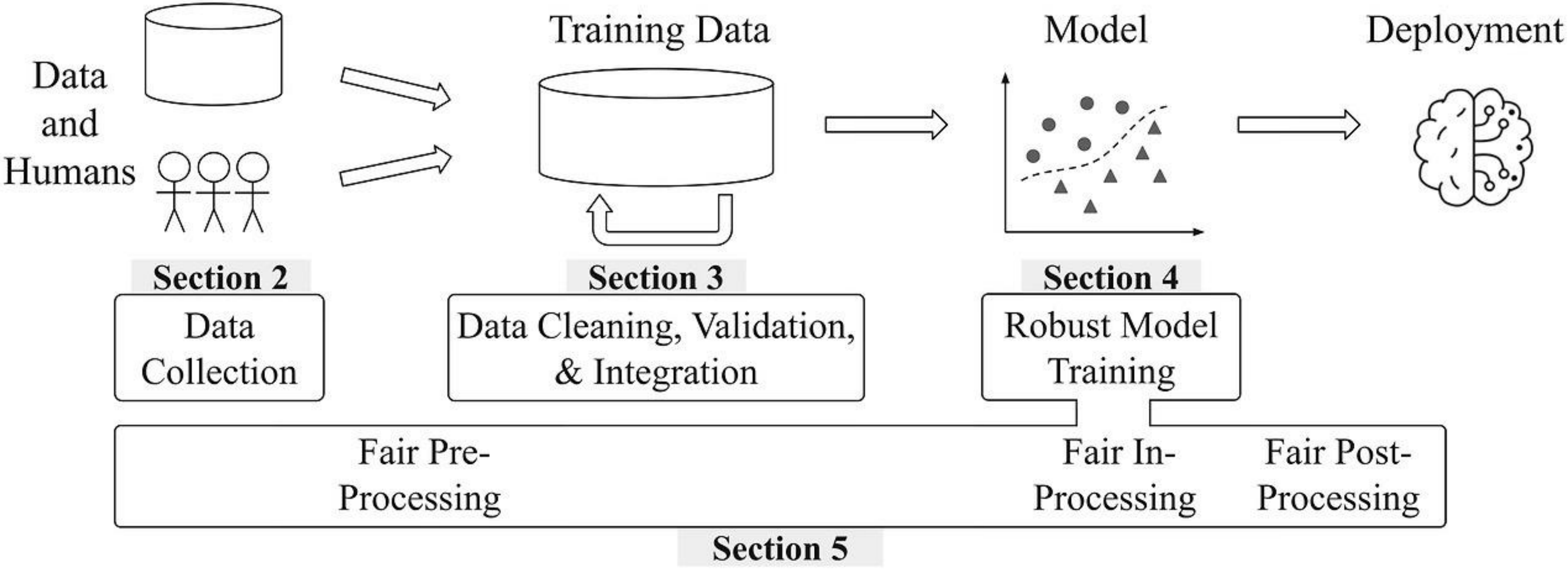
AI 실전 2주차

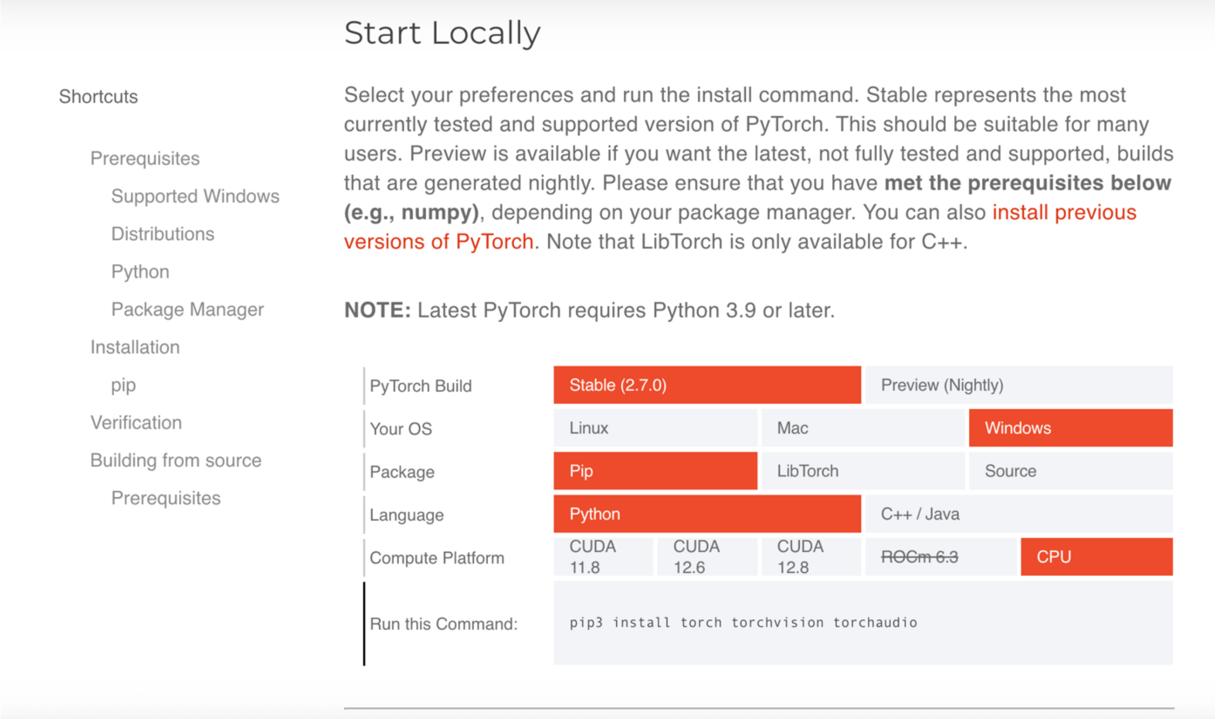
나만의 모델 설계 과정 및 진행

Feat. PyTorch

모델 제작 과정


Data and Humans
Training Data
Model
Deployment
Section 2
Data Collection
Section 3
Data Cleaning, Validation, & Integration
Section 4
Robust Model Training
Fair Pre-Processing
Fair In-Processing
Fair Post-Processing
Section 5

Pytorch install



Start Locally

Shortcuts

- Prerequisites
  - Supported Windows
  - Distributions
  - Python
  - Package Manager
- Installation
  - pip
- Verification
- Building from source
  - Prerequisites

Select your preferences and run the install command. Stable represents the most currently tested and supported version of PyTorch. This should be