.0115],
  [-0.0303, -0.0212, -0.0320]],

 [[-0.0318, -0.0136,  0.0129],
  [ 0.0041,  0.0054,  0.0187],
  [ 0.0138, -0.0327, -0.0111]]],


...,


[[[-0.0271,  0.0021, -0.0188],
  [ 0.0181,  0.0170, -0.0020],
  [ 0.0123, -0.0096,  0.0059]],

 [[-0.0198, -0.0214, -0.0500],
  [-0.0051, -0.0247, -0.0086],
  [ 0.0160, -0.0012, -0.0087]],

 [[ 0.0201, -0.0138,  0.0231],
  [ 0.0212,  0.0288, -0.0297],
  [ 0.0419,  0.0362, -0.0129]],

 ...,

 [[-0.0270, -0.0002, -0.0088],
  [ 0.0264, -0.0224, -0.0058],
  [ 0.0214,  0.0031, -0.0295]],

 [[-0.0264, -0.0152, -0.0187],
  [-0.0281,  0.0089,  0.0373],
  [ 0.0291, -0.0099,  0.0293]],

 [[ 0.0004, -0.0074, -0.0312],
  [ 0.0282, -0.0274, -0.0139],
  [-0.0021,  0.0140,  0.0253]]],


[[[ 0.0117, -0.0134,  0.0133],
  [-0.0185, -0.0276, -0.0210],
  [ 0.0081,  0.0018, -0.0360]],

 [[-0.0070,  0.0326,  0.0002],
  [-0.0100, -0.0164, -0.0009],
  [-0.0262,  0.0113,  0.0157]],

 [[ 0.0199, -0.0205, -0.0036],
  [ 0.0237, -0.0182, -0.0003],
  [-0.0407,  0.0078, -0.0439]],

 ...,

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  [-0.0108, -0.0349,  0.0039]],

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  [ 0.0093, -0.0328,  0.0069],
  [-0.0275, -0.0363, -0.0478]],

 [[-0.0204,  0.0004, -0.0137],
  [ 0.0243, -0.0342,  0.0004],
  [-0.0058, -0.0375,  0.0063]]],


[[[-0.0228,  0.0075,  0.0112],
  [-0.0161, -0.0136,  0.0156],
  [-0.0378, -0.0358, -0.0395]],

 [[ 0.0096,  0.0185,  0.0040],
  [ 0.0278,  0.0242, -0.0101],
  [ 0.0216,  0.0065, -0.0079]],

 [[ 0.0174, -0.0136, -0.0126],
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  [-0.0230, -0.0004,  0.0227]],
```

```
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           [ 0.0265,  0.0142,  0.0097]],

          [[-0.0513, -0.0330, -0.0374],
           [-0.0324, -0.0530, -0.0385],
           [-0.0509, -0.0173, -0.0300]],

          [[ 0.0174,  0.0141, -0.0252],
           [ 0.0258, -0.0136,  0.0083],
           [-0.0224, -0.0196, -0.0366]]]], device='cuda:0')), ('conv8.bias', tensor([ 0.0075,  0.003
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         -0.0208,  0.0022, -0.0274, -0.0084,  0.0135,  0.0101,  0.0257, -0.0142,
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       device='cuda:0')), ('conv8_bn.running_mean', tensor([-0.2786, -0.2291, -0.6259, -1.6281, -0
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       device='cuda:0')), ('conv8_bn.running_var', tensor([0.2567, 0.2866, 0.3114, 0.5239, 0.2021,
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        0.2168, 0.1656, 0.4528, 0.1617, 0.4045, 0.2693, 0.2749, 0.2466, 0.2440,
        0.2146, 0.1769, 0.2884, 0.2793, 0.2205, 0.1360, 0.2479, 0.2121, 0.2848,
        0.1637, 0.1758, 0.2797, 0.4029], device='cuda:0')), ('conv8_bn.num_batches_tracked', tensor
(8160, device='cuda:0')), ('conv9.weight', tensor([[[[-0.0401, -0.0194, -0.0011],
          [ 0.0097, -0.0193,  0.0081],
          [-0.0172, -0.0227,  0.0106]],

