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

(x_train, _), (x_test, _) = mnist.load_data()
x_train = x_train.astype('float32') / 255.0
x_test = x_test.astype('float32') / 255.0
x_train = x_train.reshape((len(x_train), np.prod(x_train.shape[1:])))
x_test = x_test.reshape((len(x_test), np.prod(x_test.shape[1:])))

input_dim = x_train.shape[1]
encoding_dim = 64

input_img = Input(shape=(input_dim,))
encoded = Dense(encoding_dim, activation='relu')(input_img)
decoded = Dense(input_dim, activation='sigmoid')(encoded)

autoencoder = Model(input_img, decoded)
encoder = Model(input_img, encoded)

encoded_input = Input(shape=(encoding_dim,))
decoder_layer = autoencoder.layers[-1]
decoder = Model(encoded_input, decoder_layer(encoded_input))

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

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

encoded_imgs = encoder.predict(x_test)
decoded_imgs = decoder.predict(encoded_imgs)

n = 10
plt.figure(figsize=(20, 4))
for i in range(n):
    ax = plt.subplot(2, n, i + 1)
    plt.imshow(x_test[i].reshape(28, 28))
    plt.gray()
    ax.get_xaxis().set_visible(False)
    ax.get_yaxis().set_visible(False)

    ax = plt.subplot(2, n, i + 1 + n)
    plt.imshow(decoded_imgs[i].reshape(28, 28))
    plt.gray()
    ax.get_xaxis().set_visible(False)
    ax.get_yaxis().set_visible(False)
plt.show()
```

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Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11490434/11490434 ━━━━━━━━━━━━━━━━━━━━ 0s 0us/step
Epoch 1/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 11s 31ms/step - loss: 0.3441 - val_loss: 0.1606
Epoch 2/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 6s 14ms/step - loss: 0.1505 - val_loss: 0.1242
Epoch 3/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.1202 - val_loss: 0.1066
Epoch 4/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.1048 - val_loss: 0.0964
Epoch 5/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 10ms/step - loss: 0.0955 - val_loss: 0.0895
Epoch 6/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 11ms/step - loss: 0.0892 - val_loss: 0.0847
Epoch 7/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 0.0845 - val_loss: 0.0813
Epoch 8/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0814 - val_loss: 0.0790
Epoch 9/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 9ms/step - loss: 0.0793 - val_loss: 0.0773
Epoch 10/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0778 - val_loss: 0.0762
Epoch 11/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0768 - val_loss: 0.0756
Epoch 12/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 15ms/step - loss: 0.0760 - val_loss: 0.0750
Epoch 13/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 9ms/step - loss: 0.0753 - val_loss: 0.0745
Epoch 14/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0750 - val_loss: 0.0742
Epoch 15/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 9ms/step - loss: 0.0745 - val_loss: 0.0738
Epoch 16/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 12ms/step - loss: 0.0744 - val_loss: 0.0736
Epoch 17/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 5s 10ms/step - loss: 0.0743 - val_loss: 0.0735
Epoch 18/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 10ms/step - loss: 0.0740 - val_loss: 0.0733
Epoch 19/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 10ms/step - loss: 0.0739 - val_loss: 0.0732
Epoch 20/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 0.0737 - val_loss: 0.0731
Epoch 21/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 10ms/step - loss: 0.0735 - val_loss: 0.0730
Epoch 22/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 10ms/step - loss: 0.0736 - val_loss: 0.0730
Epoch 23/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 10ms/step - loss: 0.0737 - val_loss: 0.0729
Epoch 24/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 12ms/step - loss: 0.0735 - val_loss: 0.0728
Epoch 25/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 0.0733 - val_loss: 0.0727
Epoch 26/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 10ms/step - loss: 0.0731 - val_loss: 0.0727
Epoch 27/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 10ms/step - loss: 0.0731 - val_loss: 0.0727
Epoch 28/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 10ms/step - loss: 0.0731 - val_loss: 0.0726
Epoch 29/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 12ms/step - loss: 0.0731 - val_loss: 0.0726
Epoch 30/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 13ms/step - loss: 0.0731 - val_loss: 0.0726
Epoch 31/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 10ms/step - loss: 0.0730 - val_loss: 0.0726
Epoch 32/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 10ms/step - loss: 0.0729 - val_loss: 0.0725
Epoch 33/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 11ms/step - loss: 0.0731 - val_loss: 0.0725
Epoch 34/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 5s 10ms/step - loss: 0.0731 - val_loss: 0.0724
Epoch 35/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 10ms/step - loss: 0.0730 - val_loss: 0.0724
Epoch 36/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 10ms/step - loss: 0.0729 - val_loss: 0.0724
Epoch 37/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 11ms/step - loss: 0.0729 - val_loss: 0.0724
Epoch 38/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 5s 11ms/step - loss: 0.0729 - val_loss: 0.0724
Epoch 39/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 2s 10ms/step - loss: 0.0729 - val_loss: 0.0725
Epoch 40/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 10ms/step - loss: 0.0729 - val_loss: 0.0723
Epoch 41/50
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 12ms/step - loss: 0.0729 - val_loss: 0.0724
```