torch 사용 흐름

1. data preprocessing
2. data load (pipe line) ? 제너레이터와 같은 방식인가
3. define model
4. loss, optimizer define
5. train, test
   for i in epoch: for j in batch:

```
optimizer.zero_grad()
out = model(in)
loss = loss_func(out,label)
loss.backward()
optimizer.step()
```

```
import torch
import torch.nn as nn
import torch.optim as optim
import torchvision.datasets as dset
import torchvision.transforms as transforms
from torch.utils.data import DataLoader
from torch.autograd import Variable
import matplotlib.pyplot as plt
%matplotlib inline
import numpy as np
#device = torch.device("cuda:0" if torch.cuda.is_available() else "cpu")
```

1.MNIST train, test dataset 가져오기

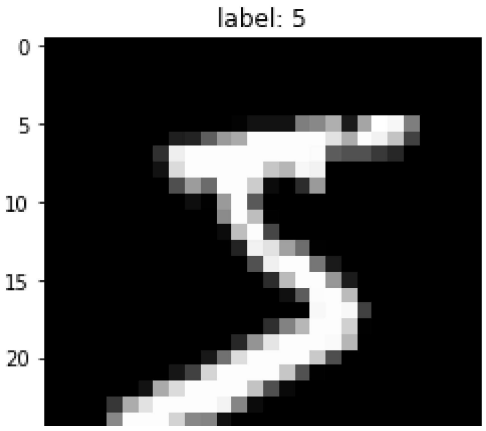
```
#train=True mean?
mnist_train = dset.MNIST("",train=True,transform=transforms.ToTensor(),
                         target_transform=None, download=True)
mnist_test = dset.MNIST("",train=False,transform=transforms.ToTensor(),
                         target_transform=None, download=True)
```

```
Downloading http://yann.lecun.com/exdb/mnist/train-images-idx3-ubyte.gz
Downloading http://yann.lecun.com/exdb/mnist/train-images-idx3-ubyte.gz to MNIST/raw/train-images-idx3-u
Failed to download (trying next):
HTTP Error 503: Service Unavailable

Downloading https://ossci-datasets.s3.amazonaws.com/mnist/train-images-idx3-ubyte.gz
Downloading https://ossci-datasets.s3.amazonaws.com/mnist/train-images-idx3-ubyte.gz to MNIST/raw/train-
                                                                                9913344/? [00:05<00:00, 1776131.00it/s]

Extracting MNIST/raw/train-images-idx3-ubyte.gz to MNIST/raw

Downloading http://yann.lecun.com/exdb/mnist/train-labels-idx1-ubyte.gz
Failed to download (trying next):
HTTP Error 503: Service Unavailable

Downloading https://ossci-datasets.s3.amazonaws.com/mnist/train-labels-idx1-ubyte.gz
Downloading https://ossci-datasets.s3.amazonaws.com/mnist/train-labels-idx1-ubyte.gz to MNIST/raw/train-
                                                                                29696/? [00:01<00:00, 22711.95it/s]

Extracting MNIST/raw/train-labels-idx1-ubyte.gz to MNIST/raw

Downloading http://yann.lecun.com/exdb/mnist/t10k-images-idx3-ubyte.gz
Downloading http://yann.lecun.com/exdb/mnist/t10k-images-idx3-ubyte.gz to MNIST/raw/t10k-images-idx3-uby
Failed to download (trying next):
HTTP Error 503: Service Unavailable

Downloading https://ossci-datasets.s3.amazonaws.com/mnist/t10k-images-idx3-ubyte.gz
Downloading https://ossci-datasets.s3.amazonaws.com/mnist/t10k-images-idx3-ubyte.gz to MNIST/raw/t10k-im
                                                                                1649664/? [00:02<00:00, 804549.11it/s]

Extracting MNIST/raw/t10k-images-idx3-ubyte.gz to MNIST/raw

Downloading http://yann.lecun.com/exdb/mnist/t10k-labels-idx1-ubyte.gz
Failed to download (trying next):
HTTP Error 503: Service Unavailable
```

2.대략적인 데이터 형태

```
print("mnist_train len:", len(mnist_train))
print("mnist_test len:", len(mnist_test))

image, label = mnist_train.__getitem__(0)
print("image data shape: ", image.size())
print("label: ",label)

img = image.numpy()
plt.title("label: %d"%label)
plt.imshow(img[0], cmap = 'gray')
plt.show()
```

```
mnist_train len: 60000
mnist_test len: 10000
Image data shape:  torch.Size([1, 28, 28])
label:  5
```



