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Artificial Neural Network

Assignment 3

Train Intel-Image
Using ResNet Model

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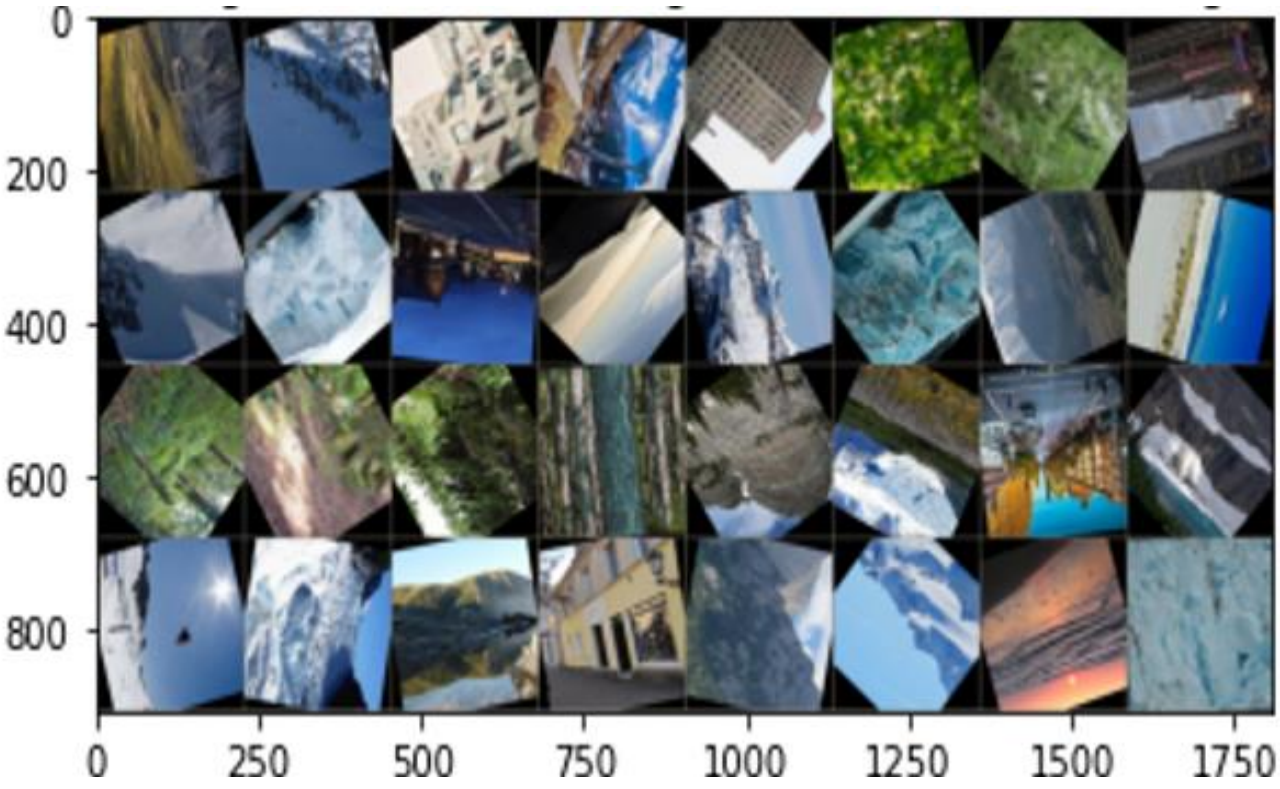
Headline :

- Dataset
- ResNet Model
- WRNS
- Inception-ResNet
- Best Model
- Confusion matrix

Dataset : (Intel-Image)

This Data contains around 25k images of size 150x150 distributed under 6 categories.

{'buildings' -> 0, 'forest' -> 1, 'glacier' -> 2, 'mountain' -> 3, 'sea' -> 4, 'street' -> 5 }



At first, we use the simplest ResNet family to train the intel image dataset

Before that, we import the required libraries.

```
[ ]
    import torch
    import torch.nn as nn
    import torch.optim as optim
    from torch.optim import lr_scheduler
    import torch.backends.cudnn as cudnn
    import torchvision
    from torchvision import datasets, models, transforms
    import matplotlib.pyplot as plt
    import numpy as np
    import os, sys
    import time
    import copy
    from glob import glob
    import imageio
```

Next, we load the required data using kaggle api and store it in the variables. To improve the training of our own model, we use data augmentation to change the trian data into different forms, and finally, in our transform data, after changing the inputs, we normalize them and load the data.

```
[ ] # Note: normalize mean and std are standardized for ImageNet

    data_transforms = {
        train: transforms.Compose([
            transforms.RandomResizedCrop(224),
            transforms.RandomHorizontalFlip(0.5),
            transforms.ToTensor(),
            transforms.Normalize([0.485, 0.456, 0.406], [0.229, 0.224, 0.225])
        ]),
        test: transforms.Compose([
            transforms.Resize(256),
            transforms.CenterCrop(224),
            transforms.ToTensor(),
            transforms.Normalize([0.485, 0.456, 0.406], [0.229, 0.224, 0.225])
        ]),
    }
```

Load data

```
[ ]
    image_datasets = {x: datasets.ImageFolder(os.path.join(x), data_transforms[x]) for x in [train, test]}

    dataloader = {x: torch.utils.data.DataLoader(image_datasets[x], batch_size=32, shuffle=True, num_workers=4) for x in [train, test]}
```

We download the ResNet152 model and make one from it. Next, we will freeze the trainable parameters of the CNN part so that we can fit our linear part, which includes random weights.

And then we transfer our model to gpu.

```
for param in resnet.parameters():
    param.requires_grad = False
```

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

We change the fully connected model section and create our desired architecture. It includes three layers with Relu activation function and dropout method.

```
[ ] resnet.fc = nn.Sequential(nn.Linear(2048, 1024),
                              nn.ReLU(),
                              nn.Dropout(0.25),
                              nn.Linear(1024, 256),
                              nn.ReLU(),
                              nn.Dropout(0.25),
                              nn.Linear(256, 6),
                              nn.LogSoftmax(dim=1))

    resnet = resnet.to(device)
```

To train the model and apply forward/backward propagation, we need to set our loss function and optimizer.

```
[ ] criterion = nn.CrossEntropyLoss()
    optimizer = optim.Adam(resnet.parameters(), lr=1e-4)
```

And then we need to implement the train_model method so that the resnet model starts training. At each epoch,

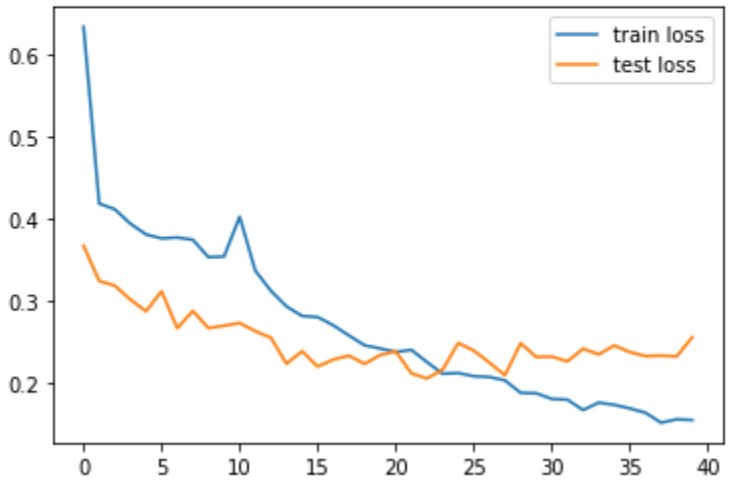
train loss, test loss and required time are displayed. In this function, it is necessary to unfreeze the parameters of the pre-trained model after a number of epochs.

```
train_losses, test_losses = train_model(
                            resnet,
                            criterion,
                            optimizer,
                            dataloader[train],
                            dataloader[test],
                            epochs=40)
```

```
Epoch 1/40, Train_Loss: 0.6348, \Test_Loss: 0.3671, Duration: 0:02:18.012346
Epoch 2/40, Train_Loss: 0.4187, \Test_Loss: 0.3239, Duration: 0:02:12.348367
Epoch 3/40, Train_Loss: 0.4116, \Test_Loss: 0.3183, Duration: 0:02:12.303492
Epoch 4/40, Train_Loss: 0.3940, \Test_Loss: 0.3011, Duration: 0:02:11.797530
Epoch 5/40, Train_Loss: 0.3809, \Test_Loss: 0.2869, Duration: 0:02:12.182279
Epoch 6/40, Train_Loss: 0.3760, \Test_Loss: 0.3113, Duration: 0:02:12.008638
Epoch 7/40, Train_Loss: 0.3771, \Test_Loss: 0.2661, Duration: 0:02:12.230927
Epoch 8/40, Train_Loss: 0.3743, \Test_Loss: 0.2872, Duration: 0:02:12.286634
Epoch 9/40, Train_Loss: 0.3530, \Test_Loss: 0.2662, Duration: 0:02:13.266736
Epoch 10/40, Train_Loss: 0.3539, \Test_Loss: 0.2692, Duration: 0:02:12.489712
Epoch 11/40, Train_Loss: 0.4025, \Test_Loss: 0.2725, Duration: 0:06:02.206394
Epoch 12/40, Train_Loss: 0.3366, \Test_Loss: 0.2625, Duration: 0:06:00.994119
Epoch 13/40, Train_Loss: 0.3119, \Test_Loss: 0.2546, Duration: 0:06:00.693115
Epoch 14/40, Train_Loss: 0.2928, \Test_Loss: 0.2227, Duration: 0:06:01.171837
Epoch 15/40, Train_Loss: 0.2811, \Test_Loss: 0.2380, Duration: 0:06:00.407107
Epoch 16/40, Train_Loss: 0.2797, \Test_Loss: 0.2192, Duration: 0:06:00.845971
Epoch 17/40, Train_Loss: 0.2697, \Test_Loss: 0.2277, Duration: 0:06:00.459688
Epoch 18/40, Train_Loss: 0.2573, \Test_Loss: 0.2326, Duration: 0:06:00.712149
Epoch 19/40, Train_Loss: 0.2453, \Test_Loss: 0.2225, Duration: 0:06:00.095190
Epoch 20/40, Train_Loss: 0.2413, \Test_Loss: 0.2334, Duration: 0:06:00.221754
Epoch 21/40, Train_Loss: 0.2371, \Test_Loss: 0.2379, Duration: 0:05:59.689844
Epoch 22/40, Train_Loss: 0.2397, \Test_Loss: 0.2109, Duration: 0:05:59.977015
Epoch 23/40, Train_Loss: 0.2248, \Test_Loss: 0.2046, Duration: 0:05:59.677062
Epoch 24/40, Train_Loss: 0.2104, \Test_Loss: 0.2154, Duration: 0:05:59.551734
Epoch 25/40, Train_Loss: 0.2113, \Test_Loss: 0.2479, Duration: 0:05:59.383888
Epoch 26/40, Train_Loss: 0.2074, \Test_Loss: 0.2388, Duration: 0:05:59.620912
Epoch 27/40, Train_Loss: 0.2065, \Test_Loss: 0.2240, Duration: 0:05:59.554906
Epoch 28/40, Train_Loss: 0.2023, \Test_Loss: 0.2087, Duration: 0:05:57.515687
Epoch 29/40, Train_Loss: 0.1871, \Test_Loss: 0.2478, Duration: 0:05:55.495677
Epoch 30/40, Train_Loss: 0.1866, \Test_Loss: 0.2309, Duration: 0:05:55.362354
Epoch 31/40, Train_Loss: 0.1797, \Test_Loss: 0.2314, Duration: 0:05:55.285163
Epoch 32/40, Train_Loss: 0.1787, \Test_Loss: 0.2256, Duration: 0:05:54.940069
Epoch 33/40, Train_Loss: 0.1660, \Test_Loss: 0.2410, Duration: 0:05:56.998170
Epoch 34/40, Train_Loss: 0.1751, \Test_Loss: 0.2341, Duration: 0:05:55.879126
Epoch 35/40, Train_Loss: 0.1724, \Test_Loss: 0.2451, Duration: 0:05:55.100177
Epoch 36/40, Train_Loss: 0.1680, \Test_Loss: 0.2369, Duration: 0:05:54.989463
Epoch 37/40, Train_Loss: 0.1628, \Test_Loss: 0.2321, Duration: 0:05:55.205754
Epoch 38/40, Train_Loss: 0.1506, \Test_Loss: 0.2326, Duration: 0:05:54.941748
Epoch 39/40, Train_Loss: 0.1547, \Test_Loss: 0.2317, Duration: 0:05:54.979370
```

