```
import numpy as np
import matplotlib.pyplot as plt
from tensorflow.keras.layers import Input, Dense
from tensorflow.keras.models import Model
from tensorflow.keras.datasets import mnist

# Load the MNIST dataset
(x_train, _), (x_test, _) = mnist.load_data()

# Normalize the data to the range of [0, 1]
x_train = x_train.astype('float32') / 255.0
x_test = x_test.astype('float32') / 255.0

# Flatten the 28x28 images into vectors of size 784
x_train = x_train.reshape((x_train.shape[0], -1))
x_test = x_test.reshape((x_test.shape[0], -1))

# Define the dimensions of the autoencoder
input_dim = x_train.shape[1]  # 784
encoding_dim = 32  # Dimension for the latent space

# Define the autoencoder
input_layer = Input(shape=(input_dim,))
encoded = Dense(encoding_dim, activation='relu')(input_layer)
decoded = Dense(input_dim, activation='sigmoid')(encoded)

# Build the autoencoder model
autoencoder = Model(inputs=input_layer, outputs=decoded)

# Build the encoder model
encoder = Model(inputs=input_layer, outputs=encoded)

# Compile the autoencoder
autoencoder.compile(optimizer='adam', loss='binary_crossentropy')

# Train the autoencoder
autoencoder.fit(x_train, x_train,
                epochs=50,
                batch_size=256,
                shuffle=True,
                validation_data=(x_test, x_test))

# Use the encoder to transform the test data
encoded_data = encoder.predict(x_test)

# Visualize some original and reconstructed images
decoded_images = autoencoder.predict(x_test)

n = 10  # Number of images to display
plt.figure(figsize=(10, 4))
for i in range(n):
    # Display original images
    ax = plt.subplot(2, n, i + 1)
    plt.imshow(x_test[i].reshape(28, 28), cmap='gray')
    plt.title("Original")
    plt.axis('off')

    # Display reconstructed images
    ax = plt.subplot(2, n, i + 1 + n)
    plt.imshow(decoded_images[i].reshape(28, 28), cmap='gray')
    plt.title("Reconstructed")
    plt.axis('off')

plt.show()

# Print the dimensions of the encoded data
print("Encoded data shape:", encoded_data.shape)
```

```
Epoch 1/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 10ms/step - loss: 0.3867 - val_loss: 0.1921
Epoch 2/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 0.1806 - val_loss: 0.1536
Epoch 3/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.1490 - val_loss: 0.1337
Epoch 4/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.1314 - val_loss: 0.1208
Epoch 5/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.1200 - val_loss: 0.1128
Epoch 6/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.1127 - val_loss: 0.1068
Epoch 7/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 0.1072 - val_loss: 0.1027
Epoch 8/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.1032 - val_loss: 0.0998
Epoch 9/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.1003 - val_loss: 0.0975
Epoch 10/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0982 - val_loss: 0.0960
Epoch 11/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0969 - val_loss: 0.0949
Epoch 12/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 0.0961 - val_loss: 0.0941
Epoch 13/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 9ms/step - loss: 0.0953 - val_loss: 0.0936
Epoch 14/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0949 - val_loss: 0.0933
Epoch 15/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0945 - val_loss: 0.0930
Epoch 16/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 12ms/step - loss: 0.0942 - val_loss: 0.0928
Epoch 17/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 11ms/step - loss: 0.0941 - val_loss: 0.0926
Epoch 18/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0939 - val_loss: 0.0925
Epoch 19/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0937 - val_loss: 0.0924
Epoch 20/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0936 - val_loss: 0.0924
Epoch 21/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 11ms/step - loss: 0.0935 - val_loss: 0.0922
Epoch 22/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 0.0934 - val_loss: 0.0921
Epoch 23/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0934 - val_loss: 0.0921
Epoch 24/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0933 - val_loss: 0.0920
Epoch 25/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0934 - val_loss: 0.0920
Epoch 26/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0933 - val_loss: 0.0920
Epoch 27/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 14ms/step - loss: 0.0933 - val_loss: 0.0919
Epoch 28/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0930 - val_loss: 0.0919
Epoch 29/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0934 - val_loss: 0.0920
Epoch 30/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0930 - val_loss: 0.0918
Epoch 31/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0929 - val_loss: 0.0918
Epoch 32/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 0.0929 - val_loss: 0.0918
Epoch 33/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 9ms/step - loss: 0.0927 - val_loss: 0.0918
Epoch 34/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0930 - val_loss: 0.0917
Epoch 35/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0929 - val_loss: 0.0918
Epoch 36/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 11ms/step - loss: 0.0930 - val_loss: 0.0917
Epoch 37/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 12ms/step - loss: 0.0929 - val_loss: 0.0917
Epoch 38/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0927 - val_loss: 0.0917
Epoch 39/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 8ms/step - loss: 0.0928 - val_loss: 0.0917
Epoch 40/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0929 - val_loss: 0.0916
Epoch 41/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0927 - val_loss: 0.0917
Epoch 42/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 0.0926 - val_loss: 0.0917
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Epoch 43/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 10ms/step - loss: 0.0926 - val_loss: 0.0916
Epoch 44/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0927 - val_loss: 0.0915
Epoch 45/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0927 - val_loss: 0.0916
Epoch 46/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0927 - val_loss: 0.0916
Epoch 47/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 11ms/step - loss: 0.0928 - val_loss: 0.0916
Epoch 48/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 5s 9ms/step - loss: 0.0923 - val_loss: 0.0916
Epoch 49/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0927 - val_loss: 0.0916
Epoch 50/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0925 - val_loss: 0.0916
313/313 ━━━━━━━━━━━━━━━━━━━━ 0s 1ms/step
313/313 ━━━━━━━━━━━━━━━━━━━━ 1s 2ms/step
```

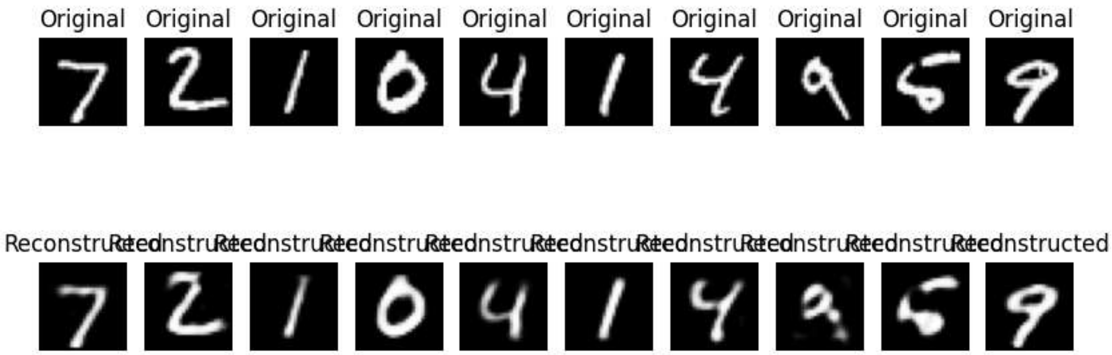


```
Encoded data shape: (10000, 32)
```