         [[ 0.0026,  0.0003,  0.0095],
          [-0.0113,  0.0149,  0.0049],
          [-0.0149,  0.0120,  0.0112]],

         [[-0.0102,  0.0189,  0.0208],
          [ 0.0076, -0.0213, -0.0096],
          [-0.0281, -0.0213, -0.0189]],

         ...,

         [[ 0.0154, -0.0037, -0.0047],
          [-0.0013,  0.0191,  0.0037],
          [-0.0142, -0.0172, -0.0171]],

         [[-0.0287, -0.0153, -0.0402],
          [-0.0142, -0.0154, -0.0282],
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         [[ 0.0016, -0.0071,  0.0138],
          [ 0.0217, -0.0158,  0.0015],
          [-0.0081, -0.0028,  0.0036]]],


        [[[-0.0012,  0.0249,  0.0297],
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          [ 0.0052,  0.0067,  0.0202]],

         [[-0.0124,  0.0119, -0.0158],
          [-0.0120,  0.0083, -0.0125],
          [ 0.0169,  0.0049,  0.0141]],

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          [ 0.0043, -0.0112,  0.0018],
          [ 0.0049,  0.0063, -0.0210]],

         ...,

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          [-0.0024,  0.0190, -0.0012],
          [ 0.0207,  0.0021,  0.0022]],

         [[ 0.0079,  0.0030, -0.0143],
          [-0.0214,  0.0091, -0.0075],
          [-0.0127, -0.0101, -0.0144]],

         [[-0.0013,  0.0111, -0.0129],
          [-0.0179, -0.0194,  0.0121],
          [ 0.0140,  0.0189,  0.0223]]],


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          [ 0.0109, -0.0014,  0.0171],
          [ 0.0061, -0.0121, -0.0122]],

         [[ 0.0186, -0.0139, -0.0000],
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          [-0.0058,  0.0140,  0.0248]],
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  [ 0.0179,  0.0175,  0.0118],
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 ...,

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  [ 0.0213,  0.0343,  0.0308],
  [ 0.0138, -0.0057,  0.0027]],

 [[-0.0039, -0.0052, -0.0126],
  [-0.0359, -0.0170, -0.0075],
  [-0.0028, -0.0124, -0.0313]],

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  [ 0.0223, -0.0090,  0.0195],
  [-0.0019,  0.0214,  0.0153]]],


...,


[[[-0.0128, -0.0082, -0.0381],
  [-0.0372, -0.0076, -0.0376],
  [-0.0062, -0.0236, -0.0123]],

 [[-0.0194, -0.0242, -0.0032],
  [-0.0158, -0.0183, -0.0374],
  [-0.0057, -0.0131,  0.0080]],

 [[-0.0135,  0.0099, -0.0157],
  [-0.0173, -0.0052, -0.0138],
  [ 0.0002, -0.0313, -0.0176]],

 ...,

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  [ 0.0212,  0.0326,  0.0154],
  [ 0.0183,  0.0039,  0.0023]],

 [[ 0.0011, -0.0079, -0.0181],
  [-0.0248,  0.0062,  0.0001],
  [-0.0129, -0.0107,  0.0041]],

 [[ 0.0170,  0.0189,  0.0094],
  [ 0.0089,  0.0232,  0.0090],
  [-0.0034, -0.0084,  0.0129]]],


[[[ 0.0115, -0.0006,  0.0012],
  [ 0.0265,  0.0191,  0.0043],
  [ 0.0130,  0.0054,  0.0293]],

 [[ 0.0110, -0.0044, -0.0103],
  [-0.0148, -0.0093,  0.0105],
  [-0.0110, -0.0151,  0.0195]],