We will plot the changes of losses for a better view.

```
[ ]  plt.plot(train_losses, label='train loss')
     plt.plot(test_losses, label='test loss')
     plt.legend()
     plt.show()
```



Now it's time to predict the model on the test data so that we can see the accuracy.

```
[ ]  train_losses=[]
     test_losses=[]
     def accuracy(loader, model):
         num_corrects = 0
         num_samples = 0
         model.eval()
         loop = tqdm(loader)
         with torch.no_grad():
             for x, y in loop:
                 x = x.to(device)
                 y = y.to(device)
                 scores = model(x)
                 test_losses.append(scores.data)
                 _, prediction = scores.max(1)
                 num_corrects += (prediction == y).sum()
                 num_samples += prediction.size(0)
                 acc = (num_corrects/num_samples) * 100
                 loop.set_postfix(acc=acc.item())
             print(f'Got {num_corrects}/{num_samples} with accuracy {acc:.4f}')
```

```
[ ]  accuracy(dataloader[test], resnet)
```

```
100% ████████████████████ 94/94 [00:21<00:00, 4.93it/s, acc=93.1]
Got 2793/3000 with accuracy 93.1000
```

WRNS :

```
[ ]  wrn = models.wide_resnet101_2(pretrained=True)
```

```
/usr/local/lib/python3.8/dist-packages/torchvision/models/_utils.py:223: U
  warnings.warn(msg)
Downloading: "https://download.pytorch.org/models/wide_resnet101_2-32ee11
100% 243M/243M [00:01<00:00, 276MB/s]
```

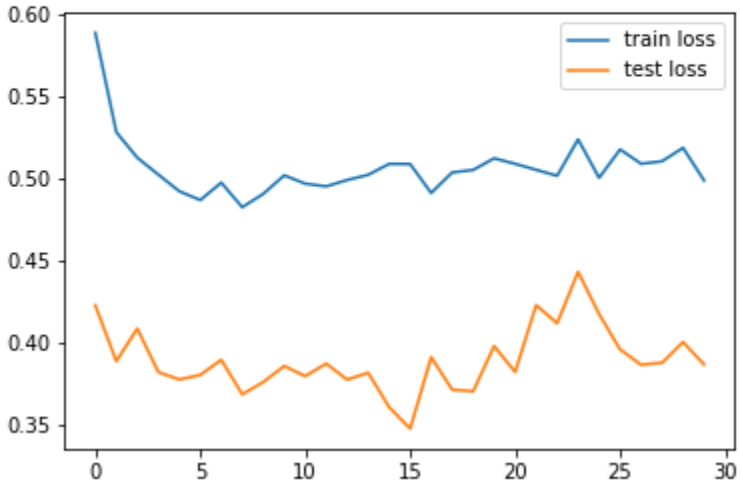
```
[ ]  for param in wrn.parameters():
         param.requires_grad = False
```

```
[ ]  wrn.fc = nn.Sequential(nn.Linear(2048, 1024),
                            nn.ReLU(),
                            nn.Dropout(0.5),
                            nn.Linear(1024, 6),
                            nn.LogSoftmax(dim=1))

     wrn = wrn.to(device)
```

In the picture, we can see that the changes in loss are not stable.

```
[ ]  plt.plot(train_losses, label='train loss')
     plt.plot(test_losses, label='test loss')
     plt.legend()
     plt.show()
```



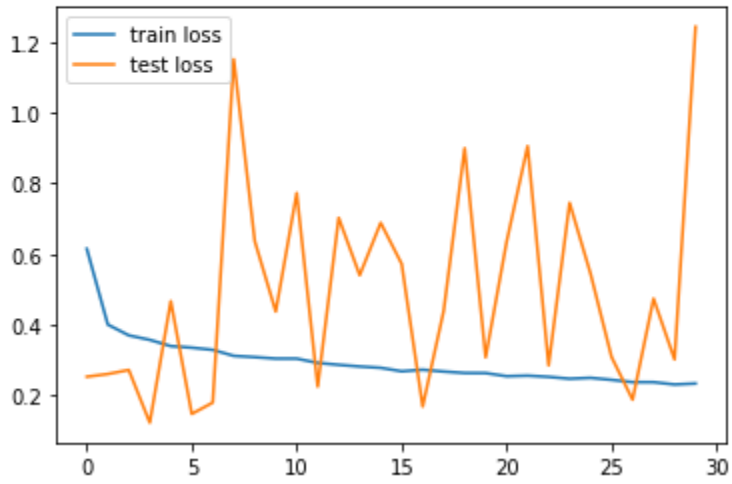
```
[ ]  accuracy(dataloader[test], wrn)
```

```
100%  94/94 [00:29<00:00, 3.54it/s, acc=89.5]
/usr/local/lib/python3.8/dist-packages/torch/utils/data/dataloader.py:554:
  warnings.warn(_create_warning_msg(
Got 2685/3000 with accuracy 89.5000
```

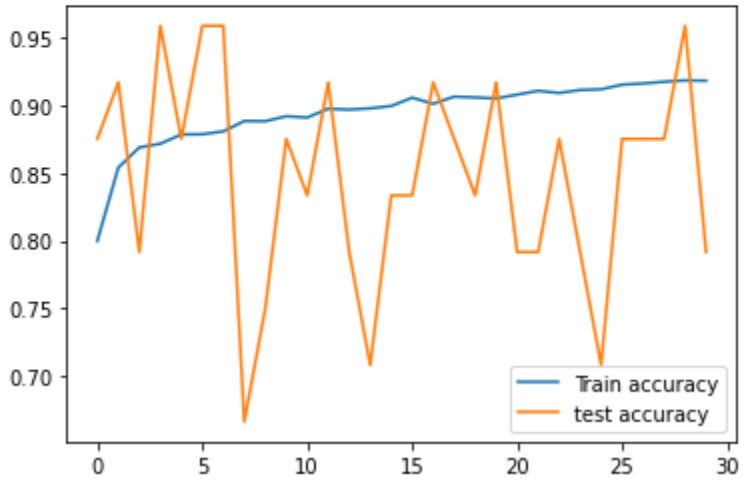
In this model, the number of parameters is almost twice as much as the previous model, and the calculation cost was much higher in training and resources. But still, it can't perform as powerfully as the previous model.

Inception_v3 :

```
[ ]  plt.plot(train_losses, label='train loss')
     plt.plot(val_losses, label='test loss')
     plt.legend()
     plt.show()
```




```
[ ]  plt.plot(train_accuracies, label='Train accuracy')
     plt.plot(val_accuracies, label='test accuracy')
     plt.legend()
     plt.show()
```



The inception model is improving on train data, while it is very unstable on train data. And as a result, in each epoch, it will have a different prediction compared to its next times. Of course, the model is much lighter and simpler than the previous two models, so it will be less efficient.

```
[ ]  accuracy(dataloader[test], model)
```


```
Got 2609/3000 with accuracy 86.9667
```

For the effect of the number of layers and parameters, we show a summary for each model

ResNet152 :

```
----------------------------------------------------------------
        Layer (type)               Output Shape         Param #
================================================================
            Conv2d-1         [-1, 64, 150, 150]           9,408
       BatchNorm2d-2         [-1, 64, 150, 150]             128
              ReLU-3         [-1, 64, 150, 150]               0
         MaxPool2d-4           [-1, 64, 75, 75]               0
            Conv2d-5           [-1, 64, 75, 75]           4,096
       BatchNorm2d-6           [-1, 64, 75, 75]             128
              ReLU-7           [-1, 64, 75, 75]               0
            Conv2d-8           [-1, 64, 75, 75]          36,864
       BatchNorm2d-9           [-1, 64, 75, 75]             128
             ReLU-10           [-1, 64, 75, 75]               0
           Conv2d-11          [-1, 256, 75, 75]          16,384
      BatchNorm2d-12          [-1, 256, 75, 75]             512
           Conv2d-13          [-1, 256, 75, 75]          16,384
      BatchNorm2d-14          [-1, 256, 75, 75]             512
             ReLU-15          [-1, 256, 75, 75]               0
       Bottleneck-16          [-1, 256, 75, 75]               0
           Conv2d-17           [-1, 64, 75, 75]          16,384
      BatchNorm2d-18           [-1, 64, 75, 75]             128
             ReLU-19           [-1, 64, 75, 75]               0
           Conv2d-20           [-1, 64, 75, 75]          36,864
      BatchNorm2d-21           [-1, 64, 75, 75]             128
             ReLU-22           [-1, 64, 75, 75]               0
           Conv2d-23          [-1, 256, 75, 75]          16,384
      BatchNorm2d-24          [-1, 256, 75, 75]             512
             ReLU-25          [-1, 256, 75, 75]               0
       Bottleneck-26          [-1, 256, 75, 75]               0
           Conv2d-27           [-1, 64, 75, 75]          16,384
      BatchNorm2d-28           [-1, 64, 75, 75]             128
             ReLU-29           [-1, 64, 75, 75]               0
           Conv2d-30           [-1, 64, 75, 75]          36,864
      BatchNorm2d-31           [-1, 64, 75, 75]             128
             ReLU-32           [-1, 64, 75, 75]               0
           Conv2d-33          [-1, 256, 75, 75]          16,384
      BatchNorm2d-34          [-1, 256, 75, 75]             512
             ReLU-35          [-1, 256, 75, 75]               0
       Bottleneck-36          [-1, 256, 75, 75]               0
           Conv2d-37          [-1, 128, 75, 75]          32,768
      BatchNorm2d-38          [-1, 128, 75, 75]             256
             ReLU-39          [-1, 128, 75, 75]               0
           Conv2d-40          [-1, 128, 38, 38]         147,456
      BatchNorm2d-41          [-1, 128, 38, 38]             256
```

