keon 목차 수정 반영 ee6ceed on 7 Oct 2019

1 contributor

451 lines (451 sloc) | 283 KB

오토인코더로 이미지의 특징을 추출하기

In [1]:
```
import torch
import torchvision
import torch.nn.functional as F
from torch import nn, optim
from torchvision import transforms, datasets

import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
from matplotlib import cm
import numpy as np
```

In [2]:
```
# 하이퍼파라미터
EPOCH = 10
BATCH_SIZE = 64
USE_CUDA = torch.cuda.is_available()
DEVICE = torch.device("cuda" if USE_CUDA else "cpu")
print("Using Device:", DEVICE)
```

```
Using Device: cpu
```

In [3]:
```
# Fashion MNIST 데이터셋
trainset = datasets.FashionMNIST(
    root      = './.data/',
    train     = True,
    download  = True,
    transform = transforms.ToTensor()
)
train_loader = torch.utils.data.DataLoader(
    dataset     = trainset,
    batch_size  = BATCH_SIZE,
    shuffle     = True,
    num_workers = 2
)
```

In [4]:
```
class Autoencoder(nn.Module):
    def __init__(self):
        super(Autoencoder, self).__init__()

        self.encoder = nn.Sequential(
            nn.Linear(28*28, 128),
            nn.ReLU(),
            nn.Linear(128, 64),
            nn.ReLU(),
            nn.Linear(64, 12),
            nn.ReLU(),
            nn.Linear(12, 3),   # 입력의 특징을 3차원으로 압축합니다
        )
        self.decoder = nn.Sequential(
            nn.Linear(3, 12),
            nn.ReLU(),
            nn.Linear(12, 64),
            nn.ReLU(),
            nn.Linear(64, 128),
            nn.ReLU(),
            nn.Linear(128, 28*28),
            nn.Sigmoid(),       # 픽셀당 0과 1 사이로 값을 출력합니다
        )

    def forward(self, x):
        encoded = self.encoder(x)
        decoded = self.decoder(encoded)
        return encoded, decoded
```

In [5]:
```
autoencoder = Autoencoder().to(DEVICE)
```

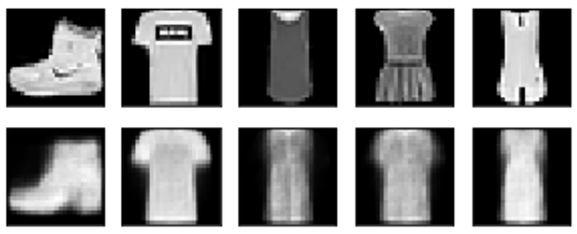
```
optimizer = torch.optim.Adam(autoencoder.parameters(), lr=0.005)
criterion = nn.MSELoss()
```

In [6]:
```
# 원본 이미지를 시각화 하기 (첫번째 열)
view_data = trainset.data[:5].view(-1, 28*28)
view_data = view_data.type(torch.FloatTensor)/255.
```

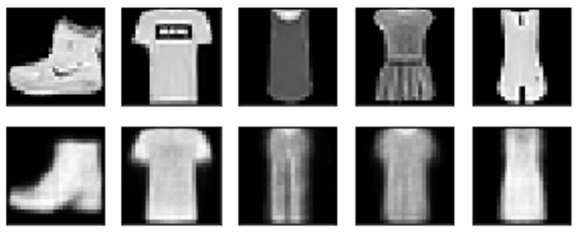
In [7]:
```
def train(autoencoder, train_loader):
    autoencoder.train()
    for step, (x, label) in enumerate(train_loader):
        x = x.view(-1, 28*28).to(DEVICE)
        y = x.view(-1, 28*28).to(DEVICE)
        label = label.to(DEVICE)

        encoded, decoded = autoencoder(x)

        loss = criterion(decoded, y)
        optimizer.zero_grad()
        loss.backward()
        optimizer.step()
```