suitable for many users. Preview is available if you want the latest, not fully tested and supported, builds that are generated nightly. Please ensure that you have **met the prerequisites below (e.g., numpy)**, depending on your package manager. You can also install previous versions of PyTorch. Note that LibTorch is only available for C++.

NOTE: Latest PyTorch requires Python 3.9 or later.

PyTorch Build	[✓ Stable (2.7.0)]	Preview (Nightly)			
Your OS	Linux	Mac	[✓ Windows]		
Package	[✓ Pip]	LibTorch	Source		
Language	[✓ Python]	C++ / Java			
Compute Platform	CUDA 11.8	CUDA 12.6	CUDA 12.8	~~ROCm 6.3~~	[✓ CPU]

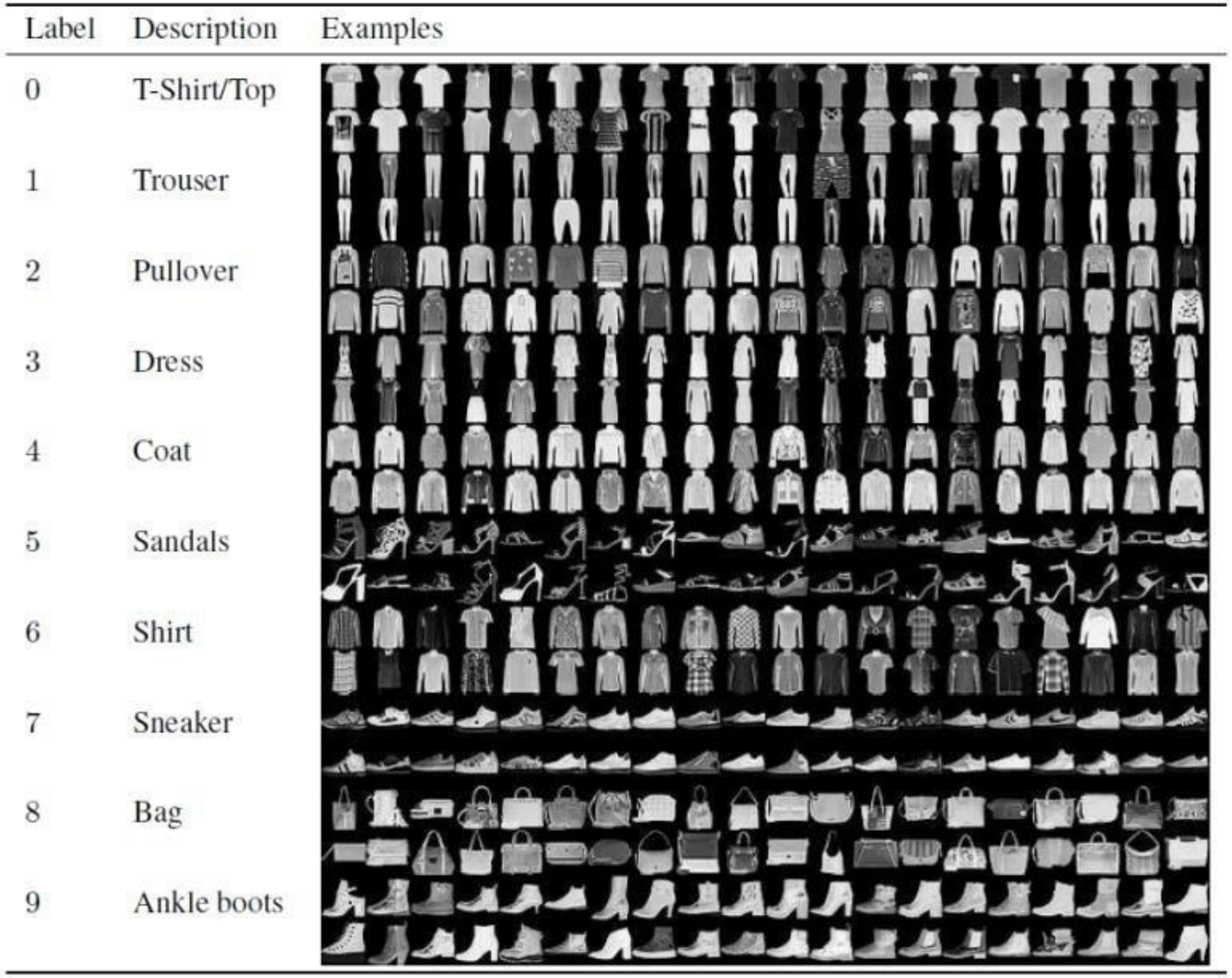
Run this Command:

```
pip3 install torch torchvision torchaudio
```