ReLU-42	[-1, 128, 38, 38]	0
Conv2d-43	[-1, 512, 38, 38]	65,536
BatchNorm2d-44	[-1, 512, 38, 38]	1,024
Conv2d-45	[-1, 512, 38, 38]	131,072
BatchNorm2d-46	[-1, 512, 38, 38]	1,024
ReLU-47	[-1, 512, 38, 38]	0
Bottleneck-48	[-1, 512, 38, 38]	0
Conv2d-49	[-1, 128, 38, 38]	65,536
BatchNorm2d-50	[-1, 128, 38, 38]	256
ReLU-51	[-1, 128, 38, 38]	0
Conv2d-52	[-1, 128, 38, 38]	147,456
BatchNorm2d-53	[-1, 128, 38, 38]	256
ReLU-54	[-1, 128, 38, 38]	0
Conv2d-55	[-1, 512, 38, 38]	65,536
BatchNorm2d-56	[-1, 512, 38, 38]	1,024
ReLU-57	[-1, 512, 38, 38]	0
Bottleneck-58	[-1, 512, 38, 38]	0
Conv2d-59	[-1, 128, 38, 38]	65,536
BatchNorm2d-60	[-1, 128, 38, 38]	256
ReLU-61	[-1, 128, 38, 38]	0
Conv2d-62	[-1, 128, 38, 38]	147,456
BatchNorm2d-63	[-1, 128, 38, 38]	256
ReLU-64	[-1, 128, 38, 38]	0
Conv2d-65	[-1, 512, 38, 38]	65,536
BatchNorm2d-66	[-1, 512, 38, 38]	1,024
ReLU-67	[-1, 512, 38, 38]	0
Bottleneck-68	[-1, 512, 38, 38]	0
Conv2d-69	[-1, 128, 38, 38]	65,536
BatchNorm2d-70	[-1, 128, 38, 38]	256
ReLU-71	[-1, 128, 38, 38]	0
Conv2d-72	[-1, 128, 38, 38]	147,456
BatchNorm2d-73	[-1, 128, 38, 38]	256
ReLU-74	[-1, 128, 38, 38]	0
Conv2d-75	[-1, 512, 38, 38]	65,536
BatchNorm2d-76	[-1, 512, 38, 38]	1,024
ReLU-77	[-1, 512, 38, 38]	0
Bottleneck-78	[-1, 512, 38, 38]	0
Conv2d-79	[-1, 128, 38, 38]	65,536
BatchNorm2d-80	[-1, 128, 38, 38]	256
ReLU-81	[-1, 128, 38, 38]	0
Conv2d-82	[-1, 128, 38, 38]	147,456
BatchNorm2d-83	[-1, 128, 38, 38]	256
ReLU-84	[-1, 128, 38, 38]	0
Conv2d-85	[-1, 512, 38, 38]	65,536
BatchNorm2d-86	[-1, 512, 38, 38]	1,024
ReLU-87	[-1, 512, 38, 38]	0
Bottleneck-88	[-1, 512, 38, 38]	0
Conv2d-89	[-1, 128, 38, 38]	65,536
BatchNorm2d-90	[-1, 128, 38, 38]	256
ReLU-91	[-1, 128, 38, 38]	0
Conv2d-92	[-1, 128, 38, 38]	147,456
BatchNorm2d-93	[-1, 128, 38, 38]	256
ReLU-94	[-1, 128, 38, 38]	0
Conv2d-95	[-1, 512, 38, 38]	65,536
BatchNorm2d-96	[-1, 512, 38, 38]	1,024
ReLU-97	[-1, 512, 38, 38]	0
Bottleneck-98	[-1, 512, 38, 38]	0
Conv2d-99	[-1, 128, 38, 38]	65,536
BatchNorm2d-100	[-1, 128, 38, 38]	256
ReLU-101	[-1, 128, 38, 38]	0
Conv2d-102	[-1, 128, 38, 38]	147,456
BatchNorm2d-103	[-1, 128, 38, 38]	256
ReLU-104	[-1, 128, 38, 38]	0

Conv2d-105	[-1, 512, 38, 38]	65,536
BatchNorm2d-106	[-1, 512, 38, 38]	1,024
ReLU-107	[-1, 512, 38, 38]	0
Bottleneck-108	[-1, 512, 38, 38]	0
Conv2d-109	[-1, 128, 38, 38]	65,536
BatchNorm2d-110	[-1, 128, 38, 38]	256
ReLU-111	[-1, 128, 38, 38]	0
Conv2d-112	[-1, 128, 38, 38]	147,456
BatchNorm2d-113	[-1, 128, 38, 38]	256
ReLU-114	[-1, 128, 38, 38]	0
Conv2d-115	[-1, 512, 38, 38]	65,536
BatchNorm2d-116	[-1, 512, 38, 38]	1,024
ReLU-117	[-1, 512, 38, 38]	0
Bottleneck-118	[-1, 512, 38, 38]	0
Conv2d-119	[-1, 256, 38, 38]	131,072
BatchNorm2d-120	[-1, 256, 38, 38]	512
ReLU-121	[-1, 256, 38, 38]	0
Conv2d-122	[-1, 256, 19, 19]	589,824
BatchNorm2d-123	[-1, 256, 19, 19]	512
ReLU-124	[-1, 256, 19, 19]	0
Conv2d-125	[-1, 1024, 19, 19]	262,144
BatchNorm2d-126	[-1, 1024, 19, 19]	2,048
Conv2d-127	[-1, 1024, 19, 19]	524,288
BatchNorm2d-128	[-1, 1024, 19, 19]	2,048
ReLU-129	[-1, 1024, 19, 19]	0
Bottleneck-130	[-1, 1024, 19, 19]	0
Conv2d-131	[-1, 256, 19, 19]	262,144
BatchNorm2d-132	[-1, 256, 19, 19]	512
ReLU-133	[-1, 256, 19, 19]	0
Conv2d-134	[-1, 256, 19, 19]	589,824
BatchNorm2d-135	[-1, 256, 19, 19]	512
ReLU-136	[-1, 256, 19, 19]	0
Conv2d-137	[-1, 1024, 19, 19]	262,144
BatchNorm2d-138	[-1, 1024, 19, 19]	2,048
ReLU-139	[-1, 1024, 19, 19]	0
Bottleneck-140	[-1, 1024, 19, 19]	0
Conv2d-141	[-1, 256, 19, 19]	262,144
BatchNorm2d-142	[-1, 256, 19, 19]	512
ReLU-143	[-1, 256, 19, 19]	0
Conv2d-144	[-1, 256, 19, 19]	589,824
BatchNorm2d-145	[-1, 256, 19, 19]	512
ReLU-146	[-1, 256, 19, 19]	0
Conv2d-147	[-1, 1024, 19, 19]	262,144
BatchNorm2d-148	[-1, 1024, 19, 19]	2,048
ReLU-149	[-1, 1024, 19, 19]	0
Bottleneck-150	[-1, 1024, 19, 19]	0
Conv2d-151	[-1, 256, 19, 19]	262,144
BatchNorm2d-152	[-1, 256, 19, 19]	512
ReLU-153	[-1, 256, 19, 19]	0
Conv2d-154	[-1, 256, 19, 19]	589,824
BatchNorm2d-155	[-1, 256, 19, 19]	512
ReLU-156	[-1, 256, 19, 19]	0
Conv2d-157	[-1, 1024, 19, 19]	262,144
BatchNorm2d-158	[-1, 1024, 19, 19]	2,048
ReLU-159	[-1, 1024, 19, 19]	0
Bottleneck-160	[-1, 1024, 19, 19]	0
Conv2d-161	[-1, 256, 19, 19]	262,144
BatchNorm2d-162	[-1, 256, 19, 19]	512
ReLU-163	[-1, 256, 19, 19]	0
Conv2d-164	[-1, 256, 19, 19]	589,824
BatchNorm2d-165	[-1, 256, 19, 19]	512
ReLU-166	[-1, 256, 19, 19]	0
Conv2d-167	[-1, 1024, 19, 19]	262,144

BatchNorm2d-168	[-1, 1024, 19, 19]	2,048
ReLU-169	[-1, 1024, 19, 19]	0
Bottleneck-170	[-1, 1024, 19, 19]	0
Conv2d-171	[-1, 256, 19, 19]	262,144
BatchNorm2d-172	[-1, 256, 19, 19]	512
ReLU-173	[-1, 256, 19, 19]	0
Conv2d-174	[-1, 256, 19, 19]	589,824
BatchNorm2d-175	[-1, 256, 19, 19]	512
ReLU-176	[-1, 256, 19, 19]	0
Conv2d-177	[-1, 1024, 19, 19]	262,144
BatchNorm2d-178	[-1, 1024, 19, 19]	2,048
ReLU-179	[-1, 1024, 19, 19]	0
Bottleneck-180	[-1, 1024, 19, 19]	0
Conv2d-181	[-1, 256, 19, 19]	262,144
BatchNorm2d-182	[-1, 256, 19, 19]	512
ReLU-183	[-1, 256, 19, 19]	0
Conv2d-184	[-1, 256, 19, 19]	589,824
BatchNorm2d-185	[-1, 256, 19, 19]	512
ReLU-186	[-1, 256, 19, 19]	0
Conv2d-187	[-1, 1024, 19, 19]	262,144
BatchNorm2d-188	[-1, 1024, 19, 19]	2,048
ReLU-189	[-1, 1024, 19, 19]	0
Bottleneck-190	[-1, 1024, 19, 19]	0
Conv2d-191	[-1, 256, 19, 19]	262,144
BatchNorm2d-192	[-1, 256, 19, 19]	512
ReLU-193	[-1, 256, 19, 19]	0
Conv2d-194	[-1, 256, 19, 19]	589,824
BatchNorm2d-195	[-1, 256, 19, 19]	512
ReLU-196	[-1, 256, 19, 19]	0
Conv2d-197	[-1, 1024, 19, 19]	262,144
BatchNorm2d-198	[-1, 1024, 19, 19]	2,048
ReLU-199	[-1, 1024, 19, 19]	0
Bottleneck-200	[-1, 1024, 19, 19]	0
Conv2d-201	[-1, 256, 19, 19]	262,144
BatchNorm2d-202	[-1, 256, 19, 19]	512
ReLU-203	[-1, 256, 19, 19]	0
Conv2d-204	[-1, 256, 19, 19]	589,824
BatchNorm2d-205	[-1, 256, 19, 19]	512
ReLU-206	[-1, 256, 19, 19]	0
Conv2d-207	[-1, 1024, 19, 19]	262,144
BatchNorm2d-208	[-1, 1024, 19, 19]	2,048
ReLU-209	[-1, 1024, 19, 19]	0
Bottleneck-210	[-1, 1024, 19, 19]	0
Conv2d-211	[-1, 256, 19, 19]	262,144
BatchNorm2d-212	[-1, 256, 19, 19]	512
ReLU-213	[-1, 256, 19, 19]	0
Conv2d-214	[-1, 256, 19, 19]	589,824
BatchNorm2d-215	[-1, 256, 19, 19]	512
ReLU-216	[-1, 256, 19, 19]	0
Conv2d-217	[-1, 1024, 19, 19]	262,144
BatchNorm2d-218	[-1, 1024, 19, 19]	2,048
ReLU-219	[-1, 1024, 19, 19]	0
Bottleneck-220	[-1, 1024, 19, 19]	0
Conv2d-221	[-1, 256, 19, 19]	262,144
BatchNorm2d-222	[-1, 256, 19, 19]	512
ReLU-223	[-1, 256, 19, 19]	0
Conv2d-224	[-1, 256, 19, 19]	589,824
BatchNorm2d-225	[-1, 256, 19, 19]	512
ReLU-226	[-1, 256, 19, 19]	0
Conv2d-227	[-1, 1024, 19, 19]	262,144
BatchNorm2d-228	[-1, 1024, 19, 19]	2,048
ReLU-229	[-1, 1024, 19, 19]	0
Bottleneck-230	[-1, 1024, 19, 19]	0

Conv2d-231	[-1, 256, 19, 19]	262,144
BatchNorm2d-232	[-1, 256, 19, 19]	512
ReLU-233	[-1, 256, 19, 19]	0
Conv2d-234	[-1, 256, 19, 19]	589,824
BatchNorm2d-235	[-1, 256, 19, 19]	512
ReLU-236	[-1, 256, 19, 19]	0
Conv2d-237	[-1, 1024, 19, 19]	262,144
BatchNorm2d-238	[-1, 1024, 19, 19]	2,048
ReLU-239	[-1, 1024, 19, 19]	0
Bottleneck-240	[-1, 1024, 19, 19]	0
Conv2d-241	[-1, 256, 19, 19]	262,144
BatchNorm2d-242	[-1, 256, 19, 19]	512
ReLU-243	[-1, 256, 19, 19]	0
Conv2d-244	[-1, 256, 19, 19]	589,824
BatchNorm2d-245	[-1, 256, 19, 19]	512
ReLU-246	[-1, 256, 19, 19]	0
Conv2d-247	[-1, 1024, 19, 19]	262,144
BatchNorm2d-248	[-1, 1024, 19, 19]	2,048
ReLU-249	[-1, 1024, 19, 19]	0
Bottleneck-250	[-1, 1024, 19, 19]	0
Conv2d-251	[-1, 256, 19, 19]	262,144
BatchNorm2d-252	[-1, 256, 19, 19]	512
ReLU-253	[-1, 256, 19, 19]	0
Conv2d-254	[-1, 256, 19, 19]	589,824
BatchNorm2d-255	[-1, 256, 19, 19]	512
ReLU-256	[-1, 256, 19, 19]	0
Conv2d-257	[-1, 1024, 19, 19]	262,144
BatchNorm2d-258	[-1, 1024, 19, 19]	2,048
ReLU-259	[-1, 1024, 19, 19]	0
Bottleneck-260	[-1, 1024, 19, 19]	0
Conv2d-261	[-1, 256, 19, 19]	262,144
BatchNorm2d-262	[-1, 256, 19, 19]	512
ReLU-263	[-1, 256, 19, 19]	0
Conv2d-264	[-1, 256, 19, 19]	589,824
BatchNorm2d-265	[-1, 256, 19, 19]	512
ReLU-266	[-1, 256, 19, 19]	0
Conv2d-267	[-1, 1024, 19, 19]	262,144
BatchNorm2d-268	[-1, 1024, 19, 19]	2,048
ReLU-269	[-1, 1024, 19, 19]	0
Bottleneck-270	[-1, 1024, 19, 19]	0
Conv2d-271	[-1, 256, 19, 19]	262,144
BatchNorm2d-272	[-1, 256, 19, 19]	512
ReLU-273	[-1, 256, 19, 19]	0
Conv2d-274	[-1, 256, 19, 19]	589,824
BatchNorm2d-275	[-1, 256, 19, 19]	512
ReLU-276	[-1, 256, 19, 19]	0
Conv2d-277	[-1, 1024, 19, 19]	262,144
BatchNorm2d-278	[-1, 1024, 19, 19]	2,048
ReLU-279	[-1, 1024, 19, 19]	0
Bottleneck-280	[-1, 1024, 19, 19]	0
Conv2d-281	[-1, 256, 19, 19]	262,144
BatchNorm2d-282	[-1, 256, 19, 19]	512
ReLU-283	[-1, 256, 19, 19]	0
Conv2d-284	[-1, 256, 19, 19]	589,824
BatchNorm2d-285	[-1, 256, 19, 19]	512
ReLU-286	[-1, 256, 19, 19]	0
Conv2d-287	[-1, 1024, 19, 19]	262,144
BatchNorm2d-288	[-1, 1024, 19, 19]	2,048
ReLU-289	[-1, 1024, 19, 19]	0
Bottleneck-290	[-1, 1024, 19, 19]	0
Conv2d-291	[-1, 256, 19, 19]	262,144
BatchNorm2d-292	[-1, 256, 19, 19]	512
ReLU-293	[-1, 256, 19, 19]	0

Conv2d-294	[-1, 256, 19, 19]	589,824
BatchNorm2d-295	[-1, 256, 19, 19]	512
ReLU-296	[-1, 256, 19, 19]	0
Conv2d-297	[-1, 1024, 19, 19]	262,144
BatchNorm2d-298	[-1, 1024, 19, 19]	2,048
ReLU-299	[-1, 1024, 19, 19]	0
Bottleneck-300	[-1, 1024, 19, 19]	0
Conv2d-301	[-1, 256, 19, 19]	262,144
BatchNorm2d-302	[-1, 256, 19, 19]	512
ReLU-303	[-1, 256, 19, 19]	0
Conv2d-304	[-1, 256, 19, 19]	589,824
BatchNorm2d-305	[-1, 256, 19, 19]	512
ReLU-306	[-1, 256, 19, 19]	0
Conv2d-307	[-1, 1024, 19, 19]	262,144
BatchNorm2d-308	[-1, 1024, 19, 19]	2,048
ReLU-309	[-1, 1024, 19, 19]	0
Bottleneck-310	[-1, 1024, 19, 19]	0
Conv2d-311	[-1, 256, 19, 19]	262,144
BatchNorm2d-312	[-1, 256, 19, 19]	512
ReLU-313	[-1, 256, 19, 19]	0
Conv2d-314	[-1, 256, 19, 19]	589,824
BatchNorm2d-315	[-1, 256, 19, 19]	512
ReLU-316	[-1, 256, 19, 19]	0
Conv2d-317	[-1, 1024, 19, 19]	262,144
BatchNorm2d-318	[-1, 1024, 19, 19]	2,048
ReLU-319	[-1, 1024, 19, 19]	0
Bottleneck-320	[-1, 1024, 19, 19]	0
Conv2d-321	[-1, 256, 19, 19]	262,144
BatchNorm2d-322	[-1, 256, 19, 19]	512
ReLU-323	[-1, 256, 19, 19]	0
Conv2d-324	[-1, 256, 19, 19]	589,824
BatchNorm2d-325	[-1, 256, 19, 19]	512
ReLU-326	[-1, 256, 19, 19]	0
Conv2d-327	[-1, 1024, 19, 19]	262,144
BatchNorm2d-328	[-1, 1024, 19, 19]	2,048
ReLU-329	[-1, 1024, 19, 19]	0
Bottleneck-330	[-1, 1024, 19, 19]	0
Conv2d-331	[-1, 256, 19, 19]	262,144
BatchNorm2d-332	[-1, 256, 19, 19]	512
ReLU-333	[-1, 256, 19, 19]	0
Conv2d-334	[-1, 256, 19, 19]	589,824
BatchNorm2d-335	[-1, 256, 19, 19]	512
ReLU-336	[-1, 256, 19, 19]	0
Conv2d-337	[-1, 1024, 19, 19]	262,144
BatchNorm2d-338	[-1, 1024, 19, 19]	2,048
ReLU-339	[-1, 1024, 19, 19]	0
Bottleneck-340	[-1, 1024, 19, 19]	0
Conv2d-341	[-1, 256, 19, 19]	262,144
BatchNorm2d-342	[-1, 256, 19, 19]	512
ReLU-343	[-1, 256, 19, 19]	0
Conv2d-344	[-1, 256, 19, 19]	589,824
BatchNorm2d-345	[-1, 256, 19, 19]	512
ReLU-346	[-1, 256, 19, 19]	0
Conv2d-347	[-1, 1024, 19, 19]	262,144
BatchNorm2d-348	[-1, 1024, 19, 19]	2,048
ReLU-349	[-1, 1024, 19, 19]	0
Bottleneck-350	[-1, 1024, 19, 19]	0
Conv2d-351	[-1, 256, 19, 19]	262,144
BatchNorm2d-352	[-1, 256, 19, 19]	512
ReLU-353	[-1, 256, 19, 19]	0
Conv2d-354	[-1, 256, 19, 19]	589,824
BatchNorm2d-355	[-1, 256, 19, 19]	512
ReLU-356	[-1, 256, 19, 19]	0

Conv2d-357	[-1, 1024, 19, 19]	262,144
BatchNorm2d-358	[-1, 1024, 19, 19]	2,048
ReLU-359	[-1, 1024, 19, 19]	0
Bottleneck-360	[-1, 1024, 19, 19]	0
Conv2d-361	[-1, 256, 19, 19]	262,144
BatchNorm2d-362	[-1, 256, 19, 19]	512
ReLU-363	[-1, 256, 19, 19]	0
Conv2d-364	[-1, 256, 19, 19]	589,824
BatchNorm2d-365	[-1, 256, 19, 19]	512
ReLU-366	[-1, 256, 19, 19]	0
Conv2d-367	[-1, 1024, 19, 19]	262,144
BatchNorm2d-368	[-1, 1024, 19, 19]	2,048
ReLU-369	[-1, 1024, 19, 19]	0
Bottleneck-370	[-1, 1024, 19, 19]	0
Conv2d-371	[-1, 256, 19, 19]	262,144
BatchNorm2d-372	[-1, 256, 19, 19]	512
ReLU-373	[-1, 256, 19, 19]	0
Conv2d-374	[-1, 256, 19, 19]	589,824
BatchNorm2d-375	[-1, 256, 19, 19]	512
ReLU-376	[-1, 256, 19, 19]	0
Conv2d-377	[-1, 1024, 19, 19]	262,144
BatchNorm2d-378	[-1, 1024, 19, 19]	2,048
ReLU-379	[-1, 1024, 19, 19]	0
Bottleneck-380	[-1, 1024, 19, 19]	0
Conv2d-381	[-1, 256, 19, 19]	262,144
BatchNorm2d-382	[-1, 256, 19, 19]	512
ReLU-383	[-1, 256, 19, 19]	0
Conv2d-384	[-1, 256, 19, 19]	589,824
BatchNorm2d-385	[-1, 256, 19, 19]	512
ReLU-386	[-1, 256, 19, 19]	0
Conv2d-387	[-1, 1024, 19, 19]	262,144
BatchNorm2d-388	[-1, 1024, 19, 19]	2,048
ReLU-389	[-1, 1024, 19, 19]	0
Bottleneck-390	[-1, 1024, 19, 19]	0
Conv2d-391	[-1, 256, 19, 19]	262,144
BatchNorm2d-392	[-1, 256, 19, 19]	512
ReLU-393	[-1, 256, 19, 19]	0
Conv2d-394	[-1, 256, 19, 19]	589,824
BatchNorm2d-395	[-1, 256, 19, 19]	512
ReLU-396	[-1, 256, 19, 19]	0
Conv2d-397	[-1, 1024, 19, 19]	262,144
BatchNorm2d-398	[-1, 1024, 19, 19]	2,048
ReLU-399	[-1, 1024, 19, 19]	0
Bottleneck-400	[-1, 1024, 19, 19]	0
Conv2d-401	[-1, 256, 19, 19]	262,144
BatchNorm2d-402	[-1, 256, 19, 19]	512
ReLU-403	[-1, 256, 19, 19]	0
Conv2d-404	[-1, 256, 19, 19]	589,824
BatchNorm2d-405	[-1, 256, 19, 19]	512
ReLU-406	[-1, 256, 19, 19]	0
Conv2d-407	[-1, 1024, 19, 19]	262,144
BatchNorm2d-408	[-1, 1024, 19, 19]	2,048
ReLU-409	[-1, 1024, 19, 19]	0
Bottleneck-410	[-1, 1024, 19, 19]	0
Conv2d-411	[-1, 256, 19, 19]	262,144
BatchNorm2d-412	[-1, 256, 19, 19]	512
ReLU-413	[-1, 256, 19, 19]	0
Conv2d-414	[-1, 256, 19, 19]	589,824
BatchNorm2d-415	[-1, 256, 19, 19]	512
ReLU-416	[-1, 256, 19, 19]	0
Conv2d-417	[-1, 1024, 19, 19]	262,144
BatchNorm2d-418	[-1, 1024, 19, 19]	2,048
ReLU-419	[-1, 1024, 19, 19]	0

