```
import numpy as np
import matplotlib.pyplot as plt
from tensorflow.keras.layers import Input, Dense
from tensorflow.keras.models import Model
from sklearn.datasets import fetch_lfw_people
from sklearn.model_selection import train_test_split

# Load the LFW dataset (Labeled Faces in the Wild)
lfw_people = fetch_lfw_people(min_faces_per_person=70, resize=0.4)

# Split the dataset into training and testing sets
X_train, X_test, _, _ = train_test_split(lfw_people.data,
lfw_people.target, test_size=0.25, random_state=42)

# Normalize pixel values to be between 0 and 1
X_train = X_train.astype('float32') / 255.0
X_test = X_test.astype('float32') / 255.0

# Define the autoencoder model
encoding_dim = 64  # Size of the encoded representations
input_img = Input(shape=(X_train.shape[1],))
encoded = Dense(encoding_dim, activation='relu')(input_img)
decoded = Dense(X_train.shape[1], activation='sigmoid')(encoded)

autoencoder = Model(input_img, decoded)

# 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))

# Create a separate encoder model
encoder = Model(input_img, encoded)

# Encode the test images
encoded_imgs = encoder.predict(X_test)

# Decode the encoded images
decoded_imgs = autoencoder.predict(X_test)

# Display original and reconstructed images
n = 10  # Number of images to display
plt.figure(figsize=(20, 8))  # Adjusted figsize for two rows
for i in range(n):
    # Original images
    ax = plt.subplot(2, n, i + 1)
    plt.imshow(X_test[i].reshape(50, 37), cmap='gray')  # Assuming
images are 50x37 grayscale
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    ax.get_xaxis().set_visible(False)
    ax.get_yaxis().set_visible(False)



plt.show()
```

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Epoch 1/50
4/4 [==============================] - 1s 76ms/step - loss: 0.6924 -
val_loss: 0.6910
Epoch 2/50
4/4 [==============================] - 0s 37ms/step - loss: 0.6901 -
val_loss: 0.6882
Epoch 3/50
4/4 [==============================] - 0s 34ms/step - loss: 0.6869 -
val_loss: 0.6842
Epoch 4/50
4/4 [==============================] - 0s 35ms/step - loss: 0.6823 -
val_loss: 0.6783
Epoch 5/50
4/4 [==============================] - 0s 36ms/step - loss: 0.6755 -
val_loss: 0.6700
Epoch 6/50
4/4 [==============================] - 0s 34ms/step - loss: 0.6661 -
val_loss: 0.6587
Epoch 7/50
4/4 [==============================] - 0s 35ms/step - loss: 0.6536 -
val_loss: 0.6442
Epoch 8/50
4/4 [==============================] - 0s 34ms/step - loss: 0.6378 -
val_loss: 0.6263
Epoch 9/50
4/4 [==============================] - 0s 32ms/step - loss: 0.6186 -
val_loss: 0.6049
Epoch 10/50
4/4 [==============================] - 0s 36ms/step - loss: 0.5957 -
val_loss: 0.5800
Epoch 11/50
4/4 [==============================] - 0s 32ms/step - loss: 0.5696 -
val_loss: 0.5520
Epoch 12/50
4/4 [==============================] - 0s 35ms/step - loss: 0.5403 -
val_loss: 0.5212
Epoch 13/50
4/4 [==============================] - 0s 32ms/step - loss: 0.5084 -
val_loss: 0.4880
Epoch 14/50
4/4 [==============================] - 0s 33ms/step - loss: 0.4744 -
val_loss: 0.4531
Epoch 15/50
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4/4 [==============================] - 0s 35ms/step - loss: 0.4389 -
val_loss: 0.4172
Epoch 16/50
4/4 [==============================] - 0s 36ms/step - loss: 0.4027 -
val_loss: 0.3810
Epoch 17/50
4/4 [==============================] - 0s 35ms/step - loss: 0.3664 -
val_loss: 0.3452