- pip3 install torch torchvision torchaudio

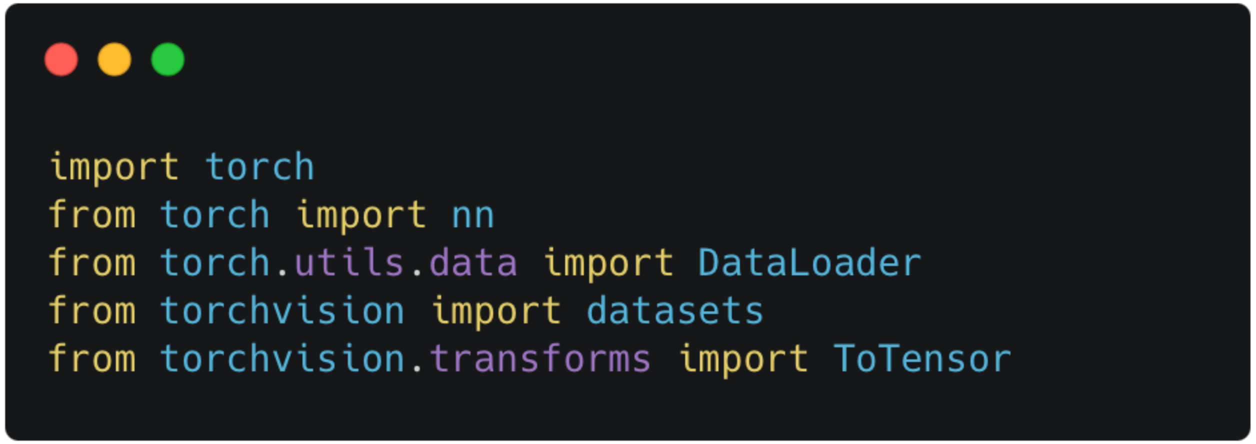
https://pytorch.org/get-started/locally/