Bottleneck-420	[-1, 1024, 19, 19]	0
Conv2d-421	[-1, 256, 19, 19]	262,144
BatchNorm2d-422	[-1, 256, 19, 19]	512
ReLU-423	[-1, 256, 19, 19]	0
Conv2d-424	[-1, 256, 19, 19]	589,824
BatchNorm2d-425	[-1, 256, 19, 19]	512
ReLU-426	[-1, 256, 19, 19]	0
Conv2d-427	[-1, 1024, 19, 19]	262,144
BatchNorm2d-428	[-1, 1024, 19, 19]	2,048
ReLU-429	[-1, 1024, 19, 19]	0
Bottleneck-430	[-1, 1024, 19, 19]	0
Conv2d-431	[-1, 256, 19, 19]	262,144
BatchNorm2d-432	[-1, 256, 19, 19]	512
ReLU-433	[-1, 256, 19, 19]	0
Conv2d-434	[-1, 256, 19, 19]	589,824
BatchNorm2d-435	[-1, 256, 19, 19]	512
ReLU-436	[-1, 256, 19, 19]	0
Conv2d-437	[-1, 1024, 19, 19]	262,144
BatchNorm2d-438	[-1, 1024, 19, 19]	2,048
ReLU-439	[-1, 1024, 19, 19]	0
Bottleneck-440	[-1, 1024, 19, 19]	0
Conv2d-441	[-1, 256, 19, 19]	262,144
BatchNorm2d-442	[-1, 256, 19, 19]	512
ReLU-443	[-1, 256, 19, 19]	0
Conv2d-444	[-1, 256, 19, 19]	589,824
BatchNorm2d-445	[-1, 256, 19, 19]	512
ReLU-446	[-1, 256, 19, 19]	0
Conv2d-447	[-1, 1024, 19, 19]	262,144
BatchNorm2d-448	[-1, 1024, 19, 19]	2,048
ReLU-449	[-1, 1024, 19, 19]	0
Bottleneck-450	[-1, 1024, 19, 19]	0
Conv2d-451	[-1, 256, 19, 19]	262,144
BatchNorm2d-452	[-1, 256, 19, 19]	512
ReLU-453	[-1, 256, 19, 19]	0
Conv2d-454	[-1, 256, 19, 19]	589,824
BatchNorm2d-455	[-1, 256, 19, 19]	512
ReLU-456	[-1, 256, 19, 19]	0
Conv2d-457	[-1, 1024, 19, 19]	262,144
BatchNorm2d-458	[-1, 1024, 19, 19]	2,048
ReLU-459	[-1, 1024, 19, 19]	0
Bottleneck-460	[-1, 1024, 19, 19]	0
Conv2d-461	[-1, 256, 19, 19]	262,144
BatchNorm2d-462	[-1, 256, 19, 19]	512
ReLU-463	[-1, 256, 19, 19]	0
Conv2d-464	[-1, 256, 19, 19]	589,824
BatchNorm2d-465	[-1, 256, 19, 19]	512
ReLU-466	[-1, 256, 19, 19]	0
Conv2d-467	[-1, 1024, 19, 19]	262,144
BatchNorm2d-468	[-1, 1024, 19, 19]	2,048
ReLU-469	[-1, 1024, 19, 19]	0
Bottleneck-470	[-1, 1024, 19, 19]	0
Conv2d-471	[-1, 256, 19, 19]	262,144
BatchNorm2d-472	[-1, 256, 19, 19]	512
ReLU-473	[-1, 256, 19, 19]	0
Conv2d-474	[-1, 256, 19, 19]	589,824
BatchNorm2d-475	[-1, 256, 19, 19]	512
ReLU-476	[-1, 256, 19, 19]	0
Conv2d-477	[-1, 1024, 19, 19]	262,144
BatchNorm2d-478	[-1, 1024, 19, 19]	2,048
ReLU-479	[-1, 1024, 19, 19]	0
Bottleneck-480	[-1, 1024, 19, 19]	0
Conv2d-481	[-1, 512, 19, 19]	524,288
BatchNorm2d-482	[-1, 512, 19, 19]	1,024

```
                ReLU-483          [-1, 512, 19, 19]               0
              Conv2d-484          [-1, 512, 10, 10]       2,359,296
         BatchNorm2d-485          [-1, 512, 10, 10]           1,024
                ReLU-486          [-1, 512, 10, 10]               0
              Conv2d-487         [-1, 2048, 10, 10]       1,048,576
         BatchNorm2d-488         [-1, 2048, 10, 10]           4,096
              Conv2d-489         [-1, 2048, 10, 10]       2,097,152
         BatchNorm2d-490         [-1, 2048, 10, 10]           4,096
                ReLU-491         [-1, 2048, 10, 10]               0
          Bottleneck-492         [-1, 2048, 10, 10]               0
              Conv2d-493          [-1, 512, 10, 10]       1,048,576
         BatchNorm2d-494          [-1, 512, 10, 10]           1,024
                ReLU-495          [-1, 512, 10, 10]               0
              Conv2d-496          [-1, 512, 10, 10]       2,359,296
         BatchNorm2d-497          [-1, 512, 10, 10]           1,024
                ReLU-498          [-1, 512, 10, 10]               0
              Conv2d-499         [-1, 2048, 10, 10]       1,048,576
         BatchNorm2d-500         [-1, 2048, 10, 10]           4,096
                ReLU-501         [-1, 2048, 10, 10]               0
          Bottleneck-502         [-1, 2048, 10, 10]               0
              Conv2d-503          [-1, 512, 10, 10]       1,048,576
         BatchNorm2d-504          [-1, 512, 10, 10]           1,024
                ReLU-505          [-1, 512, 10, 10]               0
              Conv2d-506          [-1, 512, 10, 10]       2,359,296
         BatchNorm2d-507          [-1, 512, 10, 10]           1,024
                ReLU-508          [-1, 512, 10, 10]               0
              Conv2d-509         [-1, 2048, 10, 10]       1,048,576
         BatchNorm2d-510         [-1, 2048, 10, 10]           4,096
                ReLU-511         [-1, 2048, 10, 10]               0
          Bottleneck-512         [-1, 2048, 10, 10]               0
AdaptiveAvgPool2d-513           [-1, 2048, 1, 1]               0
              Linear-514                 [-1, 1000]       2,049,000
================================================================
                                  Total params: 60,192,808
                              Trainable params: 60,192,808
                          Non-trainable params: 0
----------------------------------------------------------------
                                  Input size (MB): 1.03
                        Forward/backward pass size (MB): 1113.07
                                  Params size (MB): 229.62
                        Estimated Total Size (MB): 1343.71
----------------------------------------------------------------
```

WRN :

Layer (type)	Output Shape	Param #
Conv2d-1	[-1, 64, 150, 150]	9,408
BatchNorm2d-2	[-1, 64, 150, 150]	128
ReLU-3	[-1, 64, 150, 150]	0
MaxPool2d-4	[-1, 64, 75, 75]	0
Conv2d-5	[-1, 128, 75, 75]	8,192
BatchNorm2d-6	[-1, 128, 75, 75]	256
ReLU-7	[-1, 128, 75, 75]	0
Conv2d-8	[-1, 128, 75, 75]	147,456
BatchNorm2d-9	[-1, 128, 75, 75]	256
ReLU-10	[-1, 128, 75, 75]	0
Conv2d-11	[-1, 256, 75, 75]	32,768
BatchNorm2d-12	[-1, 256, 75, 75]	512
Conv2d-13	[-1, 256, 75, 75]	16,384
BatchNorm2d-14	[-1, 256, 75, 75]	512
ReLU-15	[-1, 256, 75, 75]	0
Bottleneck-16	[-1, 256, 75, 75]	0
Conv2d-17	[-1, 128, 75, 75]	32,768
BatchNorm2d-18	[-1, 128, 75, 75]	256
ReLU-19	[-1, 128, 75, 75]	0
Conv2d-20	[-1, 128, 75, 75]	147,456
BatchNorm2d-21	[-1, 128, 75, 75]	256
ReLU-22	[-1, 128, 75, 75]	0
Conv2d-23	[-1, 256, 75, 75]	32,768
BatchNorm2d-24	[-1, 256, 75, 75]	512
ReLU-25	[-1, 256, 75, 75]	0
Bottleneck-26	[-1, 256, 75, 75]	0
Conv2d-27	[-1, 128, 75, 75]	32,768
BatchNorm2d-28	[-1, 128, 75, 75]	256
ReLU-29	[-1, 128, 75, 75]	0
Conv2d-30	[-1, 128, 75, 75]	147,456
BatchNorm2d-31	[-1, 128, 75, 75]	256
ReLU-32	[-1, 128, 75, 75]	0
Conv2d-33	[-1, 256, 75, 75]	32,768
BatchNorm2d-34	[-1, 256, 75, 75]	512
ReLU-35	[-1, 256, 75, 75]	0
Bottleneck-36	[-1, 256, 75, 75]	0
Conv2d-37	[-1, 256, 75, 75]	65,536
BatchNorm2d-38	[-1, 256, 75, 75]	512
ReLU-39	[-1, 256, 75, 75]	0
Conv2d-40	[-1, 256, 38, 38]	589,824
BatchNorm2d-41	[-1, 256, 38, 38]	512
ReLU-42	[-1, 256, 38, 38]	0
Conv2d-43	[-1, 512, 38, 38]	131,072
BatchNorm2d-44	[-1, 512, 38, 38]	1,024
Conv2d-45	[-1, 512, 38, 38]	131,072
BatchNorm2d-46	[-1, 512, 38, 38]	1,024
ReLU-47	[-1, 512, 38, 38]	0
Bottleneck-48	[-1, 512, 38, 38]	0
Conv2d-49	[-1, 256, 38, 38]	131,072
BatchNorm2d-50	[-1, 256, 38, 38]	512
ReLU-51	[-1, 256, 38, 38]	0
Conv2d-52	[-1, 256, 38, 38]	589,824
BatchNorm2d-53	[-1, 256, 38, 38]	512
ReLU-54	[-1, 256, 38, 38]	0
Conv2d-55	[-1, 512, 38, 38]	131,072
BatchNorm2d-56	[-1, 512, 38, 38]	1,024
ReLU-57	[-1, 512, 38, 38]	0
Bottleneck-58	[-1, 512, 38, 38]	0

Conv2d-59	[-1, 256, 38, 38]	131,072
BatchNorm2d-60	[-1, 256, 38, 38]	512
ReLU-61	[-1, 256, 38, 38]	0
Conv2d-62	[-1, 256, 38, 38]	589,824
BatchNorm2d-63	[-1, 256, 38, 38]	512
ReLU-64	[-1, 256, 38, 38]	0
Conv2d-65	[-1, 512, 38, 38]	131,072
BatchNorm2d-66	[-1, 512, 38, 38]	1,024
ReLU-67	[-1, 512, 38, 38]	0
Bottleneck-68	[-1, 512, 38, 38]	0
Conv2d-69	[-1, 256, 38, 38]	131,072
BatchNorm2d-70	[-1, 256, 38, 38]	512
ReLU-71	[-1, 256, 38, 38]	0
Conv2d-72	[-1, 256, 38, 38]	589,824
BatchNorm2d-73	[-1, 256, 38, 38]	512
ReLU-74	[-1, 256, 38, 38]	0
Conv2d-75	[-1, 512, 38, 38]	131,072
BatchNorm2d-76	[-1, 512, 38, 38]	1,024
ReLU-77	[-1, 512, 38, 38]	0
Bottleneck-78	[-1, 512, 38, 38]	0
Conv2d-79	[-1, 512, 38, 38]	262,144
BatchNorm2d-80	[-1, 512, 38, 38]	1,024
ReLU-81	[-1, 512, 38, 38]	0
Conv2d-82	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-83	[-1, 512, 19, 19]	1,024
ReLU-84	[-1, 512, 19, 19]	0
Conv2d-85	[-1, 1024, 19, 19]	524,288
BatchNorm2d-86	[-1, 1024, 19, 19]	2,048
Conv2d-87	[-1, 1024, 19, 19]	524,288
BatchNorm2d-88	[-1, 1024, 19, 19]	2,048
ReLU-89	[-1, 1024, 19, 19]	0
Bottleneck-90	[-1, 1024, 19, 19]	0
Conv2d-91	[-1, 512, 19, 19]	524,288
BatchNorm2d-92	[-1, 512, 19, 19]	1,024
ReLU-93	[-1, 512, 19, 19]	0
Conv2d-94	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-95	[-1, 512, 19, 19]	1,024
ReLU-96	[-1, 512, 19, 19]	0
Conv2d-97	[-1, 1024, 19, 19]	524,288
BatchNorm2d-98	[-1, 1024, 19, 19]	2,048
ReLU-99	[-1, 1024, 19, 19]	0
Bottleneck-100	[-1, 1024, 19, 19]	0
Conv2d-101	[-1, 512, 19, 19]	524,288
BatchNorm2d-102	[-1, 512, 19, 19]	1,024
ReLU-103	[-1, 512, 19, 19]	0
Conv2d-104	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-105	[-1, 512, 19, 19]	1,024
ReLU-106	[-1, 512, 19, 19]	0
Conv2d-107	[-1, 1024, 19, 19]	524,288
BatchNorm2d-108	[-1, 1024, 19, 19]	2,048
ReLU-109	[-1, 1024, 19, 19]	0
Bottleneck-110	[-1, 1024, 19, 19]	0
Conv2d-111	[-1, 512, 19, 19]	524,288
BatchNorm2d-112	[-1, 512, 19, 19]	1,024
ReLU-113	[-1, 512, 19, 19]	0
Conv2d-114	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-115	[-1, 512, 19, 19]	1,024
ReLU-116	[-1, 512, 19, 19]	0
Conv2d-117	[-1, 1024, 19, 19]	524,288
BatchNorm2d-118	[-1, 1024, 19, 19]	2,048
ReLU-119	[-1, 1024, 19, 19]	0
Bottleneck-120	[-1, 1024, 19, 19]	0
Conv2d-121	[-1, 512, 19, 19]	524,288