 [[ 0.0184,  0.0146,  0.0103],
  [ 0.0062,  0.0178, -0.0070],
  [ 0.0169, -0.0107, -0.0043]],

 ...,

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  [-0.0097,  0.0119,  0.0121],
  [ 0.0003,  0.0056, -0.0099]],

 [[ 0.0387,  0.0051,  0.0300],
  [ 0.0154,  0.0040,  0.0176],
  [ 0.0008,  0.0031, -0.0111]],

 [[ 0.0313,  0.0109,  0.0220],
  [ 0.0218,  0.0058,  0.0234],
  [ 0.0001,  0.0416,  0.0178]]],


[[[ 0.0101, -0.0001, -0.0150],
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```
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           [-0.0128,  0.0126, -0.0204],
           [ 0.0005,  0.0193, -0.0001]],

          [[ 0.0047, -0.0101,  0.0116],
           [-0.0153, -0.0071,  0.0164],
           [-0.0018, -0.0066, -0.0108]],

          [[-0.0234, -0.0241, -0.0007],
           [-0.0190, -0.0119,  0.0013],
           [ 0.0078, -0.0122, -0.0186]],

          ...,

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           [-0.0125,  0.0106, -0.0143]],

          [[-0.0118, -0.0157,  0.0010],
           [ 0.0266, -0.0072,  0.0200],
           [ 0.0254,  0.0188,  0.0349]],

          [[ 0.0070,  0.0021, -0.0023],
           [ 0.0094,  0.0079,  0.0278],
           [ 0.0335,  0.0038, -0.0033]]]], device='cuda:0')), ('conv9.bias', tensor([-0.0125,  0.015
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        -0.0107,  0.0170, -0.0070, -0.0021, -0.0139, -0.0018,  0.0198, -0.0163,
         0.0137, -0.0125, -0.0132, -0.0150,  0.0132, -0.0026, -0.0081,  0.0065,
         0.0155, -0.0184, -0.0047,  0.0173, -0.0088,  0.0191, -0.0096, -0.0052,
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         0.0019, -0.0035, -0.0184, -0.0061,  0.0102, -0.0160,  0.0000, -0.0088,
        -0.0175,  0.0165, -0.0076,  0.0055,  0.0045,  0.0104,  0.0109,  0.0020,
         0.0102,  0.0035,  0.0049,  0.0182,  0.0013, -0.0173,  0.0022,  0.0205,
        -0.0056,  0.0037,  0.0143, -0.0101,  0.0127, -0.0081, -0.0120,  0.0140,
         0.0151,  0.0063,  0.0174,  0.0103,  0.0046,  0.0173,  0.0082, -0.0065,
        -0.0056,  0.0088,  0.0113,  0.0073,  0.0048,  0.0094, -0.0063,  0.0009,
         0.0083,  0.0189, -0.0010,  0.0023,  0.0173,  0.0168,  0.0180,  0.0015,
        -0.0115,  0.0150, -0.0013,  0.0042, -0.0074,  0.0079,  0.0165, -0.0038,
        -0.0061, -0.0041,  0.0175,  0.0094,  0.0126, -0.0122,  0.0163,  0.0071,
        -0.0007, -0.0017, -0.0168,  0.0072, -0.0207, -0.0137, -0.0060, -0.0135,
         0.0160,  0.0045,  0.0050, -0.0050, -0.0142,  0.0007, -0.0181,  0.0201],
       device='cuda:0')), ('conv9_bn.weight', tensor([0.9555, 0.8036, 0.6342, 1.0029, 0.0349, 0.196
7, 0.2373, 0.7224, 0.9667,
        0.4167, 0.6038, 0.2548, 0.1591, 0.3788, 0.8739, 0.3875, 0.6714, 0.5794,
        0.1169, 0.1191, 0.9435, 0.2906, 0.1307, 0.1851, 0.5292, 0.3881, 0.1194,
        0.2878, 0.0641, 0.7973, 0.7154, 0.8538, 0.4938, 0.3061, 0.5594, 0.8879,
        0.5988, 0.6477, 0.8888, 0.8864, 0.1811, 0.2092, 0.2502, 0.8261, 0.6549,
        0.3445, 0.6368, 0.3962, 0.2461, 0.7130, 0.3038, 0.5263, 0.9602, 0.1788,
        0.8796, 0.2116, 0.6428, 0.6522, 0.4647, 0.6414, 0.3103, 0.6630, 0.3744,
        0.7710, 0.6298, 0.1504, 0.2689, 0.6347, 0.5884, 0.5801, 0.1769, 0.2783,
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        0.2372, 0.9321, 0.2039, 0.0864, 0.8710, 0.9018, 0.6732, 0.1412, 0.9734,
        0.6231, 1.0060, 0.9666, 0.1108, 0.0419, 0.2593, 0.0002, 0.2119, 0.4209,
        0.0986, 0.6918, 0.0310, 0.8055, 0.5234, 0.4369, 0.2455, 0.1856, 0.1326,
        0.4730, 0.3047, 0.3640, 0.8552, 0.6728, 0.7603, 0.9446, 0.4601, 0.7376,
        0.8073, 0.1829, 0.5514, 0.5910, 0.3350, 0.4541, 0.6063, 0.1666, 0.1322,
        0.6027, 0.5793], device='cuda:0')), ('conv9_bn.bias', tensor([-0.0330, -0.0217, -0.0147, -
0.0072, -0.0100, -0.0019, -0.0135,  0.0007,
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        -0.0481, -0.0299, -0.0190, -0.0230, -0.0411, -0.0044, -0.0004, -0.0336,
        -0.0299,  0.0161, -0.0190,  0.0067, -0.0061, -0.0289, -0.0299, -0.0086,
        -0.0107, -0.0334, -0.0154, -0.0254, -0.0321, -0.0197, -0.0289, -0.0539,
        -0.0030, -0.0230, -0.0201, -0.0348, -0.0341, -0.0245, -0.0547, -0.0327,
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        -0.0633, -0.0150, -0.0353, -0.0380, -0.0539, -0.0108, -0.0063, -0.0261,
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       device='cuda:0')), ('conv9_bn.running_mean', tensor([-1.4488, -0.9198, -0.3364, -1.4885, -0
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        -1.1771, -0.7269, -0.7231, -0.4227, -1.1017,  0.7726,  0.1648, -0.3491,
```