CIFAR-10 DataSet



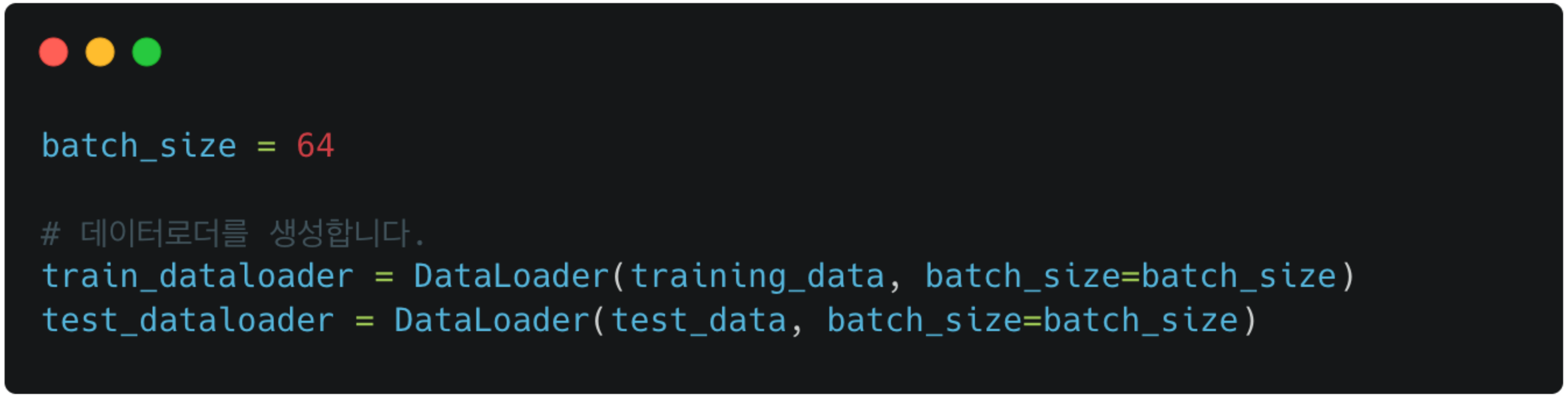
Label	Description	Examples
0	T-Shirt/Top	
1	Trouser	
2	Pullover	
3	Dress	
4	Coat	
5	Sandals	
6	Shirt	
7	Sneaker	
8	Bag	
9	Ankle boots	

필요한 라이브러리 불러오기



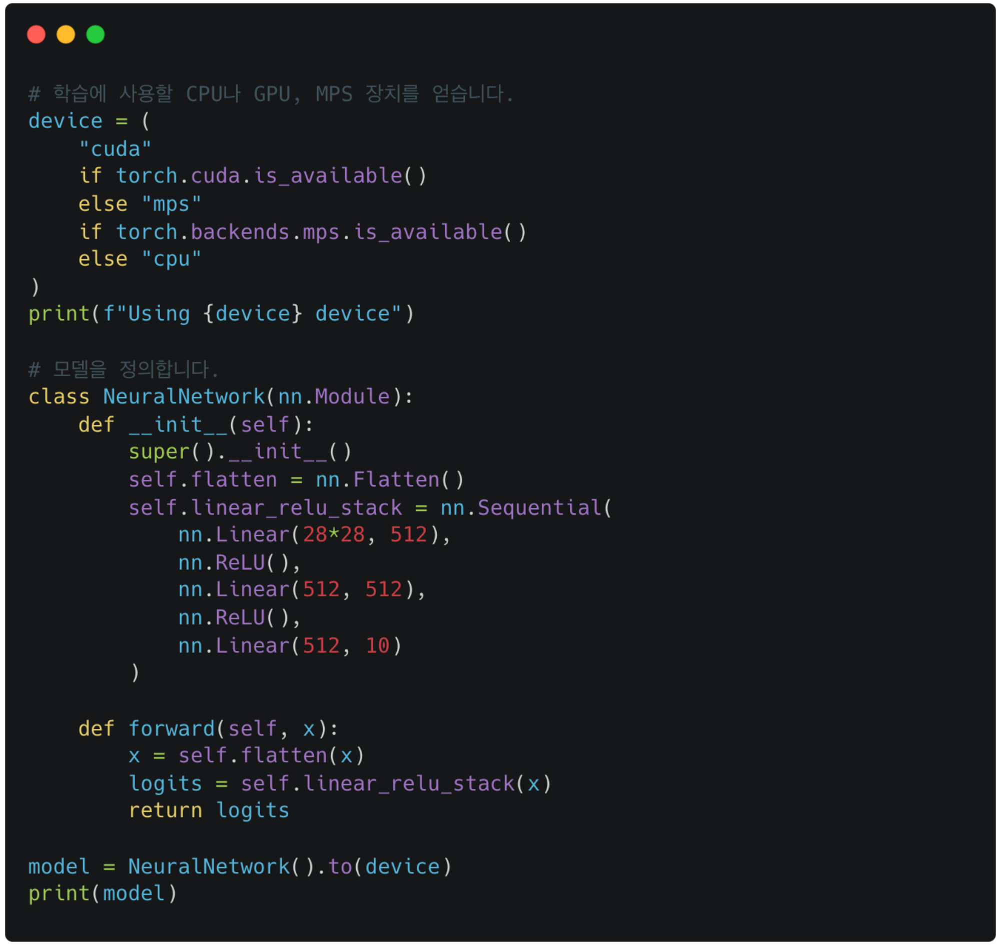
```python
import torch
from torch import nn
from torch.utils.data import DataLoader
from torchvision import datasets
from torchvision.transforms import ToTensor
```