Epoch 18/50
4/4 [==============================] - 0s 36ms/step - loss: 0.3309 -
val_loss: 0.3107
Epoch 19/50
4/4 [==============================] - 0s 33ms/step - loss: 0.2969 -
val_loss: 0.2779
Epoch 20/50
4/4 [==============================] - 0s 36ms/step - loss: 0.2649 -
val_loss: 0.2474
Epoch 21/50
4/4 [==============================] - 0s 33ms/step - loss: 0.2353 -
val_loss: 0.2196
Epoch 22/50
4/4 [==============================] - 0s 32ms/step - loss: 0.2085 -
val_loss: 0.1945
Epoch 23/50
4/4 [==============================] - 0s 35ms/step - loss: 0.1845 -
val_loss: 0.1723
Epoch 24/50
4/4 [==============================] - 0s 36ms/step - loss: 0.1632 -
val_loss: 0.1527
Epoch 25/50
4/4 [==============================] - 0s 48ms/step - loss: 0.1447 -
val_loss: 0.1357
Epoch 26/50
4/4 [==============================] - 0s 63ms/step - loss: 0.1286 -
val_loss: 0.1210
Epoch 27/50
4/4 [==============================] - 0s 49ms/step - loss: 0.1147 -
val_loss: 0.1083
Epoch 28/50
4/4 [==============================] - 0s 52ms/step - loss: 0.1028 -
val_loss: 0.0974
Epoch 29/50
4/4 [==============================] - 0s 49ms/step - loss: 0.0926 -
val_loss: 0.0881
Epoch 30/50
4/4 [==============================] - 0s 52ms/step - loss: 0.0838 -
val_loss: 0.0800
Epoch 31/50
4/4 [==============================] - 0s 49ms/step - loss: 0.0763 -
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val_loss: 0.0731
Epoch 32/50
4/4 [==============================] - 0s 49ms/step - loss: 0.0698 -
val_loss: 0.0672
Epoch 33/50
4/4 [==============================] - 0s 139ms/step - loss: 0.0642 -
val_loss: 0.0620
Epoch 34/50
4/4 [==============================] - 0s 72ms/step - loss: 0.0594 -
val_loss: 0.0575
Epoch 35/50
4/4 [==============================] - 0s 48ms/step - loss: 0.0552 -
val_loss: 0.0536
Epoch 36/50
4/4 [==============================] - 1s 164ms/step - loss: 0.0515 -
val_loss: 0.0502
Epoch 37/50
4/4 [==============================] - 0s 37ms/step - loss: 0.0483 -
val_loss: 0.0472
Epoch 38/50
4/4 [==============================] - 0s 36ms/step - loss: 0.0454 -
val_loss: 0.0445
Epoch 39/50
4/4 [==============================] - 0s 34ms/step - loss: 0.0429 -
val_loss: 0.0421
Epoch 40/50
4/4 [==============================] - 0s 33ms/step - loss: 0.0407 -
val_loss: 0.0400
Epoch 41/50
4/4 [==============================] - 0s 31ms/step - loss: 0.0387 -
val_loss: 0.0381
Epoch 42/50
4/4 [==============================] - 0s 35ms/step - loss: 0.0369 -
val_loss: 0.0364
Epoch 43/50
4/4 [==============================] - 0s 32ms/step - loss: 0.0353 -
val_loss: 0.0349
Epoch 44/50
4/4 [==============================] - 0s 34ms/step - loss: 0.0339 -
val_loss: 0.0335
Epoch 45/50
4/4 [==============================] - 0s 32ms/step - loss: 0.0326 -
val_loss: 0.0323
Epoch 46/50
4/4 [==============================] - 0s 40ms/step - loss: 0.0314 -
val_loss: 0.0311
Epoch 47/50
4/4 [==============================] - 0s 36ms/step - loss: 0.0303 -
val_loss: 0.0301
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Epoch 48/50
4/4 [==============================] - 0s 32ms/step - loss: 0.0293 -
val_loss: 0.0291
Epoch 49/50
4/4 [==============================] - 0s 32ms/step - loss: 0.0284 -
val_loss: 0.0282
Epoch 50/50
4/4 [==============================] - 0s 33ms/step - loss: 0.0276 -
val_loss: 0.0274
11/11 [==============================] - 0s 2ms/step
11/11 [==============================] - 0s 3ms/step
```