```
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         0.2266, -1.3088, -0.6967, -0.4713,  0.5824, -0.6058, -0.7043, -1.1956,
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        -0.2009,  0.0820, -0.4741, -0.3431, -1.3215,  0.5855, -0.7092, -0.7302,
        -1.1733, -1.0559, -1.0396, -1.1679, -0.8339,  0.2914, -0.9168, -1.7544,
        -1.1213, -0.4270, -0.9166, -0.8978, -1.2313, -1.4646, -0.1293, -0.8109,
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       device='cuda:0')), ('conv9_bn.running_var', tensor([0.4056, 0.4762, 0.4347, 0.6082, 0.4911,
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        0.3622, 0.3702, 0.5099, 0.4445, 0.4370, 0.3143, 0.4017, 0.4839, 0.3744,
        0.5743, 0.5213, 0.3362, 0.3607, 0.7559, 0.5496, 0.3487, 0.4628, 0.4460,
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        0.8052, 0.3305], device='cuda:0')), ('conv9_bn.num_batches_tracked', tensor(8160, device='c
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2.4129e-02],
          [ 2.5889e-02,  1.4497e-02,  2.1209e-02,  1.7558e-02,  3.1274e-02],
          [-8.7551e-03,  1.5731e-02,  7.1584e-03,  3.3049e-02,  2.2491e-02],
          [ 7.9594e-03,  3.4122e-02,  1.2075e-02,  2.8851e-02,  3.7112e-02],
          [ 2.3186e-02,  1.8593e-02,  3.0815e-02,  3.0024e-02,  4.6403e-02]],