1. Load DataSet



```
batch_size = 64

# 데이터로더를 생성합니다.
train_dataloader = DataLoader(training_data, batch_size=batch_size)
test_dataloader = DataLoader(test_data, batch_size=batch_size)
```

2. Model 생성

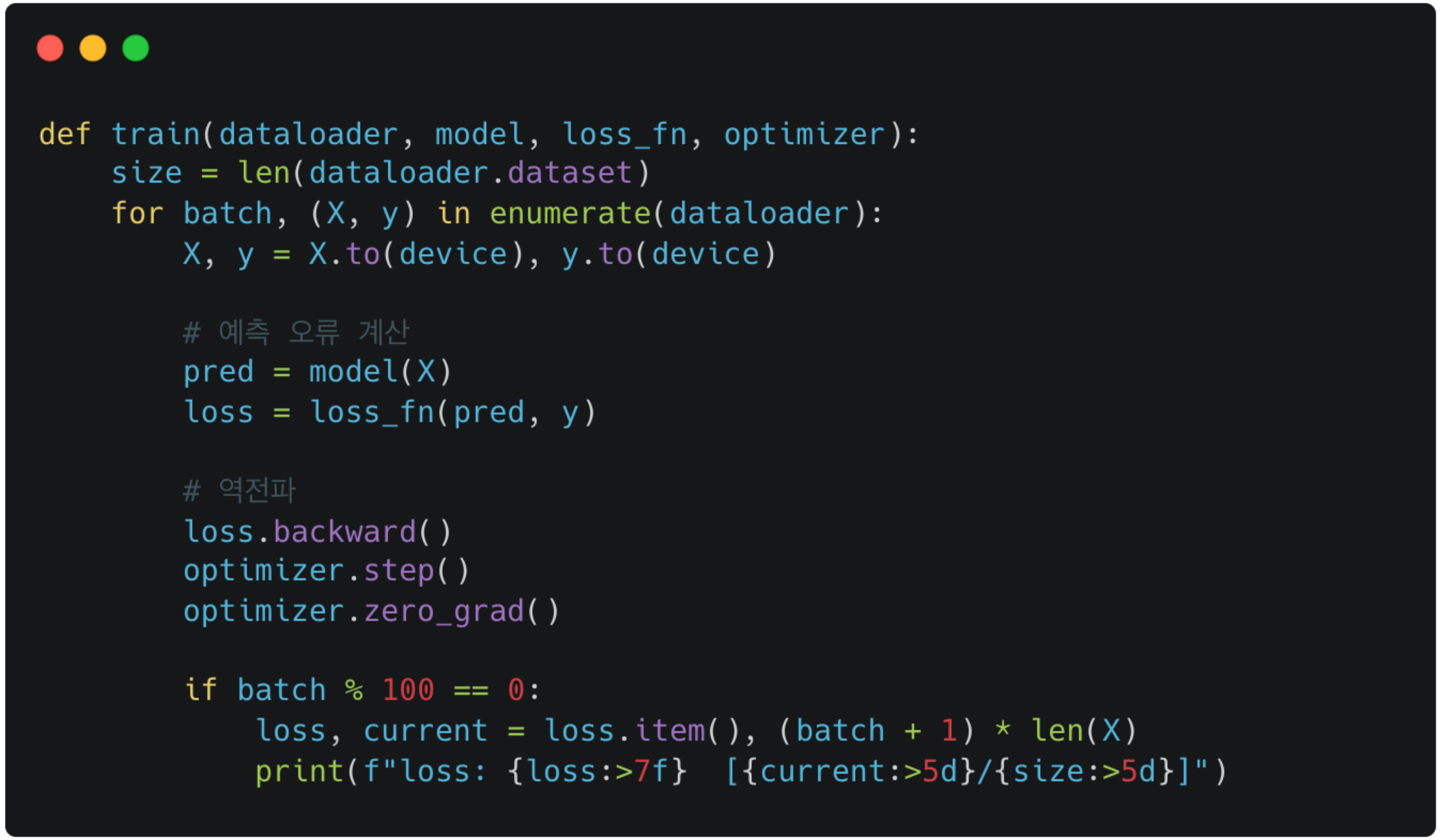


```python
# 학습에 사용할 CPU나 GPU, MPS 장치를 얻습니다.
device = (
    "cuda"
    if torch.cuda.is_available()
    else "mps"
    if torch.backends.mps.is_available()
    else "cpu"
)
print(f"Using {device} device")

# 모델을 정의합니다.
class NeuralNetwork(nn.Module):
    def __init__(self):
        super().__init__()
        self.flatten = nn.Flatten()
        self.linear_relu_stack = nn.Sequential(
            nn.Linear(28*28, 512),
            nn.ReLU(),
            nn.Linear(512, 512),
            nn.ReLU(),
            nn.Linear(512, 10)
        )

    def forward(self, x):
        x = self.flatten(x)
        logits = self.linear_relu_stack(x)
        return logits

model = NeuralNetwork().to(device)
print(model)
```

3. 모델 최적화 설정

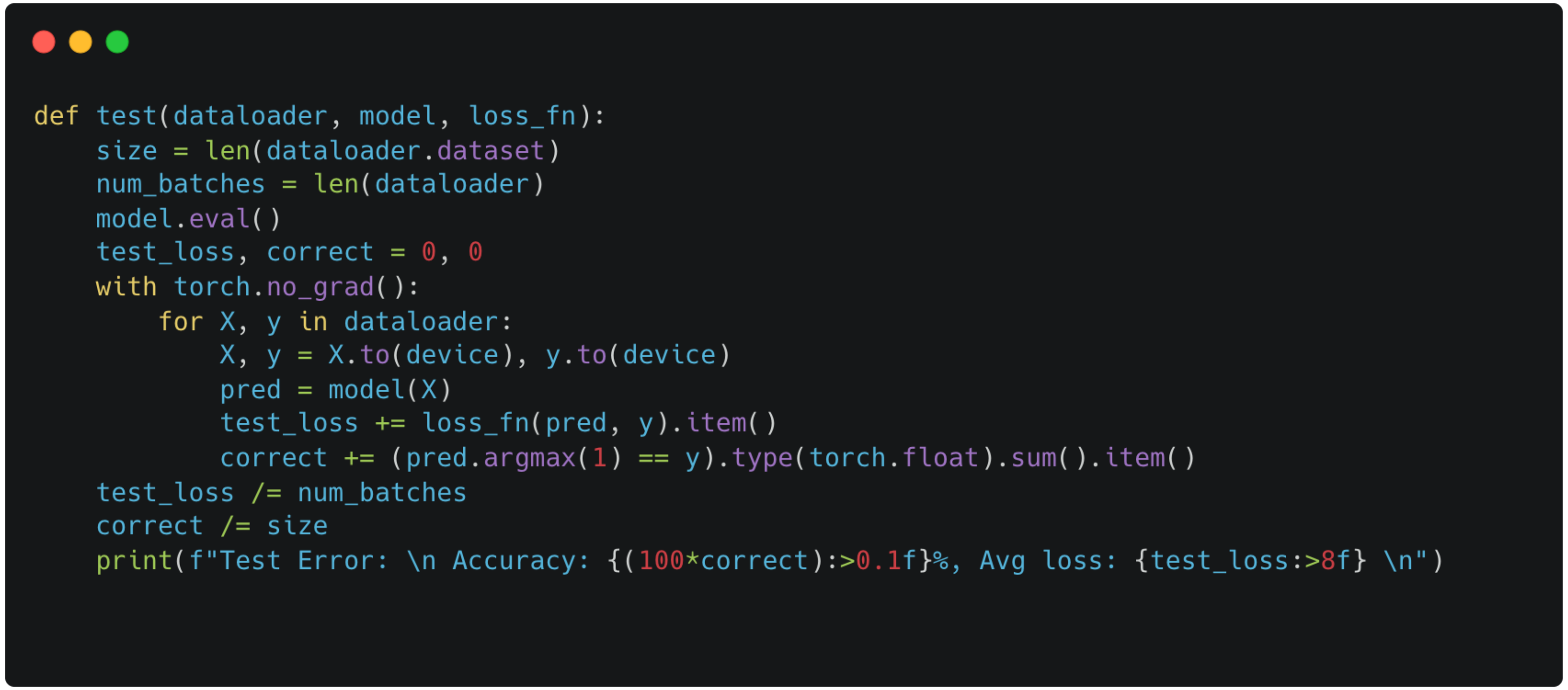
```
loss_fn = nn.CrossEntropyLoss()
optimizer = torch.optim.SGD(model.parameters(), lr=1e-3)
```

