```
from torch.utils.data import DataLoader,Dataset
import torch
import torchvision.transforms as transforms
from torchvision import datasets
import torchvision.models as models
import torchvision
import matplotlib.pyplot as plt
import numpy as np
from tqdm import tqdm
```

```
device = torch.device("cuda" if torch.cuda.is_available() else "cpu")
print(device)
```

```
cuda
```

```
train_data = datasets.MNIST(root='./data',train=True,download=True,transform=tor
test_data = datasets.MNIST(root='./data',train=False,download=True,transform=tor
train_loader = DataLoader(train_data,batch_size=64,shuffle=True)
test_loader = DataLoader(test_data,batch_size=64,shuffle=True)
```

```
class Autoencoder(torch.nn.Module):
    def __init__(self):
        super(Autoencoder,self).__init__()
        self.relu = torch.nn.ReLU()
        self.sigmoid = torch.nn.Sigmoid()
        self.maxpool = torch.nn.MaxPool2d(2,2)
        self.conv1 = torch.nn.Conv2d(1,16,2,padding=1)
        self.conv2 = torch.nn.Conv2d(16,8,2,padding=1)
        self.tconv1 = torch.nn.ConvTranspose2d(8,16,4,stride=2,padding=1)
        self.tconv2 = torch.nn.ConvTranspose2d(16,1,1,stride=1,padding=1)


    def forward(self,x):
        x = self.encode(x)
        x = self.decode(x)
        return x
    def encode(self,x):
        x = self.conv1(x)
        x = self.relu(x)
        x = self.maxpool(x)
        x = self.conv2(x)
        x = self.relu(x)
        return x
    def decode(self,x):
        x = self.tconv1(x)
        x = self.relu(x)
        x = self.tconv2(x)
        x = self.sigmoid(x)
        return x
```

```
model = Autoencoder().to(device)
epochs = 10
optimizer = torch.optim.Adam(model.parameters(),lr=0.001)
criterion = torch.nn.MSELoss()
running_loss = 0


for epoch in range(epochs):
    running_loss = 0
    for data in tqdm(train_loader):
        img,label = data
        img = img.to(device)
        output = model(img)
        loss = criterion(output,img)
        running_loss += loss.item()
        loss.backward()
        optimizer.step()
        optimizer.zero_grad()
    print(f'epoch: {epoch}, loss: {running_loss}')
```