         [[ 1.0036e-04, -9.7199e-03, -2.1399e-03,  7.0495e-04,  2.2064e-03],
          [ 2.2012e-02, -7.7031e-04, -4.8839e-03,  5.4042e-03, -9.6653e-03],
          [-9.6374e-04,  2.4844e-02, -5.9766e-03,  1.1392e-02,  8.8397e-03],
          [ 2.9631e-02,  2.7097e-03,  4.4058e-03, -1.3415e-03, -3.9816e-03],
          [-3.2529e-03,  1.3657e-02,  1.2269e-03,  5.9423e-03,  1.9842e-02]],

         [[ 2.7150e-02,  8.3621e-03,  1.2276e-02, -1.0126e-02, -6.3498e-03],
          [ 6.0066e-03,  5.8464e-03,  5.0765e-03,  7.7181e-03,  1.4957e-02],
          [ 2.2404e-03, -2.6807e-03, -3.2920e-03,  1.6401e-02,  1.4059e-02],
          [ 1.2069e-02,  1.6975e-02, -1.6175e-02,  6.4811e-03,  7.7313e-03],
          [ 1.9768e-02,  8.1700e-03,  9.6380e-03,  1.7907e-02, -1.3491e-02]],

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         [[-7.4683e-03, -1.5679e-02, -4.1912e-03,  4.2822e-03,  4.8738e-03],
          [ 7.0736e-03,  1.5370e-02, -1.4390e-02,  2.5831e-03, -8.3306e-03],
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          [ 7.4019e-03,  1.4122e-02,  1.7132e-03,  1.1815e-02,  1.4722e-02],
          [ 1.8804e-03, -1.1930e-02,  3.4842e-03, -1.1307e-03, -1.4298e-02]],

         [[ 1.6620e-02, -6.2950e-04, -1.3199e-02,  1.5334e-02,  6.7752e-03],
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          [ 1.5918e-02,  3.7658e-03, -7.1476e-03,  9.6585e-04, -9.9840e-04],
          [ 3.3181e-04, -5.8062e-03,  1.0069e-02, -3.7352e-03,  9.9981e-03]],

         [[ 5.1911e-02,  1.5034e-02,  4.4266e-02,  3.4878e-02,  4.3233e-02],
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          [ 1.6502e-02,  1.1631e-02,  3.7704e-03,  3.0818e-02,  2.1846e-02],
          [ 3.6874e-02,  5.2203e-02,  4.4949e-02,  3.7796e-02,  3.7080e-02],
          [ 5.2271e-02,  4.1201e-02,  5.8012e-02,  3.1806e-02,  7.0491e-02]]],


        [[[ 9.0660e-04, -5.5239e-03, -5.3901e-03,  1.2152e-02, -1.2698e-03],
          [ 6.8816e-03,  8.4212e-03, -7.6905e-03, -7.3564e-03, -5.3874e-03],
          [ 2.0416e-02,  2.1263e-03,  1.0248e-03, -7.3100e-03,  2.0624e-02],
          [ 1.3736e-05, -1.4891e-02, -6.5024e-03, -4.1613e-03,  5.4207e-03],
          [ 1.4280e-03,  1.6876e-03,  5.2963e-03,  1.5912e-02,  7.3181e-03]],

