Data Science(Machine Learning, Deep Learning)

- 소스 깃 참고

16장 표현학습, 17장 확률론적 관점 패스

CNN(합성곱신경망) - Convolutional Neural Network

패턴 추출

pytorch, torchvision 설치가 안 되어 에러가 뜨는 경우
conda install pytorch torchvision install 해줘야함.

<cnn.py> - 모델 클래스 구현

<train.py 수정>

```
(base) C:\Users\admin\Desktop\BigData DeepLearning\DeepLearning
소스코드\실습\18-cnn>python train.py --model_fn ./model.pth --model cnn
Train: torch.Size([48000, 28, 28]) torch.Size([48000])
Valid: torch.Size([12000, 28, 28]) torch.Size([12000])
ConvolutionalClassifier(
  (blocks): Sequential(
    (0): ConvolutionBlock(
      (layers): Sequential(
        (0): Conv2d(1, 32, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
        (1): ReLU()
        (2): BatchNorm2d(32, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
        (3): Conv2d(32, 32, kernel_size=(3, 3), stride=(2, 2), padding=(1, 1))
        (4): ReLU()
        (5): BatchNorm2d(32, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      )
    )
    (1): ConvolutionBlock(
      (layers): Sequential(
        (0): Conv2d(32, 64, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
        (1): ReLU()
        (2): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
        (3): Conv2d(64, 64, kernel_size=(3, 3), stride=(2, 2), padding=(1, 1))
        (4): ReLU()
        (5): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      )
    )
    (2): ConvolutionBlock(
      (layers): Sequential(
        (0): Conv2d(64, 128, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
        (1): ReLU()
```

```
        (2): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
        (3): Conv2d(128, 128, kernel_size=(3, 3), stride=(2, 2), padding=(1, 1))
        (4): ReLU()
        (5): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      )
    )
    (3): ConvolutionBlock(
      (layers): Sequential(
        (0): Conv2d(128, 256, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
        (1): ReLU()
        (2): BatchNorm2d(256, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
        (3): Conv2d(256, 256, kernel_size=(3, 3), stride=(2, 2), padding=(1, 1))
        (4): ReLU()
        (5): BatchNorm2d(256, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      )
    )
    (4): ConvolutionBlock(
      (layers): Sequential(
        (0): Conv2d(256, 512, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
        (1): ReLU()
        (2): BatchNorm2d(512, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
        (3): Conv2d(512, 512, kernel_size=(3, 3), stride=(2, 2), padding=(1, 1))
        (4): ReLU()
        (5): BatchNorm2d(512, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      )
    )
  )
  (layers): Sequential(
    (0): Linear(in_features=512, out_features=50, bias=True)
    (1): ReLU()
    (2): BatchNorm1d(50, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
    (3): Linear(in_features=50, out_features=10, bias=True)
    (4): LogSoftmax(dim=-1)
  )
)
Adam (
Parameter Group 0
    amsgrad: False
    betas: (0.9, 0.999)
    capturable: False
    differentiable: False
    eps: 1e-08
    foreach: None
```

```
    fused: None
    lr: 0.001
    maximize: False
    weight_decay: 0
)
NLLLoss()
Epoch(1/10): train_loss=1.8603e-01   valid_loss=8.7814e-02   lowest_loss=8.7814e-02
Epoch(2/10): train_loss=5.3109e-02   valid_loss=8.4416e-02   lowest_loss=8.4416e-02
Epoch(3/10): train_loss=3.6915e-02   valid_loss=4.5671e-02   lowest_loss=4.5671e-02
Epoch(4/10): train_loss=2.4024e-02   valid_loss=4.1718e-02   lowest_loss=4.1718e-02
Epoch(5/10): train_loss=2.2342e-02   valid_loss=4.2429e-02   lowest_loss=4.1718e-02
Epoch(6/10): train_loss=2.2036e-02   valid_loss=4.5503e-02   lowest_loss=4.1718e-02
Epoch(7/10): train_loss=1.4721e-02   valid_loss=6.0025e-02   lowest_loss=4.1718e-02
Epoch(8/10): train_loss=1.4759e-02   valid_loss=4.6336e-02   lowest_loss=4.1718e-02
Epoch(9/10): train_loss=1.4324e-02   valid_loss=3.6083e-02   lowest_loss=3.6083e-02
Epoch(10/10): train_loss=7.2854e-03   valid_loss=6.8029e-02   lowest_loss=3.6083e-02
```

python train.py --model_fn ./model.pth --model cnn을 사용하여 트레이닝을 했을 때 이와 같은 형태가 나온다.

<predict.ipynb 수정>

```
import sys
import numpy as np
import matplotlib.pyplot as plt

from mnist_classifier.utils import load_mnist
from mnist_classifier.utils import get_model
```

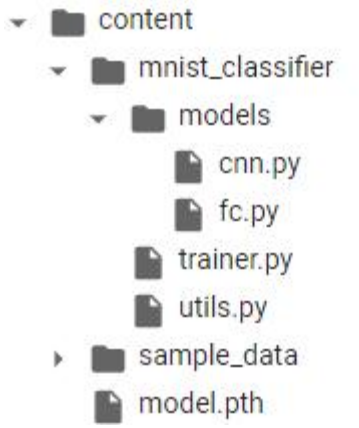
이 부분에서 에러가 발생함.

<에러 해결>
Colab에서 train.py로 만든 model.pth content로 이동 시키기
mnist_classifier 폴더 생성 trainer.py utils.py 이동
하위 폴더로 models 폴더 생성 cnn.py fc.py 이동

import sys 앞 구문에 코드 추가

```
from google.colab import drive
drive.mount('/content/drive')
%cd /content/drive/MyDrive/Colab Notebooks/BigData DeepLearning/DeepLearning 소스코드/실습/18-cnn
```

Colab의 드라이브 마운트 시켜줘야 함.