4. 모델 학습 함수



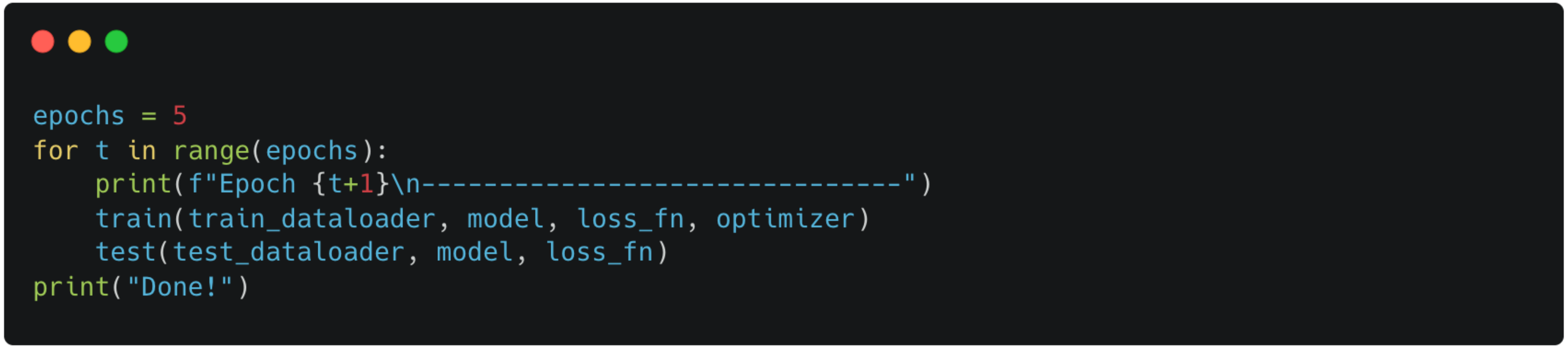
```python
def train(dataloader, model, loss_fn, optimizer):
    size = len(dataloader.dataset)
    for batch, (X, y) in enumerate(dataloader):
        X, y = X.to(device), y.to(device)

        # 예측 오류 계산
        pred = model(X)
        loss = loss_fn(pred, y)

        # 역전파
        loss.backward()
        optimizer.step()
        optimizer.zero_grad()

        if batch % 100 == 0:
            loss, current = loss.item(), (batch + 1) * len(X)
            print(f"loss: {loss:>7f}  [{current:>5d}/{size:>5d}]")
```

5. 테스트 데이터 정확도 확인



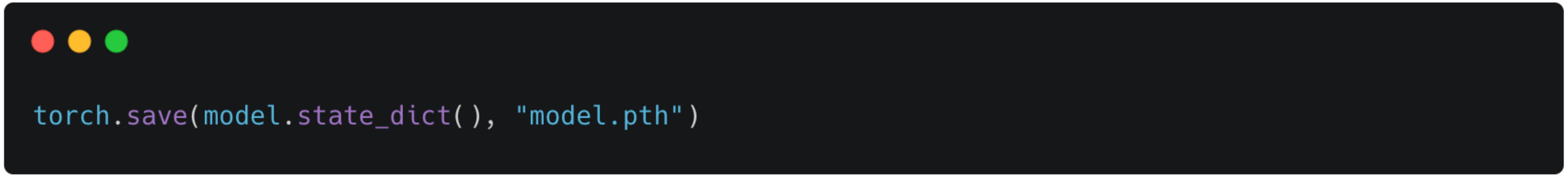
```python
def test(dataloader, model, loss_fn):
    size = len(dataloader.dataset)
    num_batches = len(dataloader)
    model.eval()
    test_loss, correct = 0, 0
    with torch.no_grad():
        for X, y in dataloader:
            X, y = X.to(device), y.to(device)
            pred = model(X)
            test_loss += loss_fn(pred, y).item()
            correct += (pred.argmax(1) == y).type(torch.float).sum().item()
    test_loss /= num_batches
    correct /= size
    print(f"Test Error: \n Accuracy: {(100*correct):>0.1f}%, Avg loss: {test_loss:>8f} \n")
```

5. 모델 학습 시작



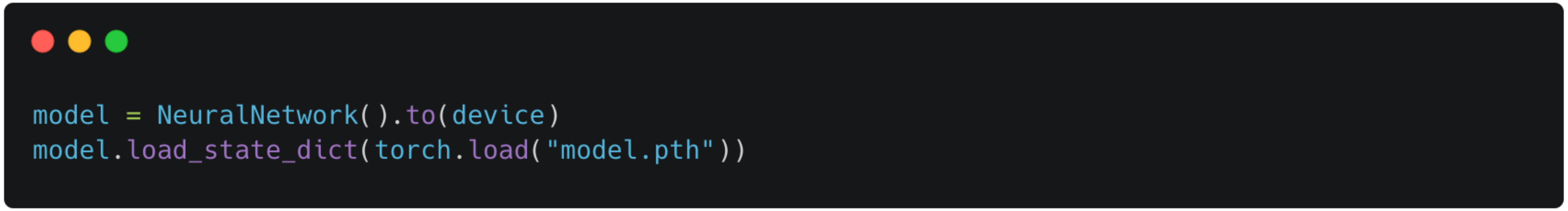
```python
epochs = 5
for t in range(epochs):
    print(f"Epoch {t+1}\n-------------------------------")
    train(train_dataloader, model, loss_fn, optimizer)
    test(test_dataloader, model, loss_fn)
print("Done!")
```