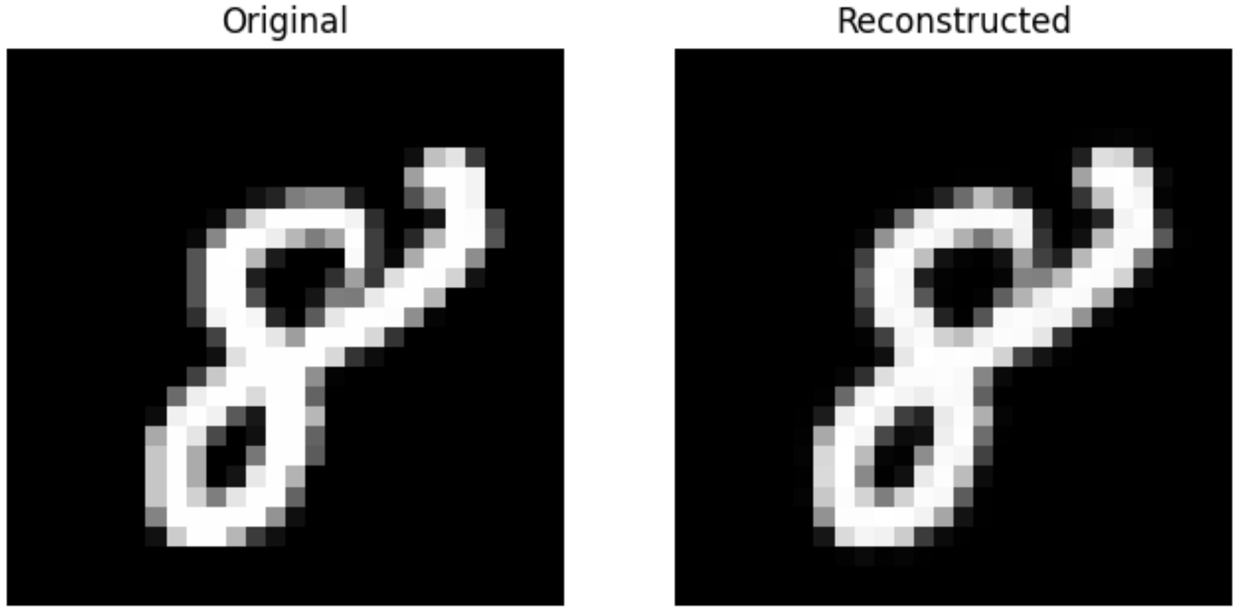
```
100%|██████████| 938/938 [00:08<00:00, 104.58it/s]
epoch: 0, loss: 21.021349078742787
100%|██████████| 938/938 [00:09<00:00, 101.63it/s]
epoch: 1, loss: 1.4236517088720575
100%|██████████| 938/938 [00:12<00:00, 75.20it/s]
epoch: 2, loss: 1.0637703678221442
100%|██████████| 938/938 [00:09<00:00, 101.13it/s]
epoch: 3, loss: 0.89903840579791
100%|██████████| 938/938 [00:09<00:00, 100.19it/s]
epoch: 4, loss: 0.7781607505166903
100%|██████████| 938/938 [00:08<00:00, 110.61it/s]
epoch: 5, loss: 0.7113410125602968
100%|██████████| 938/938 [00:09<00:00, 102.16it/s]
epoch: 6, loss: 0.659316350822337
100%|██████████| 938/938 [00:09<00:00, 101.74it/s]
epoch: 7, loss: 0.6143598763737828
100%|██████████| 938/938 [00:08<00:00, 107.24it/s]
epoch: 8, loss: 0.5844341737683862
100%|██████████| 938/938 [00:09<00:00, 97.73it/s] epoch: 9, loss: 0.5638279
```

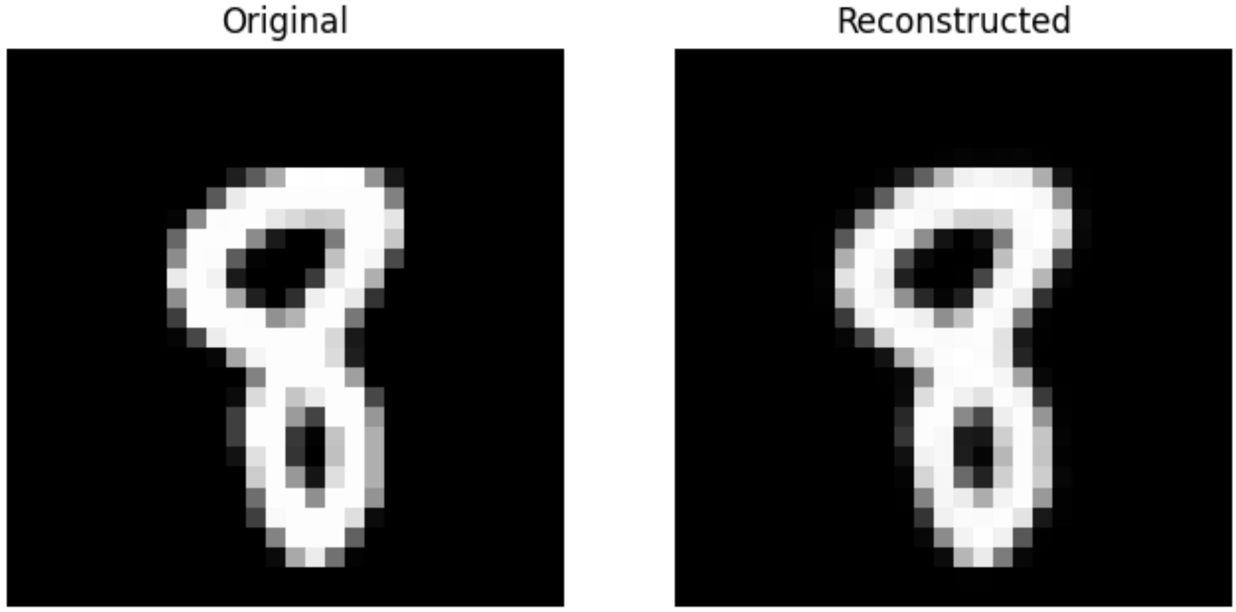
```
data_iter = iter(train_loader)
images,labels = next(data_iter)

with torch.no_grad():
    output = model(images.to(device))
    output = output.cpu()
    output = output.numpy()
    print(output.shape)
    output = np.reshape(output,(64,28,28))
```

