```
 guest@titan: ~                                                          —  □  ×

  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/container.py", line 92, in forward
    input = module(input)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/module.py", line 541, in __call__
    result = self.forward(*input, **kwargs)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/conv.py", line 345, in forward
    return self.conv2d_forward(input, self.weight)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/conv.py", line 342, in conv2d_forward
    self.padding, self.dilation, self.groups)
RuntimeError: Input type (torch.FloatTensor) and weight type (torch.cuda.FloatTensor) should be the same
guest@titan:~$ python3 final.py
Files already downloaded and verified
Files already downloaded and verified
Traceback (most recent call last):
  File "final.py", line 58, in <module>
    X = model.features(train_images_tensor.to(device))
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/module.py", line 541, in __call__
    result = self.forward(*input, **kwargs)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/container.py", line 92, in forward
    input = module(input)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/module.py", line 541, in __call__
    result = self.forward(*input, **kwargs)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/pooling.py", line 141, in forward
    self.return_indices)
  File "/usr/local/lib/python3.5/dist-packages/torch/_jit_internal.py", line 138, in fn
    return if_false(*args, **kwargs)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/functional.py", line 488, in _max_pool2d
    input, kernel_size, stride, padding, dilation, ceil_mode)
RuntimeError: CUDA out of memory. Tried to allocate 1.16 GiB (GPU 0; 11.91 GiB total capacity; 10.05 GiB already allocat
ed; 105.75 MiB free; 25.49 MiB cached)
guest@titan:~$
```
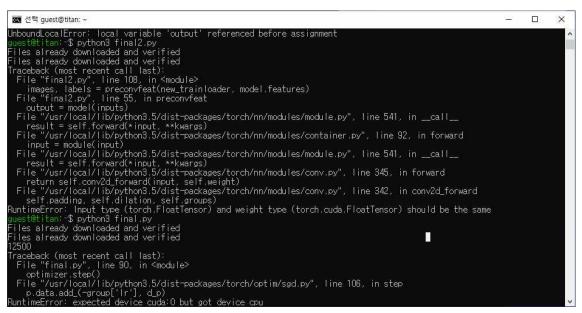
< vgg19 features를 먼저 적용하려고 할 때 >

```
 선택 guest@titan: ~                                                     —  □  ×

UnboundLocalError: local variable 'output' referenced before assignment
guest@titan:~$ python3 final2.py
Files already downloaded and verified
Files already downloaded and verified
Traceback (most recent call last):
  File "final2.py", line 108, in <module>
    images, labels = preconvfeat(new_trainloader, model.features)
  File "final2.py", line 55, in preconvfeat
    output = model(inputs)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/module.py", line 541, in __call__
    result = self.forward(*input, **kwargs)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/container.py", line 92, in forward
    input = module(input)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/module.py", line 541, in __call__
    result = self.forward(*input, **kwargs)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/conv.py", line 345, in forward
    return self.conv2d_forward(input, self.weight)
  File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/conv.py", line 342, in conv2d_forward
    self.padding, self.dilation, self.groups)
RuntimeError: Input type (torch.FloatTensor) and weight type (torch.cuda.FloatTensor) should be the same
guest@titan:~$ python3 final.py
Files already downloaded and verified
Files already downloaded and verified
12500
Traceback (most recent call last):
  File "final.py", line 90, in <module>
    optimizer.step()
  File "/usr/local/lib/python3.5/dist-packages/torch/optim/sgd.py", line 106, in step
    p.data.add_(-group['lr'], d_p)
RuntimeError: expected device cuda:0 but got device cpu
```

< vgg19 features는 cpu에서, classifier는 gpu에서 하려할 때 >

```
 File "final.py", line 58, in <module>
   X = model.features(train_images_tensor.to(device))
 File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/module.py", line 541, in __call__
   result = self.forward(*input, **kwargs)
 File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/container.py", line 92, in forward
   input = module(input)
 File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/module.py", line 541, in __call__
   result = self.forward(*input, **kwargs)
 File "/usr/local/lib/python3.5/dist-packages/torch/nn/modules/pooling.py", line 141, in forward
   self.return_indices)
 File "/usr/local/lib/python3.5/dist-packages/torch/_jit_internal.py", line 138, in fn
   return if_false(*args, **kwargs)
 File "/usr/local/lib/python3.5/dist-packages/torch/nn/functional.py", line 488, in _max_pool2d
   input, kernel_size, stride, padding, dilation, ceil_mode)
RuntimeError: CUDA out of memory. Tried to allocate 1.16 GiB (GPU 0; 11.91 GiB total capacity; 10.05 GiB already allocat
ed; 105.75 MiB free; 25.49 MiB cached)
guest@titan:~$ python3 final.py
Files already downloaded and verified
Files already downloaded and verified
12500
Traceback (most recent call last):
 File "final.py", line 89, in <module>
   cost.backward()
 File "/usr/local/lib/python3.5/dist-packages/torch/tensor.py", line 166, in backward
   torch.autograd.backward(self, gradient, retain_graph, create_graph)
 File "/usr/local/lib/python3.5/dist-packages/torch/autograd/__init__.py", line 99, in backward
   allow_unreachable=True)  # allow_unreachable flag
RuntimeError: Trying to backward through the graph a second time, but the buffers have already been freed. Specify retai
n_graph=True when calling backward the first time.
guest@titan:~$
```

< gpu memory error를 피하기 위해 모든 과정을 cpu로 진행했을 때,
혹은 vgg19 features 과정도 batch size를 나눠 진행하고 classifier 했을 때 >


```
torch.Size([9500, 512])
[Epoch:    12] cost = 1.51938546
torch.Size([9500, 512])
[Epoch:    13] cost = 1.35942936
torch.Size([9500, 512])
[Epoch:    14] cost = 1.26838613
torch.Size([9500, 512])
[Epoch:    15] cost = 1.2124294
torch.Size([9500, 512])
[Epoch:    16] cost = 1.13159442
torch.Size([9500, 512])
[Epoch:    17] cost = 1.13838291
torch.Size([9500, 512])
[Epoch:    18] cost = 1.05410969
torch.Size([9500, 512])
[Epoch:    19] cost = 0.981471956
torch.Size([9500, 512])
[Epoch:    20] cost = 0.888013065
Accuracy of the network on the 10000 test images: 24 %
Accuracy for class truck is: 17.3 %
Accuracy for class plane is: 72.7 %
Accuracy for class frog  is: 28.0 %
Accuracy for class bird  is: 11.9 %
Accuracy for class horse is: 14.2 %
Accuracy for class deer  is: 18.1 %
Accuracy for class car   is: 31.4 %
Accuracy for class ship  is: 19.6 %
Accuracy for class dog   is: 15.9 %
Accuracy for class cat   is: 12.2 %
guest@titan:~$
```

< 매 training epochs마다 smote를 적용해줄 때>

+ Variable 설정해주면 학습이 전혀 되지 않음 (autograd)