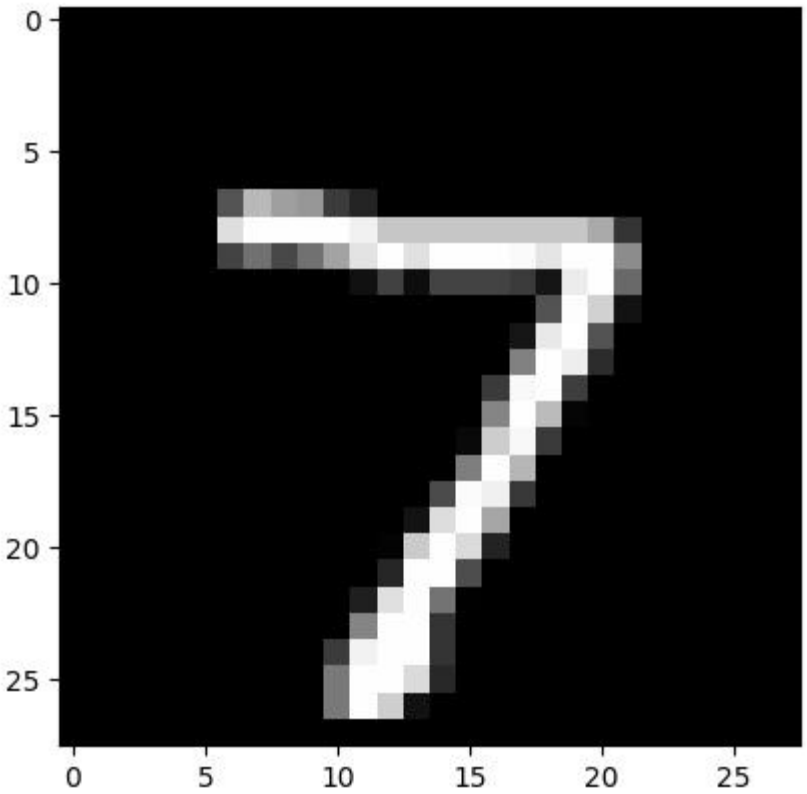


MNIST 테스트 세팅

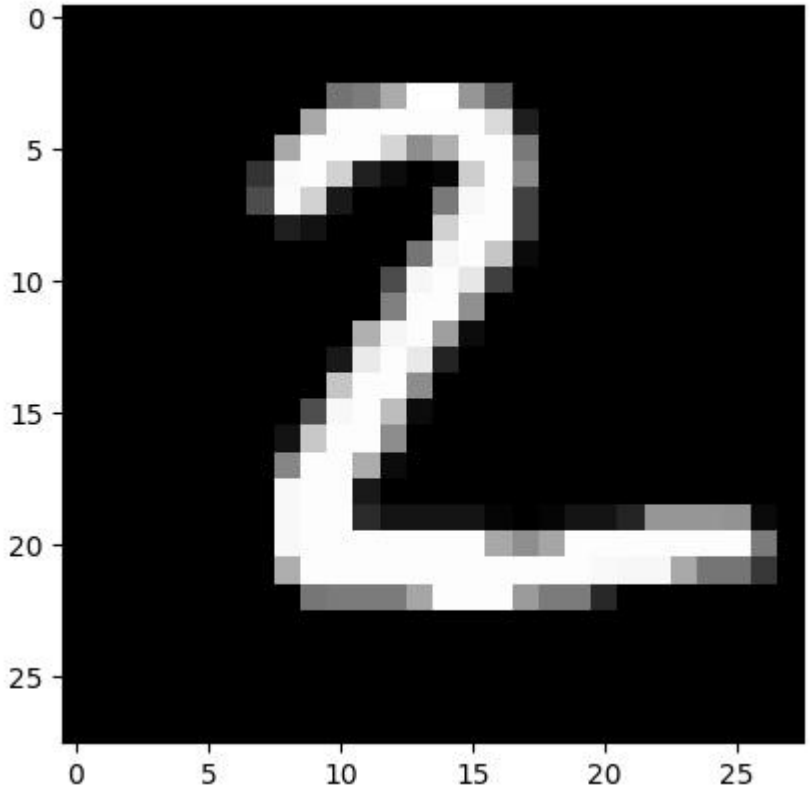
```
# Load MNIST test set.
x, y = load_mnist(is_train=False, flatten=(train_config.model == "fc"))
x, y = x.to(device), y.to(device)

print(x.shape, y.shape)

input_size = int(x.shape[-1])
output_size = int(max(y)) + 1

model = get_model(
    input_size,
    output_size,
    train_config,
    device,
)

model.load_state_dict(model_dict)

test(model, x, y, to_be_shown=False)
```

```
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
../data/MNIST/raw/train-images-idx3-ubyte.gz
100%|████████████████| 9912422/9912422 [00:00<00:00, 128978523.84it/s]Extracting
../data/MNIST/raw/train-images-idx3-ubyte.gz to ../data/MNIST/raw


Downloading http://yann.lecun.com/exdb/mnist/train-labels-idx1-ubyte.gz
Downloading http://yann.lecun.com/exdb/mnist/train-labels-idx1-ubyte.gz to
../data/MNIST/raw/train-labels-idx1-ubyte.gz
100%|████████████████| 28881/28881 [00:00<00:00, 32554607.32it/s]
Extracting ../data/MNIST/raw/train-labels-idx1-ubyte.gz to ../data/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
../data/MNIST/raw/t10k-images-idx3-ubyte.gz
100%|████████████████| 1648877/1648877 [00:00<00:00, 68804570.43it/s]Extracting
../data/MNIST/raw/t10k-images-idx3-ubyte.gz to ../data/MNIST/raw
```

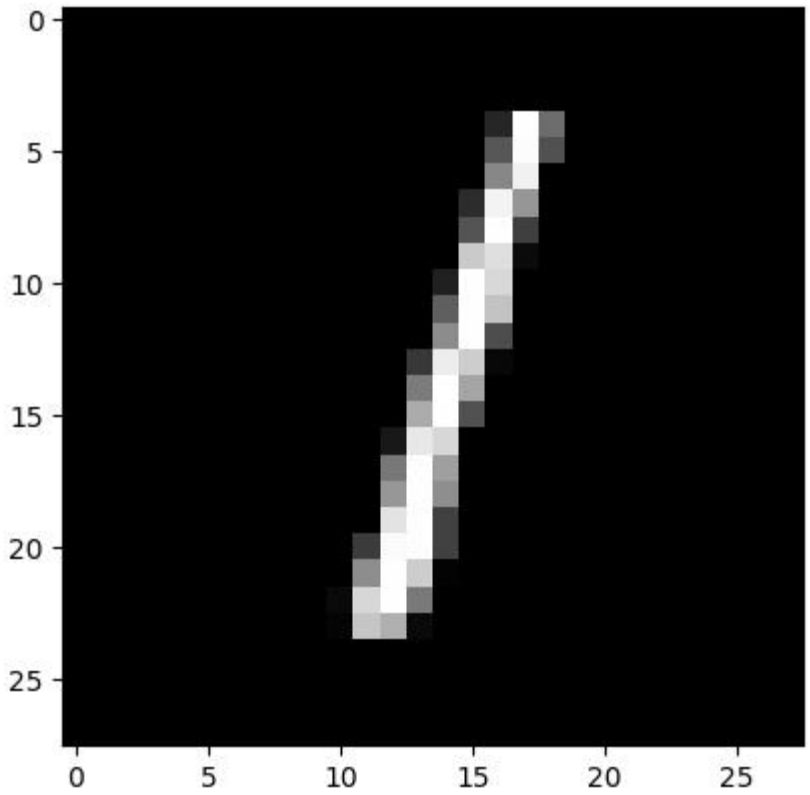
```
Downloading http://yann.lecun.com/exdb/mnist/t10k-labels-idx1-ubyte.gz
Downloading http://yann.lecun.com/exdb/mnist/t10k-labels-idx1-ubyte.gz to
../data/MNIST/raw/t10k-labels-idx1-ubyte.gz
100%|████████████████| 4542/4542 [00:00<00:00, 3428203.85it/s]
Extracting ../data/MNIST/raw/t10k-labels-idx1-ubyte.gz to ../data/MNIST/raw

torch.Size([10000, 28, 28]) torch.Size([10000])
Accuracy: 0.9916

n_test = 20
test(model, x[:n_test], y[:n_test], to_be_shown=True)


Accuracy: 1.0000
```