In [8]:
```
for epoch in range(1, EPOCH+1):
    train(autoencoder, train_loader)

    # 디코더에서 나온 이미지를 시각화 하기 (두번째 열)
    test_x = view_data.to(DEVICE)
    _, decoded_data = autoencoder(test_x)

    # 원본과 디코딩 결과 비교해보기
    f, a = plt.subplots(2, 5, figsize=(5, 2))
    print("[Epoch {}]".format(epoch))
    for i in range(5):
        img = np.reshape(view_data.data.numpy()[i],(28, 28))
        a[0][i].imshow(img, cmap='gray')
        a[0][i].set_xticks(()); a[0][i].set_yticks(())

    for i in range(5):
        img = np.reshape(decoded_data.to("cpu").data.numpy()[i], (28, 28))
        a[1][i].imshow(img, cmap='gray')
        a[1][i].set_xticks(()); a[1][i].set_yticks(())
    plt.show()
```

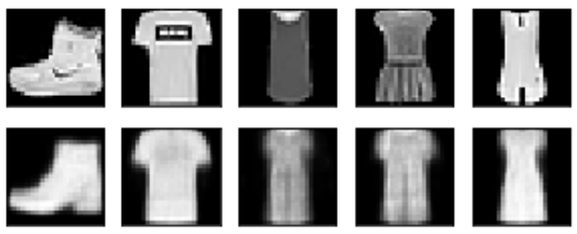
```
[Epoch 1]
```



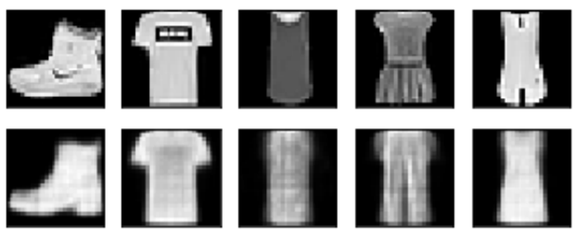