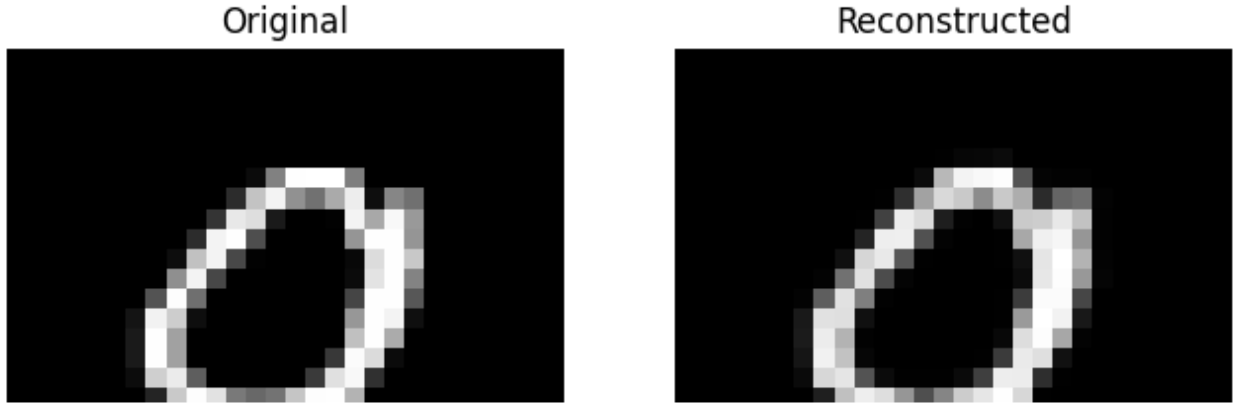
```
for j in range(5):
    image = images[j].numpy()
    fig, axes = plt.subplots(1, 2, figsize=(8, 4))
```

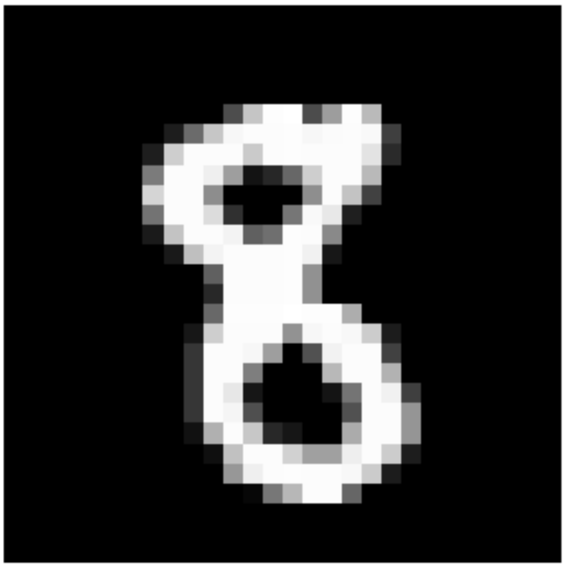
```
fig, axes = plt.subplots(1, 2, figsize=(8, 4))
axes[0].imshow(image[0], cmap='gray')
axes[0].set_title('Original')
axes[0].axis('off')
axes[1].imshow(output[j], cmap='gray')
axes[1].set_title('Reconstructed')
axes[1].axis('off')
plt.show()
```

```
(64, 1, 28, 28)
```