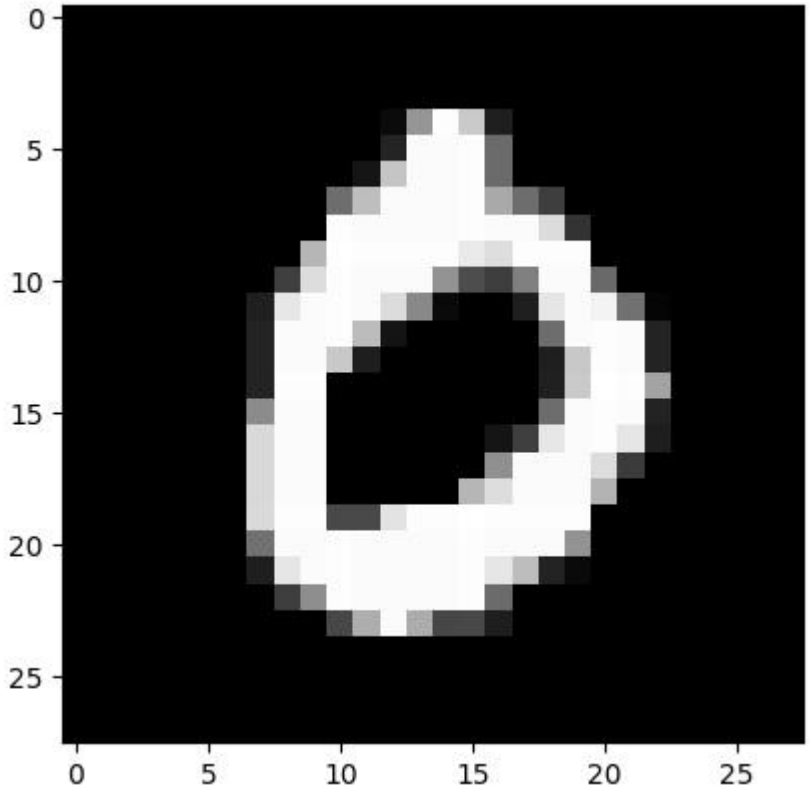
Predict: 7.0



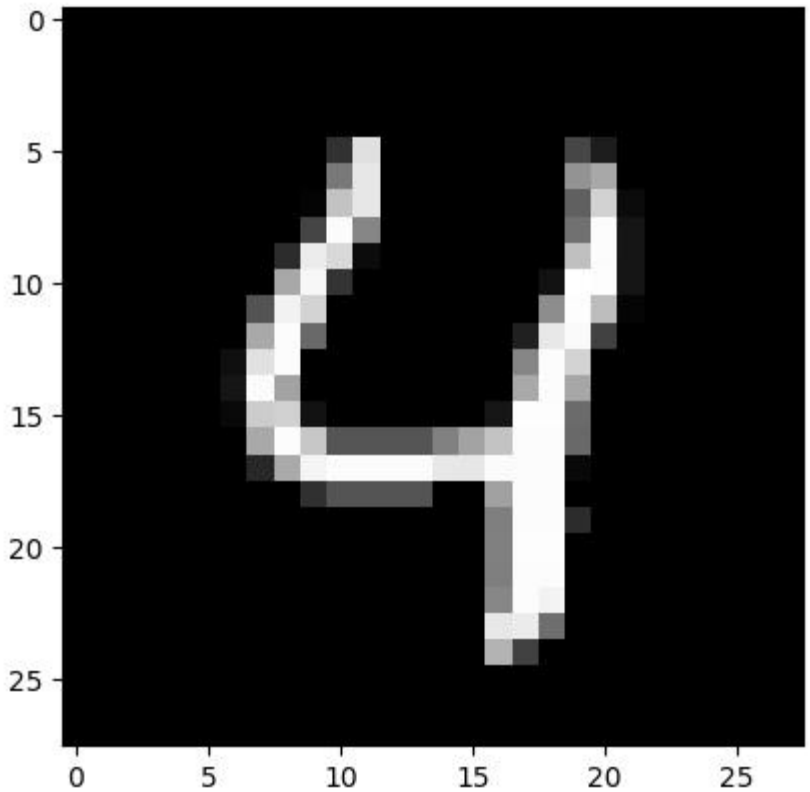
Predict: 2.0



Predict: 1.0



Predict: 0.0



이와 같은 형태로 나타난다.