3. 데이터 로드함수

학습시킬 때 batch_dize 단위로 끊어서 로드하기 위함

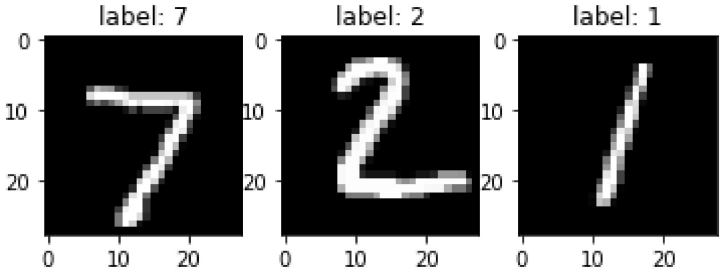
```
batch_size = 1024
learning_rate = 0.01
num_epoch = 400
```

```
train_loader = torch.utils.data.DataLoader(mnist_train,
                                           batch_size=batch_size,
                                           shuffle=True, num_workers=2,# num_workers는 cpu 코어 개수
                                           drop_last=True)
test_loader = torch.utils.data.DataLoader(mnist_test,
                                           batch_size=batch_size,
                                           shuffle=False, num_workers=2,
                                           drop_last=True)
```

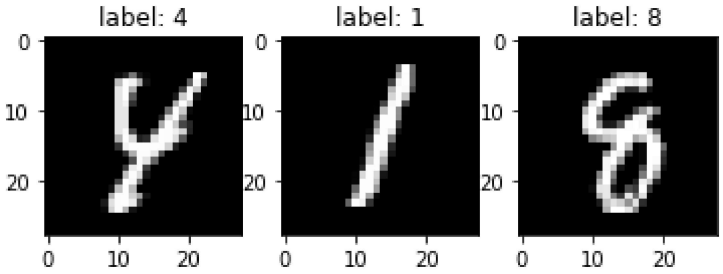
데이터 로드함수 이해하기

```
n = 3
for i ,[imgs, labels] in enumerate(test_loader):
    if i>5:
        break

    print("[%d]"%i)
    print("한 번에 로드되는 데이터 크기: ", len(imgs))

    for j in range(n):
        img = imgs[j].numpy()
        img = img.reshape((img.shape[1], img.shape[2]))

        plt.subplot(1, n, j+1)
        plt.imshow(img, cmap='gray')
        plt.title("label: %d"%labels[j])
    plt.show()
```

