Data Science(Machine Learning, Deep Learning)

- 실습 소스 깃 참고

<실전 머신러닝 활용 및 데이터 수집>

train.py 구현 및 실행
<train.py 소스 코드>

```
import argparse

import torch
import torch.nn as nn
import torch.optim as optim

from model import ImageClassifier
from trainer import Trainer

from utils import load_mnist
from utils import split_data
from utils import get_hidden_sizes


def define_argparser():
    p = argparse.ArgumentParser()

    p.add_argument('--model_fn', required=True)
    p.add_argument('--gpu_id', type=int, default=0 if torch.cuda.is_available() else -1)

    p.add_argument('--train_ratio', type=float, default=.8)

    p.add_argument('--batch_size', type=int, default=256)
    p.add_argument('--n_epochs', type=int, default=20)

    p.add_argument('--n_layers', type=int, default=5)
    p.add_argument('--use_dropout', action='store_true')
    p.add_argument('--dropout_p', type=float, default=.3)

    p.add_argument('--verbose', type=int, default=1)

    config = p.parse_args()

    return config


def main(config):
    # Set device based on user defined configuration.
    device = torch.device('cpu') if config.gpu_id < 0 else torch.device('cuda:%d' %
config.gpu_id)
```

```
    x, y = load_mnist(is_train=True, flatten=True)
    x, y = split_data(x.to(device), y.to(device), train_ratio=config.train_ratio)

    print("Train:", x[0].shape, y[0].shape)
    print("Valid:", x[1].shape, y[1].shape)

    input_size = int(x[0].shape[-1])
    output_size = int(max(y[0])) + 1

    model = ImageClassifier(
        input_size=input_size,
        output_size=output_size,
        hidden_sizes=get_hidden_sizes(input_size,
                                      output_size,
                                      config.n_layers),
        use_batch_norm=not config.use_dropout,
        dropout_p=config.dropout_p,
    ).to(device)
    optimizer = optim.Adam(model.parameters())
    crit = nn.NLLLoss()

    if config.verbose >= 1:
        print(model)
        print(optimizer)
        print(crit)

    trainer = Trainer(model, optimizer, crit)

    trainer.train(
        train_data=(x[0], y[0]),
        valid_data=(x[1], y[1]),
        config=config
    )

    # Save best model weights.
    torch.save({
        'model': trainer.model.state_dict(),
        'opt': optimizer.state_dict(),
        'config': config,
    }, config.model_fn)


if __name__ == '__main__':
    config = define_argparser()
    main(config)
```

main이 보통은 숨겨져 있음.
소스 코드를 파악할 때 main부분을 파악하는 것이 중요함.

arg = 인수, 매개변수라고도 함
함수를 호출할 때 전달되는 값을 인수라고 하고, 함수를 정의할 때 선언되는 변수를 매개변수라고 합니다.

arg는 인수와 매개변수의 개념을 모두 포함하는 포괄적인 용어

<train.py 활용>
Anaconda Prompt
<Pytorch 설치>
(base) C:\Users\admin\Desktop\BigData DeepLearning\DeepLearning 소스코드\실습\15-practical_exercise>conda install pytorch
The following packages will be downloaded:

```
    package                    |            build
    ---------------------------|-----------------
    ca-certificates-2023.08.22 |       haa95532_0         123 KB
    conda-content-trust-0.2.0  |  py311haa95532_0          82 KB
    libuv-1.44.2               |       h2bbff1b_0         288 KB
    ninja-1.10.2               |       haa95532_5          14 KB
    ninja-base-1.10.2          |       h6d14046_5         255 KB
    openssl-1.1.1w             |       h2bbff1b_0         5.5 MB
    pytorch-2.0.1              |cpu_py311hd080823_0        91.2 MB
    ------------------------------------------------------------
                                           Total:         97.5 MB
```

Package 설치
중간에 Proceed ([y]/n)?가 나오면 y입력

(base) C:\Users\admin\Desktop\BigData DeepLearning\DeepLearning 소스코드\실습\15-practical_exercise>python train.py
usage: train.py [-h] --model_fn MODEL_FN [--gpu_id GPU_ID] [--train_ratio TRAIN_RATIO] [--batch_size BATCH_SIZE]
[--n_epochs N_EPOCHS] [--n_layers N_LAYERS] [--use_dropout] [--dropout_p DROPOUT_P] [--verbose VERBOSE]
train.py: error: the following arguments are required: --model_fn

에러가 뜸

```
if __name__ == '__main__':
    config = define_argparser()
    main(config)
```

argparser로 매개변수(인수)를 쪼갬

(base) C:\Users\admin\Desktop\BigData DeepLearning\DeepLearning 소스코드\실습\15-practical_exercise>python train.py --model_fn tmp.pth --gpu_id -1 --batch_size 256 --n_epochs 20 –n_layers 5

아래같이 에러가 뜨는 경우 conda install torchvision으로 TorchVision 설치해 줘야 함
(base) C:\Users\admin\Desktop\BigData DeepLearning\DeepLearning 소스코드\실습\15-practical_exercise>python train.py --model_fn tmp.pth --gpu_id -1 --batch_size 256 --n_epochs 20 --n_layers 5

```
Traceback (most recent call last):
  File "C:\Users\admin\Desktop\BigData DeepLearning\DeepLearning
소스코드\실습\15-practical_exercise\train.py", line 85, in <module>
    main(config)
  File "C:\Users\admin\Desktop\BigData DeepLearning\DeepLearning
소스코드\실습\15-practical_exercise\train.py", line 41, in main
    x, y = load_mnist(is_train=True, flatten=True)
           ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
  File "C:\Users\admin\Desktop\BigData DeepLearning\DeepLearning
소스코드\실습\15-practical_exercise\utils.py", line 5, in load_mnist
    from torchvision import datasets, transforms
ModuleNotFoundError: No module named 'torchvision'

(base) C:\Users\admin\Desktop\BigData DeepLearning\DeepLearning
소스코드\실습\15-practical_exercise>python train.py --model_fn tmp.pth --gpu_id -1
--batch_size 256 --n_epochs 20 --n_layers 5
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, 33641580.07it/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, 343026.50it/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 [00:01<00:00, 1347742.62it/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<?, ?it/s]
Extracting ../data\MNIST\raw\t10k-labels-idx1-ubyte.gz to ../data\MNIST\raw

Train: torch.Size([48000, 784]) torch.Size([48000])
Valid: torch.Size([12000, 784]) torch.Size([12000])
ImageClassifier(
  (layers): Sequential(
    (0): Block(
      (block): Sequential(
```

```
          (0): Linear(in_features=784, out_features=630, bias=True)
          (1): LeakyReLU(negative_slope=0.01)
          (2): BatchNorm1d(630, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
        )
      )
      (1): Block(
        (block): Sequential(
          (0): Linear(in_features=630, out_features=476, bias=True)
          (1): LeakyReLU(negative_slope=0.01)
          (2): BatchNorm1d(476, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
        )
      )
      (2): Block(
        (block): Sequential(
          (0): Linear(in_features=476, out_features=322, bias=True)
          (1): LeakyReLU(negative_slope=0.01)
          (2): BatchNorm1d(322, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
        )
      )
      (3): Block(
        (block): Sequential(
          (0): Linear(in_features=322, out_features=168, bias=True)
          (1): LeakyReLU(negative_slope=0.01)
          (2): BatchNorm1d(168, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
        )
      )
      (4): Linear(in_features=168, out_features=10, bias=True)
      (5): 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(1/20): train_loss=1.9742e-01   valid_loss=1.0411e-01   lowest_loss=1.0411e-01
Epoch(2/20): train_loss=8.1424e-02   valid_loss=9.0457e-02   lowest_loss=9.0457e-02
```

```
Epoch(3/20): train_loss=5.6666e-02   valid_loss=8.7683e-02   lowest_loss=8.7683e-02
Epoch(4/20): train_loss=4.2112e-02   valid_loss=1.0279e-01   lowest_loss=8.7683e-02
Epoch(5/20): train_loss=3.5553e-02   valid_loss=8.5411e-02   lowest_loss=8.5411e-02
Epoch(6/20): train_loss=2.5702e-02   valid_loss=7.4233e-02   lowest_loss=7.4233e-02
Epoch(7/20): train_loss=2.6314e-02   valid_loss=7.5723e-02   lowest_loss=7.4233e-02
Epoch(8/20): train_loss=2.0976e-02   valid_loss=8.4059e-02   lowest_loss=7.4233e-02
Epoch(9/20): train_loss=1.5663e-02   valid_loss=9.4074e-02   lowest_loss=7.4233e-02
Epoch(10/20): train_loss=1.7997e-02   valid_loss=8.3264e-02   lowest_loss=7.4233e-02
Epoch(11/20): train_loss=1.5647e-02   valid_loss=8.0157e-02   lowest_loss=7.4233e-02
Epoch(12/20): train_loss=1.3690e-02   valid_loss=7.8018e-02   lowest_loss=7.4233e-02
Epoch(13/20): train_loss=1.5982e-02   valid_loss=8.3138e-02   lowest_loss=7.4233e-02
Epoch(14/20): train_loss=1.2972e-02   valid_loss=8.2686e-02   lowest_loss=7.4233e-02
Epoch(15/20): train_loss=1.1763e-02   valid_loss=7.6221e-02   lowest_loss=7.4233e-02
Epoch(16/20): train_loss=1.2345e-02   valid_loss=7.0978e-02   lowest_loss=7.0978e-02
Epoch(17/20): train_loss=8.5329e-03   valid_loss=7.4744e-02   lowest_loss=7.0978e-02
Epoch(18/20): train_loss=9.8661e-03   valid_loss=8.3837e-02   lowest_loss=7.0978e-02
Epoch(19/20): train_loss=7.0544e-03   valid_loss=7.6451e-02   lowest_loss=7.0978e-02
Epoch(20/20): train_loss=1.0674e-02   valid_loss=7.2226e-02   lowest_loss=7.0978e-02
```