         [[-1.1306e-02,  6.8395e-03,  8.1663e-03,  7.4754e-03, -1.3935e-02],
          [ 7.9261e-03, -1.2083e-02, -6.9919e-03, -4.1007e-03, -1.5086e-02],
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        -0.0095, -0.0156,  0.0105, -0.0029,  0.0115, -0.0045, -0.0119,  0.0173,
        -0.0114,  0.0100, -0.0131, -0.0116,  0.0046, -0.0133, -0.0125,  0.0113,
         0.0112, -0.0025, -0.0088,  0.0129,  0.0059, -0.0136, -0.0140, -0.0114,
        -0.0008,  0.0045,  0.0056,  0.0092, -0.0153, -0.0091,  0.0152, -0.0106,
        -0.0063,  0.0091,  0.0166, -0.0149, -0.0019,  0.0010, -0.0016, -0.0043],
       device='cuda:0')), ('conv10_bn.weight', tensor([0.9574, 0.8719, 0.3094, 0.7103, 0.8708, 0.59
07, 0.6962, 0.7781, 0.1493,
        0.4711, 0.8632, 0.6209, 0.1200, 0.8243, 0.9585, 0.3394, 0.6713, 0.6208,
        0.0222, 0.3748, 0.4149, 0.6597, 0.3182, 0.4524, 0.2472, 0.2529, 0.8372,
        0.7255, 0.9873, 0.8260, 0.3953, 0.1170, 0.3200, 0.5600, 0.9800, 0.7089,
        0.5446, 0.6121, 0.7686, 0.9634, 0.8814, 0.1783, 0.4021, 0.3195, 0.3848,
        0.2476, 0.8067, 0.5497, 0.2707, 0.8030, 0.9018, 0.1819, 0.7895, 0.6092,
        0.3522, 0.3897, 0.3359, 0.4925, 0.1721, 0.4661, 0.9531, 0.4119, 0.7910,
        0.4223, 0.9804, 0.2906, 0.5077, 0.6424, 0.1324, 0.1814, 0.2428, 0.3561,
        0.0506, 0.4073, 0.4773, 0.6870, 0.4744, 0.2148, 0.0539, 0.4735, 0.8406,
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```
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        0.8605, 0.1558, 0.5016, 0.6649, 0.5341, 0.0747, 0.8564, 1.0188, 0.2629,
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        0.8064, 0.7039, 0.5978, 0.6716, 0.5332, 0.4770, 0.1516, 0.4874, 0.7137,
        0.5287, 0.3056, 0.2949, 0.0528, 0.9863, 0.9929, 0.7107, 0.1523, 0.0512,
        0.2712, 1.0012, 0.1256, 0.8235, 0.3838, 0.9719, 0.0439, 0.8478, 0.5519,
        0.0794, 0.1829, 0.6937, 0.7900, 0.3939, 0.8686, 0.8622, 0.9774, 0.4437,
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        0.4004, 0.7593, 0.4795, 0.7619, 0.8269, 0.9809, 0.3164, 0.1144, 0.5569,
        0.0634, 0.5086, 0.6928, 1.0104, 0.7181, 0.4280, 0.0710, 0.5843, 0.6272,
        0.5930, 1.0062, 0.8267, 0.8267], device='cuda:0')), ('conv10_bn.bias', tensor([ 0.0036,  0.
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         0.0035, -0.0073,  0.0105, -0.0013,  0.0077,  0.0067,  0.0022,  0.0013,
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        -0.0062,  0.0033,  0.0089,  0.0028,  0.0051, -0.0041,  0.0057, -0.0066,
        -0.0011,  0.0067,  0.0077, -0.0029, -0.0024, -0.0056,  0.0032,  0.0109,
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         0.0120,  0.0061,  0.0053,  0.0056,  0.0009,  0.0010,  0.0075,  0.0045,
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         0.0073,  0.0074,  0.0082,  0.0049,  0.0095,  0.0057,  0.0042, -0.0005,
         0.0099, -0.0065,  0.0077, -0.0012,  0.0085, -0.0038, -0.0058,  0.0060,
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       device='cuda:0')), ('conv10_bn.running_mean', tensor([ 3.4322, -0.8694,  2.5208,  1.2851, -1
.8463,  2.2079,  1.3602, -2.4892,
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        -0.8820, -2.3434, -2.8002,  1.0875,  0.1949,  2.3251,  0.4589,  1.0728,
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       device='cuda:0')), ('conv10_bn.running_var', tensor([1.5743, 0.9858, 1.1790, 0.9226, 1.0977,
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r(8160, device='cuda:0')), ('fc1.weight', tensor([[-0.0014, -0.0012, -0.0032,  ..., -0.0059,
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        [-0.0060,  0.0037, -0.0055,  ..., -0.0058, -0.0038, -0.0064],
        [-0.0046,  0.0016,  0.0005,  ..., -0.0029, -0.0044, -0.0043],
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        [ 0.0037, -0.0030, -0.0002,  ..., -0.0044,  0.0032, -0.0020],
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       device='cuda:0')), ('fc1.bias', tensor([ 0.0039, -0.0014, -0.0017, -0.0018,  0.0095, -
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       device='cuda:0')), ('fc2.bias', tensor([-0.0277,  0.0015, -0.0240,  0.0406, -0.0146, -0.0343
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       device='cuda:0')), ('fc3.weight', tensor([[ 0.0589, -0.0480, -0.0001,  ...,  0.0276, -0.0456
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```

```
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       device='cuda:0')), ('fc3.bias', tensor([-0.0323,  0.0570, -0.0589, -0.0096,  0.0286,  0.0466
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         0.0316,  0.0955, -0.0079,  0.0254], device='cuda:0')), ('fc5.weight', tensor([[ 0.0142, -0
.1379, -0.4771,  ...,  0.0908, -0.1196,  0.0444],
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        [-0.0648, -0.1147, -0.1023,  ..., -0.0781, -0.1307, -0.0795],
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        [ 0.0402,  0.0536, -0.0618,  ...,  0.0473,  0.0031,  0.0872],
        [-0.0700, -0.0236, -0.0545,  ...,  0.0560,  0.0286, -0.1046],
        [ 0.0123,  0.0761, -0.0776,  ..., -0.1179, -0.0396,  0.0058]],
       device='cuda:0')), ('fc5.bias', tensor([-0.0446,  0.0917,  0.0640, -0.1023,  0.0632,  0.0883
, -0.0751,  0.0145,
         0.0404, -0.0932, -0.0266,  0.0905,  0.0017,  0.0793,  0.0597,  0.0854,
        -0.0934,  0.0540,  0.0681,  0.0248, -0.0811], device='cuda:0'))])
```

Evaluate on test set

In [0]:

```
ds_test = VocDataset('VOCdevkit_2007/VOC2007test/','test', test_transform)

test_loader = torch.utils.data.DataLoader(dataset=ds_test,
                                          batch_size=50,
                                          shuffle=False,
                                          num_workers=1)

mAP_test, test_loss, test_aps = test_classifier(test_loader, classifier, criterion)
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-------  Class: aeroplane        AP:   0.6648  -------
-------  Class: bicycle          AP:   0.5027  -------
-------  Class: bird             AP:   0.3829  -------
-------  Class: boat             AP:   0.4632  -------
-------  Class: bottle           AP:   0.1938  -------
-------  Class: bus              AP:   0.3465  -------
-------  Class: car              AP:   0.6809  -------
-------  Class: cat              AP:   0.4489  -------
-------  Class: chair            AP:   0.4754  -------
-------  Class: cow              AP:   0.2402  -------
-------  Class: diningtable      AP:   0.3058  -------
-------  Class: dog              AP:   0.3658  -------
-------  Class: horse            AP:   0.6997  -------
-------  Class: motorbike        AP:   0.5377  -------
```

```
-------  Class: person           AP:   0.8331  -------
-------  Class: pottedplant      AP:   0.2448  -------
-------  Class: sheep            AP:   0.3362  -------
-------  Class: sofa             AP:   0.3518  -------
-------  Class: train            AP:   0.6272  -------
-------  Class: tvmonitor        AP:   0.3815  -------
mAP: 0.4542
Avg loss: 0.17731280624866486
```

In [0]:

```
output_submission_csv('my_solution.csv', test_aps)
```