6. Model 저장하기



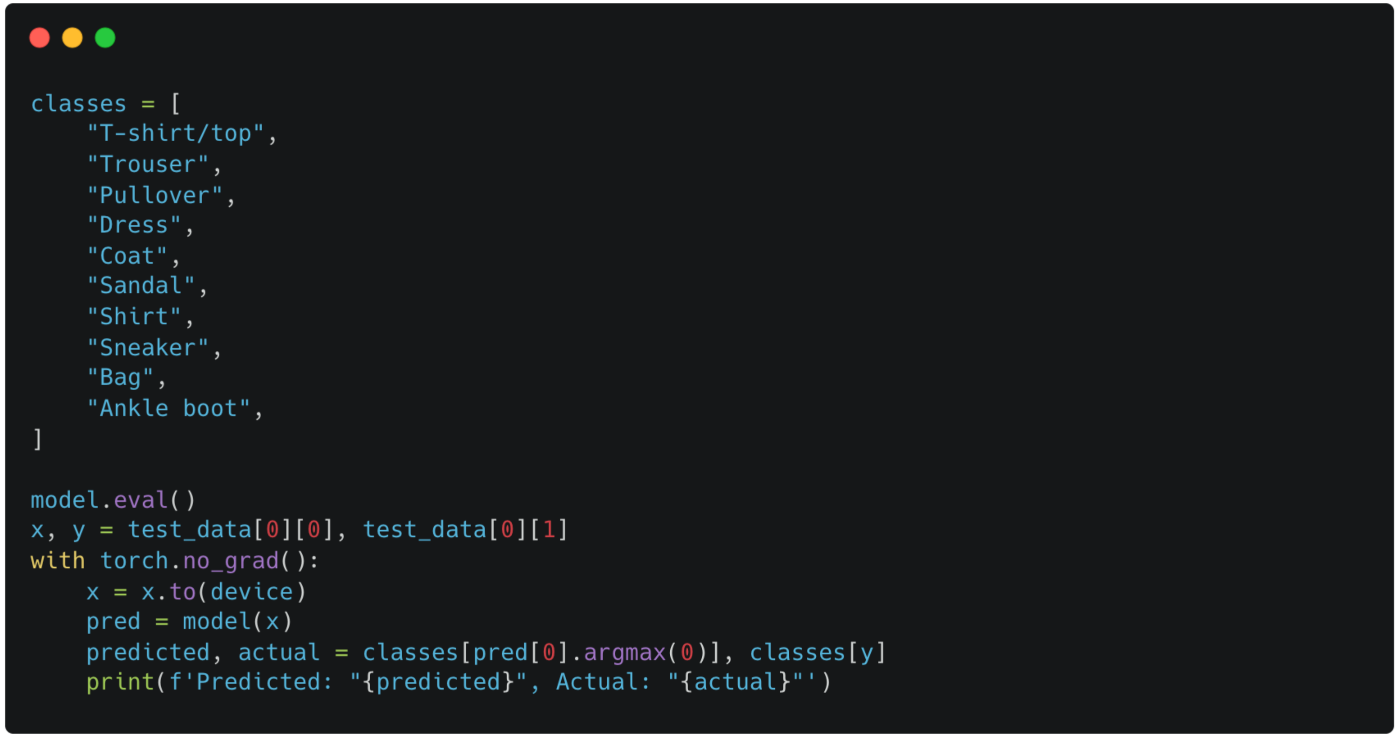
```
torch.save(model.state_dict(), "model.pth")
```

7. 모델 불러오기



```
model = NeuralNetwork().to(device)
model.load_state_dict(torch.load("model.pth"))
```

8. 모델 예측하기



```python
classes = [
    "T-shirt/top",
    "Trouser",
    "Pullover",
    "Dress",
    "Coat",
    "Sandal",
    "Shirt",
    "Sneaker",
    "Bag",
    "Ankle boot",
]

model.eval()
x, y = test_data[0][0], test_data[0][1]
with torch.no_grad():
    x = x.to(device)
    pred = model(x)
    predicted, actual = classes[pred[0].argmax(0)], classes[y]
    print(f'Predicted: "{predicted}", Actual: "{actual}"')
```

실습해보기
CNN 모델로 만들어보기

실습해보기
CIFAR-10 데이터로 학습