에러가 안 뜨면 이와 같이 나오면서 tmp.pth가 생성이 됨.

<MNIST란?>
MNIST는 "Modified National Institute of Standards and Technology"의 약어로, 손으로 쓴 숫자(0에서 9까지)로 이루어진 대형 데이터 세트
머신 러닝 및 딥 러닝에서 기본적으로 사용되는 벤치마크 데이터 세트

MNIST 데이터 세트는 컴퓨터 비전에서 이미지 분류 알고리즘을 개발하고 테스트하는 데 사용된다.
많은 머신 러닝 및 딥 러닝 프레임워크와 라이브러리에서 쉽게 사용할 수 있습니다.
MNIST 데이터 세트는 비교적 작고 간단하기 때문에, 머신 러닝 및 딥 러닝 모델을 처음 학습하는 데 좋은 출발점이 된다.

<predict.ipynb 구현>
Colab에서의 Linux 환경 구현
!ls로 현재 디렉토리 위치 확인
model.py를 content에 끌어다 넣고 !python model.py 실행

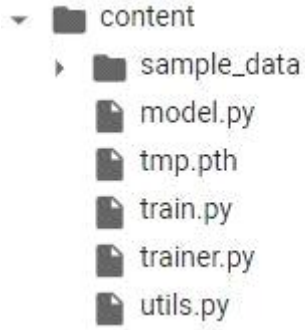
```
[ ]  !ls

     model.py  __pycache__  sample_data  tmp.pth  utils.py

[ ]  !python model.py

[ ]  !python utils.py
```

```
import sys
import numpy as np
import matplotlib.pyplot as plt
from model import ImageClassifier from utils import load_mnist
```

from utils import split_data

from utils import get_hidden_sizes 앞쪽에 추가 입력

앞서 tmp.pth 만든 것 역시 content에 복사



Jupyter Notebook에서는 환경이 다를 수 있음.