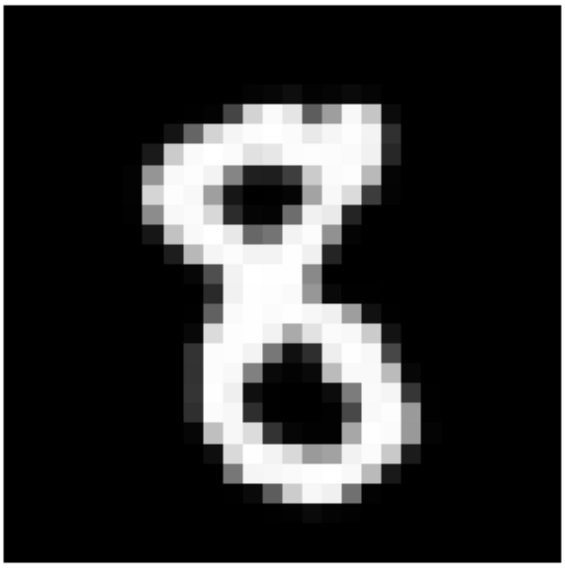




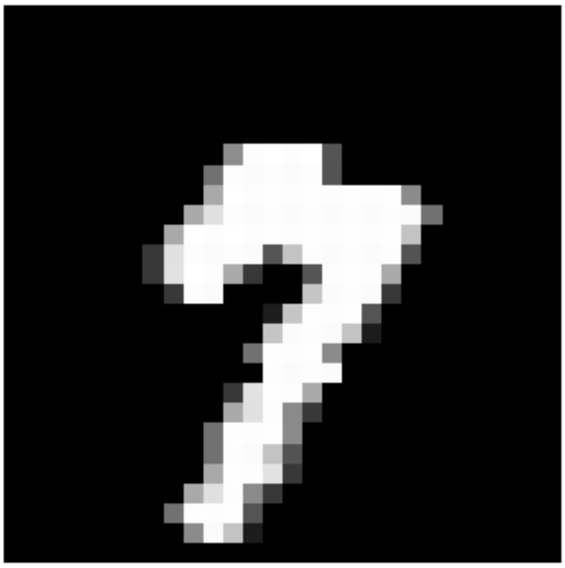




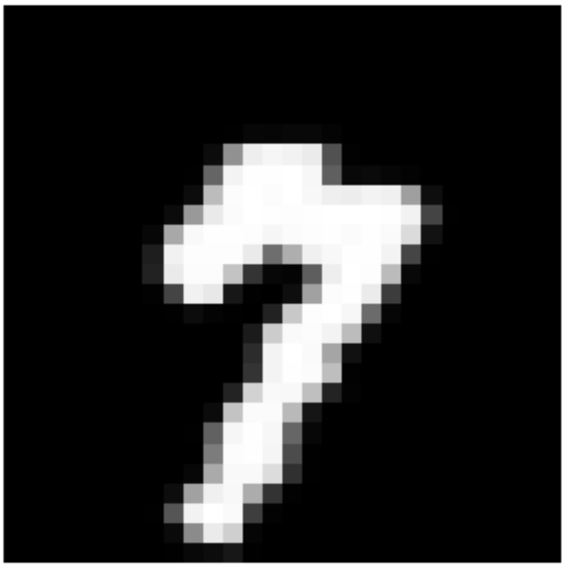
Original



Reconstructed



Original



Reconstructed