BatchNorm2d-122	[-1, 512, 19, 19]	1,024
ReLU-123	[-1, 512, 19, 19]	0
Conv2d-124	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-125	[-1, 512, 19, 19]	1,024
ReLU-126	[-1, 512, 19, 19]	0
Conv2d-127	[-1, 1024, 19, 19]	524,288
BatchNorm2d-128	[-1, 1024, 19, 19]	2,048
ReLU-129	[-1, 1024, 19, 19]	0
Bottleneck-130	[-1, 1024, 19, 19]	0
Conv2d-131	[-1, 512, 19, 19]	524,288
BatchNorm2d-132	[-1, 512, 19, 19]	1,024
ReLU-133	[-1, 512, 19, 19]	0
Conv2d-134	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-135	[-1, 512, 19, 19]	1,024
ReLU-136	[-1, 512, 19, 19]	0
Conv2d-137	[-1, 1024, 19, 19]	524,288
BatchNorm2d-138	[-1, 1024, 19, 19]	2,048
ReLU-139	[-1, 1024, 19, 19]	0
Bottleneck-140	[-1, 1024, 19, 19]	0
Conv2d-141	[-1, 512, 19, 19]	524,288
BatchNorm2d-142	[-1, 512, 19, 19]	1,024
ReLU-143	[-1, 512, 19, 19]	0
Conv2d-144	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-145	[-1, 512, 19, 19]	1,024
ReLU-146	[-1, 512, 19, 19]	0
Conv2d-147	[-1, 1024, 19, 19]	524,288
BatchNorm2d-148	[-1, 1024, 19, 19]	2,048
ReLU-149	[-1, 1024, 19, 19]	0
Bottleneck-150	[-1, 1024, 19, 19]	0
Conv2d-151	[-1, 512, 19, 19]	524,288
BatchNorm2d-152	[-1, 512, 19, 19]	1,024
ReLU-153	[-1, 512, 19, 19]	0
Conv2d-154	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-155	[-1, 512, 19, 19]	1,024
ReLU-156	[-1, 512, 19, 19]	0
Conv2d-157	[-1, 1024, 19, 19]	524,288
BatchNorm2d-158	[-1, 1024, 19, 19]	2,048
ReLU-159	[-1, 1024, 19, 19]	0
Bottleneck-160	[-1, 1024, 19, 19]	0
Conv2d-161	[-1, 512, 19, 19]	524,288
BatchNorm2d-162	[-1, 512, 19, 19]	1,024
ReLU-163	[-1, 512, 19, 19]	0
Conv2d-164	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-165	[-1, 512, 19, 19]	1,024
ReLU-166	[-1, 512, 19, 19]	0
Conv2d-167	[-1, 1024, 19, 19]	524,288
BatchNorm2d-168	[-1, 1024, 19, 19]	2,048
ReLU-169	[-1, 1024, 19, 19]	0
Bottleneck-170	[-1, 1024, 19, 19]	0
Conv2d-171	[-1, 512, 19, 19]	524,288
BatchNorm2d-172	[-1, 512, 19, 19]	1,024
ReLU-173	[-1, 512, 19, 19]	0
Conv2d-174	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-175	[-1, 512, 19, 19]	1,024
ReLU-176	[-1, 512, 19, 19]	0
Conv2d-177	[-1, 1024, 19, 19]	524,288
BatchNorm2d-178	[-1, 1024, 19, 19]	2,048
ReLU-179	[-1, 1024, 19, 19]	0
Bottleneck-180	[-1, 1024, 19, 19]	0
Conv2d-181	[-1, 512, 19, 19]	524,288
BatchNorm2d-182	[-1, 512, 19, 19]	1,024
ReLU-183	[-1, 512, 19, 19]	0
Conv2d-184	[-1, 512, 19, 19]	2,359,296

BatchNorm2d-185	[-1, 512, 19, 19]	1,024
ReLU-186	[-1, 512, 19, 19]	0
Conv2d-187	[-1, 1024, 19, 19]	524,288
BatchNorm2d-188	[-1, 1024, 19, 19]	2,048
ReLU-189	[-1, 1024, 19, 19]	0
Bottleneck-190	[-1, 1024, 19, 19]	0
Conv2d-191	[-1, 512, 19, 19]	524,288
BatchNorm2d-192	[-1, 512, 19, 19]	1,024
ReLU-193	[-1, 512, 19, 19]	0
Conv2d-194	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-195	[-1, 512, 19, 19]	1,024
ReLU-196	[-1, 512, 19, 19]	0
Conv2d-197	[-1, 1024, 19, 19]	524,288
BatchNorm2d-198	[-1, 1024, 19, 19]	2,048
ReLU-199	[-1, 1024, 19, 19]	0
Bottleneck-200	[-1, 1024, 19, 19]	0
Conv2d-201	[-1, 512, 19, 19]	524,288
BatchNorm2d-202	[-1, 512, 19, 19]	1,024
ReLU-203	[-1, 512, 19, 19]	0
Conv2d-204	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-205	[-1, 512, 19, 19]	1,024
ReLU-206	[-1, 512, 19, 19]	0
Conv2d-207	[-1, 1024, 19, 19]	524,288
BatchNorm2d-208	[-1, 1024, 19, 19]	2,048
ReLU-209	[-1, 1024, 19, 19]	0
Bottleneck-210	[-1, 1024, 19, 19]	0
Conv2d-211	[-1, 512, 19, 19]	524,288
BatchNorm2d-212	[-1, 512, 19, 19]	1,024
ReLU-213	[-1, 512, 19, 19]	0
Conv2d-214	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-215	[-1, 512, 19, 19]	1,024
ReLU-216	[-1, 512, 19, 19]	0
Conv2d-217	[-1, 1024, 19, 19]	524,288
BatchNorm2d-218	[-1, 1024, 19, 19]	2,048
ReLU-219	[-1, 1024, 19, 19]	0
Bottleneck-220	[-1, 1024, 19, 19]	0
Conv2d-221	[-1, 512, 19, 19]	524,288
BatchNorm2d-222	[-1, 512, 19, 19]	1,024
ReLU-223	[-1, 512, 19, 19]	0
Conv2d-224	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-225	[-1, 512, 19, 19]	1,024
ReLU-226	[-1, 512, 19, 19]	0
Conv2d-227	[-1, 1024, 19, 19]	524,288
BatchNorm2d-228	[-1, 1024, 19, 19]	2,048
ReLU-229	[-1, 1024, 19, 19]	0
Bottleneck-230	[-1, 1024, 19, 19]	0
Conv2d-231	[-1, 512, 19, 19]	524,288
BatchNorm2d-232	[-1, 512, 19, 19]	1,024
ReLU-233	[-1, 512, 19, 19]	0
Conv2d-234	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-235	[-1, 512, 19, 19]	1,024
ReLU-236	[-1, 512, 19, 19]	0
Conv2d-237	[-1, 1024, 19, 19]	524,288
BatchNorm2d-238	[-1, 1024, 19, 19]	2,048
ReLU-239	[-1, 1024, 19, 19]	0
Bottleneck-240	[-1, 1024, 19, 19]	0
Conv2d-241	[-1, 512, 19, 19]	524,288
BatchNorm2d-242	[-1, 512, 19, 19]	1,024
ReLU-243	[-1, 512, 19, 19]	0
Conv2d-244	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-245	[-1, 512, 19, 19]	1,024
ReLU-246	[-1, 512, 19, 19]	0
Conv2d-247	[-1, 1024, 19, 19]	524,288

BatchNorm2d-248	[-1, 1024, 19, 19]	2,048
ReLU-249	[-1, 1024, 19, 19]	0
Bottleneck-250	[-1, 1024, 19, 19]	0
Conv2d-251	[-1, 512, 19, 19]	524,288
BatchNorm2d-252	[-1, 512, 19, 19]	1,024
ReLU-253	[-1, 512, 19, 19]	0
Conv2d-254	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-255	[-1, 512, 19, 19]	1,024
ReLU-256	[-1, 512, 19, 19]	0
Conv2d-257	[-1, 1024, 19, 19]	524,288
BatchNorm2d-258	[-1, 1024, 19, 19]	2,048
ReLU-259	[-1, 1024, 19, 19]	0
Bottleneck-260	[-1, 1024, 19, 19]	0
Conv2d-261	[-1, 512, 19, 19]	524,288
BatchNorm2d-262	[-1, 512, 19, 19]	1,024
ReLU-263	[-1, 512, 19, 19]	0
Conv2d-264	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-265	[-1, 512, 19, 19]	1,024
ReLU-266	[-1, 512, 19, 19]	0
Conv2d-267	[-1, 1024, 19, 19]	524,288
BatchNorm2d-268	[-1, 1024, 19, 19]	2,048
ReLU-269	[-1, 1024, 19, 19]	0
Bottleneck-270	[-1, 1024, 19, 19]	0
Conv2d-271	[-1, 512, 19, 19]	524,288
BatchNorm2d-272	[-1, 512, 19, 19]	1,024
ReLU-273	[-1, 512, 19, 19]	0
Conv2d-274	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-275	[-1, 512, 19, 19]	1,024
ReLU-276	[-1, 512, 19, 19]	0
Conv2d-277	[-1, 1024, 19, 19]	524,288
BatchNorm2d-278	[-1, 1024, 19, 19]	2,048
ReLU-279	[-1, 1024, 19, 19]	0
Bottleneck-280	[-1, 1024, 19, 19]	0
Conv2d-281	[-1, 512, 19, 19]	524,288
BatchNorm2d-282	[-1, 512, 19, 19]	1,024
ReLU-283	[-1, 512, 19, 19]	0
Conv2d-284	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-285	[-1, 512, 19, 19]	1,024
ReLU-286	[-1, 512, 19, 19]	0
Conv2d-287	[-1, 1024, 19, 19]	524,288
BatchNorm2d-288	[-1, 1024, 19, 19]	2,048
ReLU-289	[-1, 1024, 19, 19]	0
Bottleneck-290	[-1, 1024, 19, 19]	0
Conv2d-291	[-1, 512, 19, 19]	524,288
BatchNorm2d-292	[-1, 512, 19, 19]	1,024
ReLU-293	[-1, 512, 19, 19]	0
Conv2d-294	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-295	[-1, 512, 19, 19]	1,024
ReLU-296	[-1, 512, 19, 19]	0
Conv2d-297	[-1, 1024, 19, 19]	524,288
BatchNorm2d-298	[-1, 1024, 19, 19]	2,048
ReLU-299	[-1, 1024, 19, 19]	0
Bottleneck-300	[-1, 1024, 19, 19]	0
Conv2d-301	[-1, 512, 19, 19]	524,288
BatchNorm2d-302	[-1, 512, 19, 19]	1,024
ReLU-303	[-1, 512, 19, 19]	0
Conv2d-304	[-1, 512, 19, 19]	2,359,296
BatchNorm2d-305	[-1, 512, 19, 19]	1,024
ReLU-306	[-1, 512, 19, 19]	0
Conv2d-307	[-1, 1024, 19, 19]	524,288
BatchNorm2d-308	[-1, 1024, 19, 19]	2,048
ReLU-309	[-1, 1024, 19, 19]	0
Bottleneck-310	[-1, 1024, 19, 19]	0

```
                Conv2d-311         [-1, 1024, 19, 19]       1,048,576
           BatchNorm2d-312         [-1, 1024, 19, 19]           2,048
                  ReLU-313         [-1, 1024, 19, 19]               0
                Conv2d-314         [-1, 1024, 10, 10]       9,437,184
           BatchNorm2d-315         [-1, 1024, 10, 10]           2,048
                  ReLU-316         [-1, 1024, 10, 10]               0
                Conv2d-317         [-1, 2048, 10, 10]       2,097,152
           BatchNorm2d-318         [-1, 2048, 10, 10]           4,096
                Conv2d-319         [-1, 2048, 10, 10]       2,097,152
           BatchNorm2d-320         [-1, 2048, 10, 10]           4,096
                  ReLU-321         [-1, 2048, 10, 10]               0
            Bottleneck-322         [-1, 2048, 10, 10]               0
                Conv2d-323         [-1, 1024, 10, 10]       2,097,152
           BatchNorm2d-324         [-1, 1024, 10, 10]           2,048
                  ReLU-325         [-1, 1024, 10, 10]               0
                Conv2d-326         [-1, 1024, 10, 10]       9,437,184
           BatchNorm2d-327         [-1, 1024, 10, 10]           2,048
                  ReLU-328         [-1, 1024, 10, 10]               0
                Conv2d-329         [-1, 2048, 10, 10]       2,097,152
           BatchNorm2d-330         [-1, 2048, 10, 10]           4,096
                  ReLU-331         [-1, 2048, 10, 10]               0
            Bottleneck-332         [-1, 2048, 10, 10]               0
                Conv2d-333         [-1, 1024, 10, 10]       2,097,152
           BatchNorm2d-334         [-1, 1024, 10, 10]           2,048
                  ReLU-335         [-1, 1024, 10, 10]               0
                Conv2d-336         [-1, 1024, 10, 10]       9,437,184
           BatchNorm2d-337         [-1, 1024, 10, 10]           2,048
                  ReLU-338         [-1, 1024, 10, 10]               0
                Conv2d-339         [-1, 2048, 10, 10]       2,097,152
           BatchNorm2d-340         [-1, 2048, 10, 10]           4,096
                  ReLU-341         [-1, 2048, 10, 10]               0
            Bottleneck-342         [-1, 2048, 10, 10]               0
AdaptiveAvgPool2d-343           [-1, 2048, 1, 1]               0
                Linear-344                 [-1, 1000]       2,049,000
================================================================
                                  Total params: 126,886,696
                               Trainable params: 126,886,696
                                   Non-trainable params: 0
----------------------------------------------------------------
                                        Input size (MB): 1.03
                            Forward/backward pass size (MB): 996.59
                                        Params size (MB): 484.03
                                Estimated Total Size (MB): 1481.65
----------------------------------------------------------------
```

Inception_v3 :

Layer (type)	Output Shape	Param #
Conv2d-1	[-1, 32, 149, 149]	864
BatchNorm2d-2	[-1, 32, 149, 149]	64
BasicConv2d-3	[-1, 32, 149, 149]	0
Conv2d-4	[-1, 32, 147, 147]	9,216
BatchNorm2d-5	[-1, 32, 147, 147]	64
BasicConv2d-6	[-1, 32, 147, 147]	0
Conv2d-7	[-1, 64, 147, 147]	18,432
BatchNorm2d-8	[-1, 64, 147, 147]	128
BasicConv2d-9	[-1, 64, 147, 147]	0
MaxPool2d-10	[-1, 64, 73, 73]	0
Conv2d-11	[-1, 80, 73, 73]	5,120
BatchNorm2d-12	[-1, 80, 73, 73]	160
BasicConv2d-13	[-1, 80, 73, 73]	0
Conv2d-14	[-1, 192, 71, 71]	138,240
BatchNorm2d-15	[-1, 192, 71, 71]	384
BasicConv2d-16	[-1, 192, 71, 71]	0
MaxPool2d-17	[-1, 192, 35, 35]	0
Conv2d-18	[-1, 64, 35, 35]	12,288
BatchNorm2d-19	[-1, 64, 35, 35]	128
BasicConv2d-20	[-1, 64, 35, 35]	0
Conv2d-21	[-1, 48, 35, 35]	9,216
BatchNorm2d-22	[-1, 48, 35, 35]	96
BasicConv2d-23	[-1, 48, 35, 35]	0
Conv2d-24	[-1, 64, 35, 35]	76,800
BatchNorm2d-25	[-1, 64, 35, 35]	128
BasicConv2d-26	[-1, 64, 35, 35]	0
Conv2d-27	[-1, 64, 35, 35]	12,288
BatchNorm2d-28	[-1, 64, 35, 35]	128
BasicConv2d-29	[-1, 64, 35, 35]	0
Conv2d-30	[-1, 96, 35, 35]	55,296
BatchNorm2d-31	[-1, 96, 35, 35]	192
BasicConv2d-32	[-1, 96, 35, 35]	0
Conv2d-33	[-1, 96, 35, 35]	82,944
BatchNorm2d-34	[-1, 96, 35, 35]	192
BasicConv2d-35	[-1, 96, 35, 35]	0
Conv2d-36	[-1, 32, 35, 35]	6,144
BatchNorm2d-37	[-1, 32, 35, 35]	64
BasicConv2d-38	[-1, 32, 35, 35]	0
InceptionA-39	[-1, 256, 35, 35]	0
Conv2d-40	[-1, 64, 35, 35]	16,384
BatchNorm2d-41	[-1, 64, 35, 35]	128
BasicConv2d-42	[-1, 64, 35, 35]	0
Conv2d-43	[-1, 48, 35, 35]	12,288
BatchNorm2d-44	[-1, 48, 35, 35]	96
BasicConv2d-45	[-1, 48, 35, 35]	0
Conv2d-46	[-1, 64, 35, 35]	76,800
BatchNorm2d-47	[-1, 64, 35, 35]	128
BasicConv2d-48	[-1, 64, 35, 35]	0
Conv2d-49	[-1, 64, 35, 35]	16,384
BatchNorm2d-50	[-1, 64, 35, 35]	128
BasicConv2d-51	[-1, 64, 35, 35]	0
Conv2d-52	[-1, 96, 35, 35]	55,296
BatchNorm2d-53	[-1, 96, 35, 35]	192
BasicConv2d-54	[-1, 96, 35, 35]	0
Conv2d-55	[-1, 96, 35, 35]	82,944
BatchNorm2d-56	[-1, 96, 35, 35]	192
BasicConv2d-57	[-1, 96, 35, 35]	0
Conv2d-58	[-1, 64, 35, 35]	16,384

BatchNorm2d-59	[-1, 64, 35, 35]	128
BasicConv2d-60	[-1, 64, 35, 35]	0
InceptionA-61	[-1, 288, 35, 35]	0
Conv2d-62	[-1, 64, 35, 35]	18,432
BatchNorm2d-63	[-1, 64, 35, 35]	128
BasicConv2d-64	[-1, 64, 35, 35]	0
Conv2d-65	[-1, 48, 35, 35]	13,824
BatchNorm2d-66	[-1, 48, 35, 35]	96
BasicConv2d-67	[-1, 48, 35, 35]	0
Conv2d-68	[-1, 64, 35, 35]	76,800
BatchNorm2d-69	[-1, 64, 35, 35]	128
BasicConv2d-70	[-1, 64, 35, 35]	0
Conv2d-71	[-1, 64, 35, 35]	18,432
BatchNorm2d-72	[-1, 64, 35, 35]	128
BasicConv2d-73	[-1, 64, 35, 35]	0
Conv2d-74	[-1, 96, 35, 35]	55,296
BatchNorm2d-75	[-1, 96, 35, 35]	192
BasicConv2d-76	[-1, 96, 35, 35]	0
Conv2d-77	[-1, 96, 35, 35]	82,944
BatchNorm2d-78	[-1, 96, 35, 35]	192
BasicConv2d-79	[-1, 96, 35, 35]	0
Conv2d-80	[-1, 64, 35, 35]	18,432
BatchNorm2d-81	[-1, 64, 35, 35]	128
BasicConv2d-82	[-1, 64, 35, 35]	0
InceptionA-83	[-1, 288, 35, 35]	0
Conv2d-84	[-1, 384, 17, 17]	995,328
BatchNorm2d-85	[-1, 384, 17, 17]	768
BasicConv2d-86	[-1, 384, 17, 17]	0
Conv2d-87	[-1, 64, 35, 35]	18,432
BatchNorm2d-88	[-1, 64, 35, 35]	128
BasicConv2d-89	[-1, 64, 35, 35]	0
Conv2d-90	[-1, 96, 35, 35]	55,296
BatchNorm2d-91	[-1, 96, 35, 35]	192
BasicConv2d-92	[-1, 96, 35, 35]	0
Conv2d-93	[-1, 96, 17, 17]	82,944
BatchNorm2d-94	[-1, 96, 17, 17]	192
BasicConv2d-95	[-1, 96, 17, 17]	0
InceptionB-96	[-1, 768, 17, 17]	0
Conv2d-97	[-1, 192, 17, 17]	147,456
BatchNorm2d-98	[-1, 192, 17, 17]	384
BasicConv2d-99	[-1, 192, 17, 17]	0
Conv2d-100	[-1, 128, 17, 17]	98,304
BatchNorm2d-101	[-1, 128, 17, 17]	256
BasicConv2d-102	[-1, 128, 17, 17]	0
Conv2d-103	[-1, 128, 17, 17]	114,688
BatchNorm2d-104	[-1, 128, 17, 17]	256
BasicConv2d-105	[-1, 128, 17, 17]	0
Conv2d-106	[-1, 192, 17, 17]	172,032
BatchNorm2d-107	[-1, 192, 17, 17]	384
BasicConv2d-108	[-1, 192, 17, 17]	0
Conv2d-109	[-1, 128, 17, 17]	98,304
BatchNorm2d-110	[-1, 128, 17, 17]	256
BasicConv2d-111	[-1, 128, 17, 17]	0
Conv2d-112	[-1, 128, 17, 17]	114,688
BatchNorm2d-113	[-1, 128, 17, 17]	256
BasicConv2d-114	[-1, 128, 17, 17]	0
Conv2d-115	[-1, 128, 17, 17]	114,688
BatchNorm2d-116	[-1, 128, 17, 17]	256
BasicConv2d-117	[-1, 128, 17, 17]	0
Conv2d-118	[-1, 128, 17, 17]	114,688
BatchNorm2d-119	[-1, 128, 17, 17]	256
BasicConv2d-120	[-1, 128, 17, 17]	0
Conv2d-121	[-1, 192, 17, 17]	172,032

BatchNorm2d-122	[-1, 192, 17, 17]	384
BasicConv2d-123	[-1, 192, 17, 17]	0
Conv2d-124	[-1, 192, 17, 17]	147,456
BatchNorm2d-125	[-1, 192, 17, 17]	384
BasicConv2d-126	[-1, 192, 17, 17]	0
InceptionC-127	[-1, 768, 17, 17]	0
Conv2d-128	[-1, 192, 17, 17]	147,456
BatchNorm2d-129	[-1, 192, 17, 17]	384
BasicConv2d-130	[-1, 192, 17, 17]	0
Conv2d-131	[-1, 160, 17, 17]	122,880
BatchNorm2d-132	[-1, 160, 17, 17]	320
BasicConv2d-133	[-1, 160, 17, 17]	0
Conv2d-134	[-1, 160, 17, 17]	179,200
BatchNorm2d-135	[-1, 160, 17, 17]	320
BasicConv2d-136	[-1, 160, 17, 17]	0
Conv2d-137	[-1, 192, 17, 17]	215,040
BatchNorm2d-138	[-1, 192, 17, 17]	384
BasicConv2d-139	[-1, 192, 17, 17]	0
Conv2d-140	[-1, 160, 17, 17]	122,880
BatchNorm2d-141	[-1, 160, 17, 17]	320
BasicConv2d-142	[-1, 160, 17, 17]	0
Conv2d-143	[-1, 160, 17, 17]	179,200
BatchNorm2d-144	[-1, 160, 17, 17]	320
BasicConv2d-145	[-1, 160, 17, 17]	0
Conv2d-146	[-1, 160, 17, 17]	179,200
BatchNorm2d-147	[-1, 160, 17, 17]	320
BasicConv2d-148	[-1, 160, 17, 17]	0
Conv2d-149	[-1, 160, 17, 17]	179,200
BatchNorm2d-150	[-1, 160, 17, 17]	320
BasicConv2d-151	[-1, 160, 17, 17]	0
Conv2d-152	[-1, 192, 17, 17]	215,040
BatchNorm2d-153	[-1, 192, 17, 17]	384
BasicConv2d-154	[-1, 192, 17, 17]	0
Conv2d-155	[-1, 192, 17, 17]	147,456
BatchNorm2d-156	[-1, 192, 17, 17]	384
BasicConv2d-157	[-1, 192, 17, 17]	0
InceptionC-158	[-1, 768, 17, 17]	0
Conv2d-159	[-1, 192, 17, 17]	147,456
BatchNorm2d-160	[-1, 192, 17, 17]	384
BasicConv2d-161	[-1, 192, 17, 17]	0
Conv2d-162	[-1, 160, 17, 17]	122,880
BatchNorm2d-163	[-1, 160, 17, 17]	320
BasicConv2d-164	[-1, 160, 17, 17]	0
Conv2d-165	[-1, 160, 17, 17]	179,200
BatchNorm2d-166	[-1, 160, 17, 17]	320
BasicConv2d-167	[-1, 160, 17, 17]	0
Conv2d-168	[-1, 192, 17, 17]	215,040
BatchNorm2d-169	[-1, 192, 17, 17]	384
BasicConv2d-170	[-1, 192, 17, 17]	0
Conv2d-171	[-1, 160, 17, 17]	122,880
BatchNorm2d-172	[-1, 160, 17, 17]	320
BasicConv2d-173	[-1, 160, 17, 17]	0
Conv2d-174	[-1, 160, 17, 17]	179,200
BatchNorm2d-175	[-1, 160, 17, 17]	320
BasicConv2d-176	[-1, 160, 17, 17]	0
Conv2d-177	[-1, 160, 17, 17]	179,200
BatchNorm2d-178	[-1, 160, 17, 17]	320
BasicConv2d-179	[-1, 160, 17, 17]	0
Conv2d-180	[-1, 160, 17, 17]	179,200
BatchNorm2d-181	[-1, 160, 17, 17]	320
BasicConv2d-182	[-1, 160, 17, 17]	0
Conv2d-183	[-1, 192, 17, 17]	215,040
BatchNorm2d-184	[-1, 192, 17, 17]	384

BasicConv2d-185	[-1, 192, 17, 17]	0
Conv2d-186	[-1, 192, 17, 17]	147,456
BatchNorm2d-187	[-1, 192, 17, 17]	384
BasicConv2d-188	[-1, 192, 17, 17]	0
InceptionC-189	[-1, 768, 17, 17]	0
Conv2d-190	[-1, 192, 17, 17]	147,456
BatchNorm2d-191	[-1, 192, 17, 17]	384
BasicConv2d-192	[-1, 192, 17, 17]	0
Conv2d-193	[-1, 192, 17, 17]	147,456
BatchNorm2d-194	[-1, 192, 17, 17]	384
BasicConv2d-195	[-1, 192, 17, 17]	0
Conv2d-196	[-1, 192, 17, 17]	258,048
BatchNorm2d-197	[-1, 192, 17, 17]	384
BasicConv2d-198	[-1, 192, 17, 17]	0
Conv2d-199	[-1, 192, 17, 17]	258,048
BatchNorm2d-200	[-1, 192, 17, 17]	384
BasicConv2d-201	[-1, 192, 17, 17]	0
Conv2d-202	[-1, 192, 17, 17]	147,456
BatchNorm2d-203	[-1, 192, 17, 17]	384
BasicConv2d-204	[-1, 192, 17, 17]	0
Conv2d-205	[-1, 192, 17, 17]	258,048
BatchNorm2d-206	[-1, 192, 17, 17]	384
BasicConv2d-207	[-1, 192, 17, 17]	0
Conv2d-208	[-1, 192, 17, 17]	258,048
BatchNorm2d-209	[-1, 192, 17, 17]	384
BasicConv2d-210	[-1, 192, 17, 17]	0
Conv2d-211	[-1, 192, 17, 17]	258,048
BatchNorm2d-212	[-1, 192, 17, 17]	384
BasicConv2d-213	[-1, 192, 17, 17]	0
Conv2d-214	[-1, 192, 17, 17]	258,048
BatchNorm2d-215	[-1, 192, 17, 17]	384
BasicConv2d-216	[-1, 192, 17, 17]	0
Conv2d-217	[-1, 192, 17, 17]	147,456
BatchNorm2d-218	[-1, 192, 17, 17]	384
BasicConv2d-219	[-1, 192, 17, 17]	0
InceptionC-220	[-1, 768, 17, 17]	0
Conv2d-221	[-1, 128, 5, 5]	98,304
BatchNorm2d-222	[-1, 128, 5, 5]	256
BasicConv2d-223	[-1, 128, 5, 5]	0
Conv2d-224	[-1, 768, 1, 1]	2,457,600
BatchNorm2d-225	[-1, 768, 1, 1]	1,536
BasicConv2d-226	[-1, 768, 1, 1]	0
Linear-227	[-1, 1000]	769,000
InceptionAux-228	[-1, 1000]	0
Conv2d-229	[-1, 192, 17, 17]	147,456
BatchNorm2d-230	[-1, 192, 17, 17]	384
BasicConv2d-231	[-1, 192, 17, 17]	0
Conv2d-232	[-1, 320, 8, 8]	552,960
BatchNorm2d-233	[-1, 320, 8, 8]	640
BasicConv2d-234	[-1, 320, 8, 8]	0
Conv2d-235	[-1, 192, 17, 17]	147,456
BatchNorm2d-236	[-1, 192, 17, 17]	384
BasicConv2d-237	[-1, 192, 17, 17]	0
Conv2d-238	[-1, 192, 17, 17]	258,048
BatchNorm2d-239	[-1, 192, 17, 17]	384
BasicConv2d-240	[-1, 192, 17, 17]	0
Conv2d-241	[-1, 192, 17, 17]	258,048
BatchNorm2d-242	[-1, 192, 17, 17]	384
BasicConv2d-243	[-1, 192, 17, 17]	0
Conv2d-244	[-1, 192, 8, 8]	331,776
BatchNorm2d-245	[-1, 192, 8, 8]	384
BasicConv2d-246	[-1, 192, 8, 8]	0
InceptionD-247	[-1, 1280, 8, 8]	0

```
                Conv2d-248            [-1, 320, 8, 8]         409,600
           BatchNorm2d-249            [-1, 320, 8, 8]             640
           BasicConv2d-250            [-1, 320, 8, 8]               0
                Conv2d-251            [-1, 384, 8, 8]         491,520
           BatchNorm2d-252            [-1, 384, 8, 8]             768
           BasicConv2d-253            [-1, 384, 8, 8]               0
                Conv2d-254            [-1, 384, 8, 8]         442,368
           BatchNorm2d-255            [-1, 384, 8, 8]             768
           BasicConv2d-256            [-1, 384, 8, 8]               0
                Conv2d-257            [-1, 384, 8, 8]         442,368
           BatchNorm2d-258            [-1, 384, 8, 8]             768
           BasicConv2d-259            [-1, 384, 8, 8]               0
                Conv2d-260            [-1, 448, 8, 8]         573,440
           BatchNorm2d-261            [-1, 448, 8, 8]             896
           BasicConv2d-262            [-1, 448, 8, 8]               0
                Conv2d-263            [-1, 384, 8, 8]       1,548,288
           BatchNorm2d-264            [-1, 384, 8, 8]             768
           BasicConv2d-265            [-1, 384, 8, 8]               0
                Conv2d-266            [-1, 384, 8, 8]         442,368
           BatchNorm2d-267            [-1, 384, 8, 8]             768
           BasicConv2d-268            [-1, 384, 8, 8]               0
                Conv2d-269            [-1, 384, 8, 8]         442,368
           BatchNorm2d-270            [-1, 384, 8, 8]             768
           BasicConv2d-271            [-1, 384, 8, 8]               0
                Conv2d-272            [-1, 192, 8, 8]         245,760
           BatchNorm2d-273            [-1, 192, 8, 8]             384
           BasicConv2d-274            [-1, 192, 8, 8]               0
            InceptionE-275           [-1, 2048, 8, 8]               0
                Conv2d-276            [-1, 320, 8, 8]         655,360
           BatchNorm2d-277            [-1, 320, 8, 8]             640
           BasicConv2d-278            [-1, 320, 8, 8]               0
                Conv2d-279            [-1, 384, 8, 8]         786,432
           BatchNorm2d-280            [-1, 384, 8, 8]             768
           BasicConv2d-281            [-1, 384, 8, 8]               0
                Conv2d-282            [-1, 384, 8, 8]         442,368
           BatchNorm2d-283            [-1, 384, 8, 8]             768
           BasicConv2d-284            [-1, 384, 8, 8]               0
                Conv2d-285            [-1, 384, 8, 8]         442,368
           BatchNorm2d-286            [-1, 384, 8, 8]             768
           BasicConv2d-287            [-1, 384, 8, 8]               0
                Conv2d-288            [-1, 448, 8, 8]         917,504
           BatchNorm2d-289            [-1, 448, 8, 8]             896
           BasicConv2d-290            [-1, 448, 8, 8]               0
                Conv2d-291            [-1, 384, 8, 8]       1,548,288
           BatchNorm2d-292            [-1, 384, 8, 8]             768
           BasicConv2d-293            [-1, 384, 8, 8]               0
                Conv2d-294            [-1, 384, 8, 8]         442,368
           BatchNorm2d-295            [-1, 384, 8, 8]             768
           BasicConv2d-296            [-1, 384, 8, 8]               0
                Conv2d-297            [-1, 384, 8, 8]         442,368
           BatchNorm2d-298            [-1, 384, 8, 8]             768
           BasicConv2d-299            [-1, 384, 8, 8]               0
                Conv2d-300            [-1, 192, 8, 8]         393,216
           BatchNorm2d-301            [-1, 192, 8, 8]             384
           BasicConv2d-302            [-1, 192, 8, 8]               0
            InceptionE-303           [-1, 2048, 8, 8]               0
AdaptiveAvgPool2d-304           [-1, 2048, 1, 1]               0
             Dropout-305           [-1, 2048, 1, 1]               0
                Linear-306                 [-1, 1000]       2,049,000
================================================================
                                     Total params: 27,161,264
                                Trainable params: 27,161,264
                                    Non-trainable params: 0
```

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----------------------------------------------------------------
                                 Input size (MB): 1.03
       Forward/backward pass size (MB): 228.66
                                 Params size (MB): 103.61
            Estimated Total Size (MB): 333.30
----------------------------------------------------------------
```

Confusion Matrix :

For the first model, which had the best accuracy and prediction, we display the confusion matrix to identify the weak points of the model. We can also see the objects that have more errors in their detection.