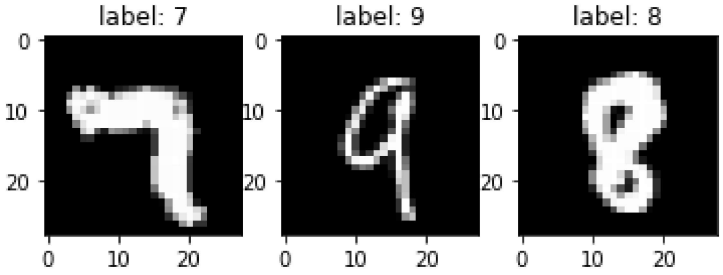
[0]
한 번에 로드되는 데이터 크기: 1024



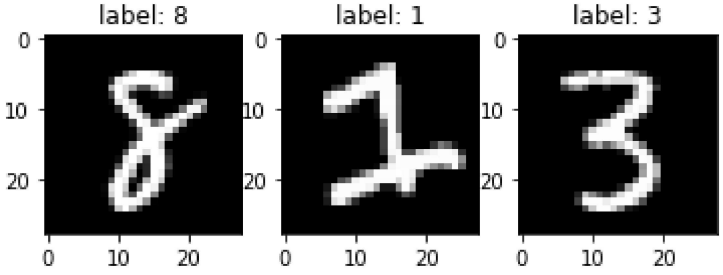
[1]
한 번에 로드되는 데이터 크기: 1024



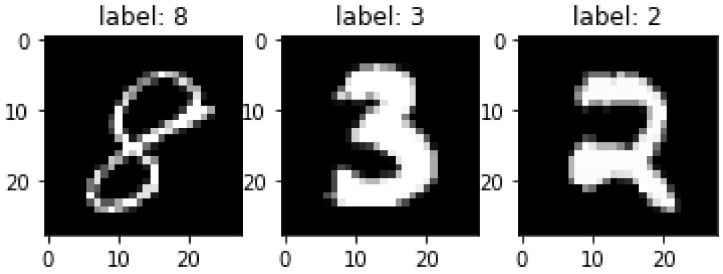
[2]
한 번에 로드되는 데이터 크기: 1024



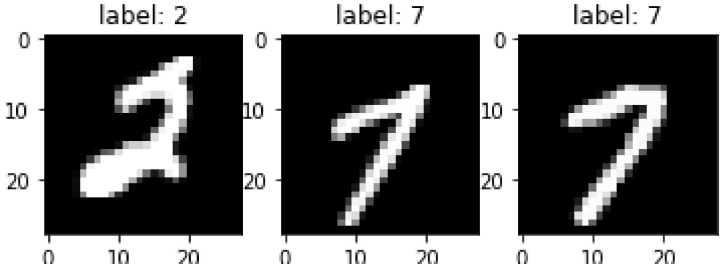
[3]
한 번에 로드되는 데이터 크기: 1024



[4]
한 번에 로드되는 데이터 크기: 1024



[5]
한 번에 로드되는 데이터 크기: 1024



4.모델 선언

```
model = nn.Sequential(
    nn.Linear(28*28,256),
    nn.Sigmoid(),
    nn.Linear(256,128),
    nn.Linear(128,10),
)
```

```
def ComputeAccr(dloader, imodel):
    correct = 0
    total = 0

    for j, [imgs, labels] in enumerate(dloader):
        img = imgs
        label = Variable(labels)

        img = img.reshape((img.shape[0],img.shape[2], img.shape[3]))

        img = img.reshape((img.shape[0],img.shape[1]*img.shape[2]))
        img = Variable(img, requires_grad=False)
        output = imodel(img)

        _, output_index = torch.max(output, 1)

        total += label.size(0)
        correct += (output_index == label).sum().float()
    print("Accuracy of Test Data: {}".format(100*correct/total))
```

```
ComputeAccr(test_loader,model)
```

```
Accuracy of Test Data: 9.765625
```

5.loss, optimizer

```
loss_func = nn.CrossEntropyLoss()
optimizer = optim.SGD(model.parameters(), lr=learning_rate)
```

6.학습

```
%time
num_epoch = 400
for j in range(num_epoch):
    for i ,[imgs, labels] in enumerate(train_loader):
        img = imgs
        label = Variable(labels)

```

```
        img = img.reshape((img.shape[0],img.shape[2], img.shape[3]))

        img = img.reshape((img.shape[0],img.shape[1]*img.shape[2]))
        img = Variable(img, requires_grad=True)

        optimizer.zero_grad()
        output = model(img)
        loss = loss_func(output, label)

        loss.backward()
        optimizer.step()

    if j%50 == 0:
        print("%d.."%j)
        ComputeAccr(test_loader, model)
        print(loss)
```

```
CPU times: user 4 µs, sys: 0 ns, total: 4 µs
Wall time: 8.34 µs
0..
Accuracy of Test Data: 11.295573234558105
tensor(2.2978, grad_fn=<NllLossBackward>)
50..
Accuracy of Test Data: 80.67491149902344
tensor(0.7203, grad_fn=<NllLossBackward>)
100..
Accuracy of Test Data: 88.37890625
tensor(0.4582, grad_fn=<NllLossBackward>)
150..
Accuracy of Test Data: 89.96310424804688
tensor(0.3168, grad_fn=<NllLossBackward>)
200..
Accuracy of Test Data: 90.69010162353516
tensor(0.3112, grad_fn=<NllLossBackward>)
250..
Accuracy of Test Data: 91.17838287353516
tensor(0.3241, grad_fn=<NllLossBackward>)
300..
Accuracy of Test Data: 91.61241149902344
tensor(0.3024, grad_fn=<NllLossBackward>)
350..
Accuracy of Test Data: 91.82942962646484
tensor(0.3025, grad_fn=<NllLossBackward>)
```

7.테스트

```
ComputeAccr(test_loader, model)
```

```
Accuracy of Test Data: 91.90538024902344
```

8.학습된 파라미터 저장

```
# netname=''
# torch.save(model, netname )
```

```
2 # torch.save(model, netname,)
3 # #model = torch.load(netname)
```

9.(Optional) 실습1에 쓰인 .npz만드려면?

```
1 # np.savez_compressed('',
2 #                        W1=W1, b1=b1,
3 #                        W2=W2, b2=b2,
4 #                        W3=W3, b3=b3,
5 #                        )
```