```
[Epoch 2]
```



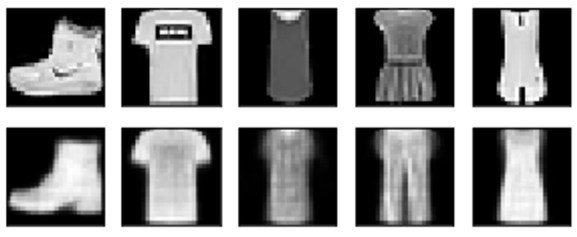
```
[Epoch 3]
```



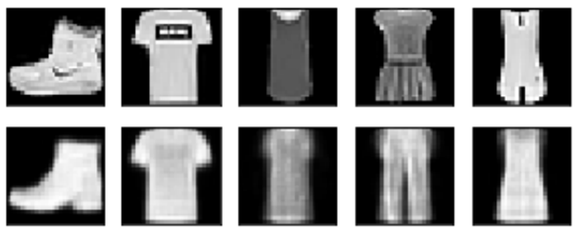
```
[Epoch 4]
```



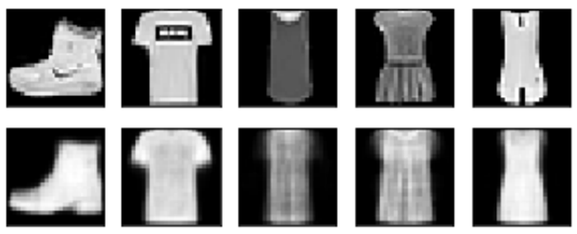
```
[Epoch 5]
```



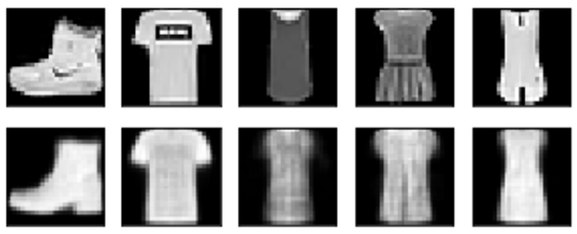
```
[Epoch 6]
```



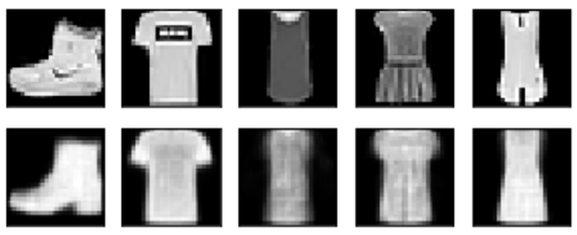
```
[Epoch 7]
```



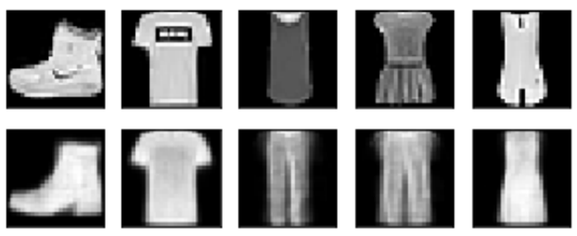
```
[Epoch 8]
```



```
[Epoch 9]
```



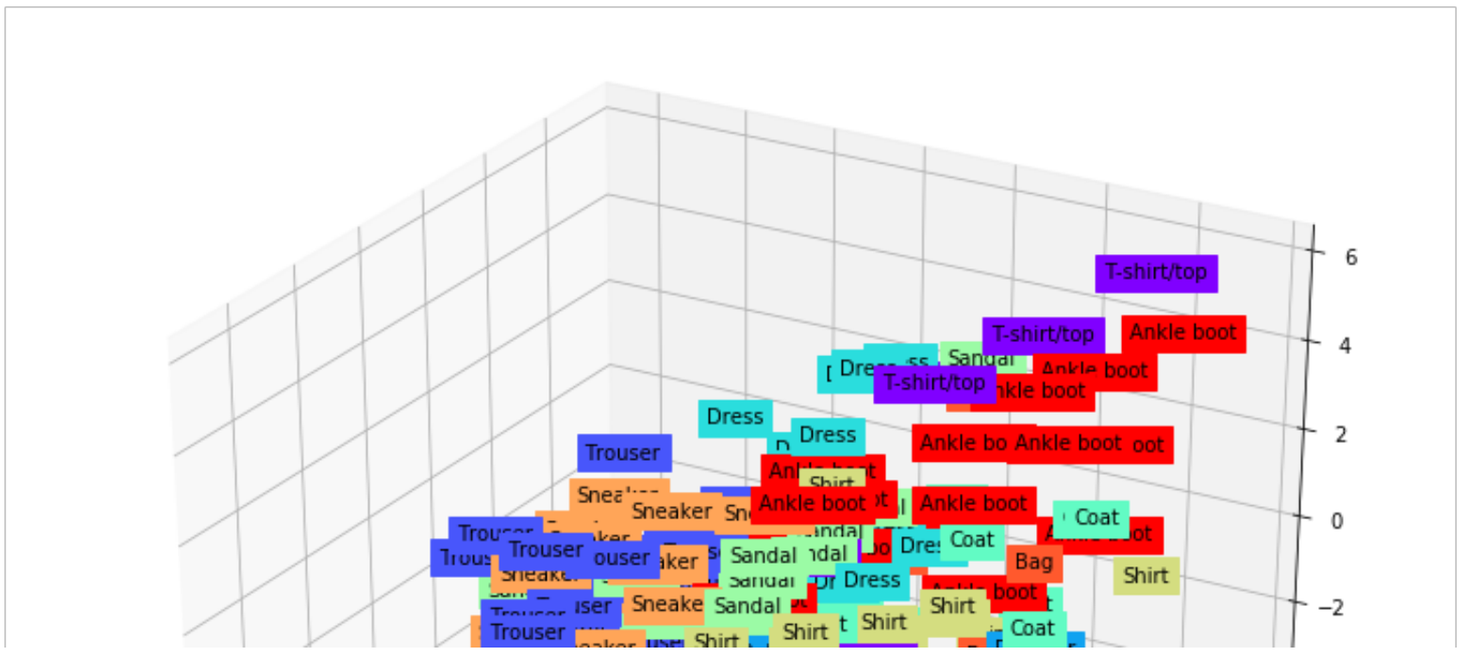
```
[Epoch 10]
```

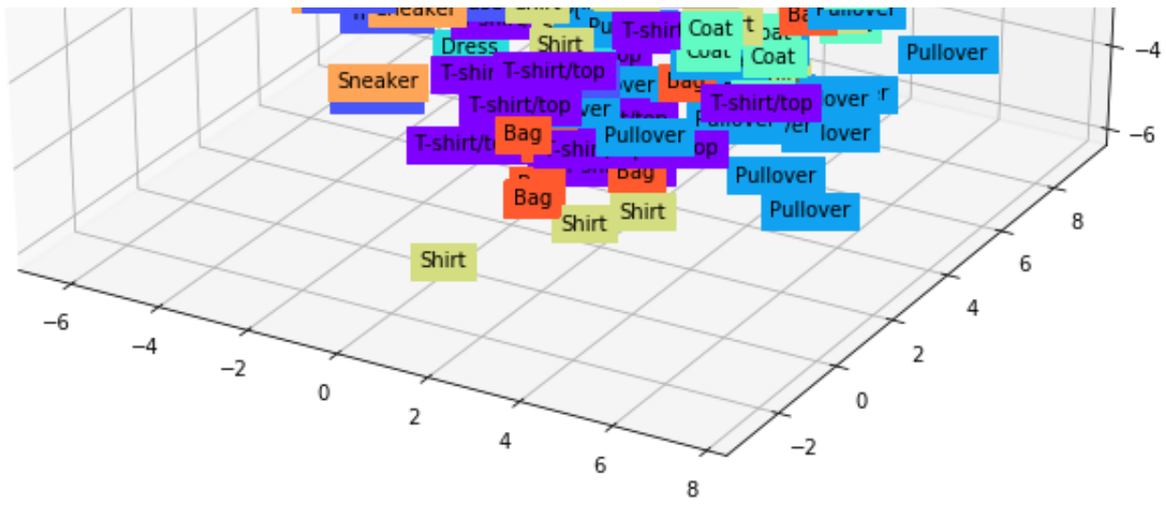


잠재변수 들여다보기

In [9]:
```
# 잠재변수를 3D 플롯으로 시각화
view_data = trainset.data[:200].view(-1, 28*28)
view_data = view_data.type(torch.FloatTensor)/255.
test_x = view_data.to(DEVICE)
encoded_data, _ = autoencoder(test_x)
encoded_data = encoded_data.to("cpu")
```

In [10]:
```
CLASSES = {
    0: 'T-shirt/top',
    1: 'Trouser',
    2: 'Pullover',
    3: 'Dress',
    4: 'Coat',
    5: 'Sandal',
    6: 'Shirt',
    7: 'Sneaker',
    8: 'Bag',
    9: 'Ankle boot'
}

fig = plt.figure(figsize=(10,8))
ax = Axes3D(fig)

X = encoded_data.data[:, 0].numpy()
Y = encoded_data.data[:, 1].numpy()
Z = encoded_data.data[:, 2].numpy()

labels = trainset.targets[:200].numpy()

for x, y, z, s in zip(X, Y, Z, labels):
    name = CLASSES[s]
    color = cm.rainbow(int(255*s/9))
    ax.text(x, y, z, name, backgroundcolor=color)

ax.set_xlim(X.min(), X.max())
ax.set_ylim(Y.min(), Y.max())
ax.set_zlim(Z.min(), Z.max())
plt.show()
```




Sneaker
Dress
Shirt
T-shirt/top
Coat
Pullover
Bag
Shirt
−6
−4
−2
0
2
4
6
8
−4
−6
8
6
4
2
0
−2

In [ ]: