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 cifar100 # Import CIFAR-100 dataset  
  
# Load the CIFAR-100 dataset  
(x\_train, \_), (x\_test, \_) = cifar100.load\_data()  
  
# 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  
  
# Flatten the images for the autoencoder  
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:])))  
  
# Define the autoencoder model  
encoding\_dim = 32 # Size of the encoded representations  
input\_img = Input(shape=(3072,))  
encoded = Dense(encoding\_dim, activation='relu')(input\_img)  
decoded = Dense(3072, 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, 4))  
for i in range(n):  
 # Original images  
 ax = plt.subplot(2, n, i + 1)  
 plt.imshow(x\_test[i].reshape(32, 32, 3)) # CIFAR-100 images are 32x32x3  
 plt.gray()  
 ax.get\_xaxis().set\_visible(False)  
 ax.get\_yaxis().set\_visible(False)  
  
 # Reconstructed images  
 ax = plt.subplot(2, n, i + 1 + n)  
 plt.imshow(decoded\_imgs[i].reshape(32, 32, 3)) # CIFAR-100 images are 32x32x3  
 plt.gray()  
 ax.get\_xaxis().set\_visible(False)  
 ax.get\_yaxis().set\_visible(False)  
  
plt.show()

Epoch 1/50  
196/196 [==============================] - 7s 31ms/step - loss: 0.6502 - val\_loss: 0.6317  
Epoch 2/50  
196/196 [==============================] - 11s 57ms/step - loss: 0.6277 - val\_loss: 0.6244  
Epoch 3/50  
196/196 [==============================] - 10s 53ms/step - loss: 0.6161 - val\_loss: 0.6122  
Epoch 4/50  
196/196 [==============================] - 6s 29ms/step - loss: 0.6089 - val\_loss: 0.6067  
Epoch 5/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.6050 - val\_loss: 0.6030  
Epoch 6/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.6015 - val\_loss: 0.6005  
Epoch 7/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5983 - val\_loss: 0.5971  
Epoch 8/50  
196/196 [==============================] - 6s 29ms/step - loss: 0.5957 - val\_loss: 0.5949  
Epoch 9/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5938 - val\_loss: 0.5935  
Epoch 10/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5925 - val\_loss: 0.5918  
Epoch 11/50  
196/196 [==============================] - 7s 36ms/step - loss: 0.5915 - val\_loss: 0.5912  
Epoch 12/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5909 - val\_loss: 0.5916  
Epoch 13/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5906 - val\_loss: 0.5902  
Epoch 14/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5902 - val\_loss: 0.5901  
Epoch 15/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5901 - val\_loss: 0.5900  
Epoch 16/50  
196/196 [==============================] - 6s 29ms/step - loss: 0.5898 - val\_loss: 0.5898  
Epoch 17/50  
196/196 [==============================] - 6s 33ms/step - loss: 0.5898 - val\_loss: 0.5897  
Epoch 18/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5897 - val\_loss: 0.5897  
Epoch 19/50  
196/196 [==============================] - 7s 36ms/step - loss: 0.5897 - val\_loss: 0.5895  
Epoch 20/50  
196/196 [==============================] - 6s 29ms/step - loss: 0.5895 - val\_loss: 0.5894  
Epoch 21/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5896 - val\_loss: 0.5896  
Epoch 22/50  
196/196 [==============================] - 6s 29ms/step - loss: 0.5895 - val\_loss: 0.5897  
Epoch 23/50  
196/196 [==============================] - 7s 38ms/step - loss: 0.5895 - val\_loss: 0.5897  
Epoch 24/50  
196/196 [==============================] - 6s 29ms/step - loss: 0.5896 - val\_loss: 0.5894  
Epoch 25/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5894 - val\_loss: 0.5895  
Epoch 26/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5894 - val\_loss: 0.5895  
Epoch 27/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5895 - val\_loss: 0.5894  
Epoch 28/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5894 - val\_loss: 0.5894  
Epoch 29/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5895 - val\_loss: 0.5896  
Epoch 30/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5894 - val\_loss: 0.5895  
Epoch 31/50  
196/196 [==============================] - 7s 36ms/step - loss: 0.5894 - val\_loss: 0.5894  
Epoch 32/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5894 - val\_loss: 0.5893  
Epoch 33/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5894 - val\_loss: 0.5896  
Epoch 34/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5894 - val\_loss: 0.5894  
Epoch 35/50  
196/196 [==============================] - 7s 37ms/step - loss: 0.5893 - val\_loss: 0.5893  
Epoch 36/50  
196/196 [==============================] - 6s 29ms/step - loss: 0.5893 - val\_loss: 0.5894  
Epoch 37/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5894 - val\_loss: 0.5893  
Epoch 38/50  
196/196 [==============================] - 6s 29ms/step - loss: 0.5894 - val\_loss: 0.5893  
Epoch 39/50  
196/196 [==============================] - 7s 33ms/step - loss: 0.5893 - val\_loss: 0.5893  
Epoch 40/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5893 - val\_loss: 0.5893  
Epoch 41/50  
196/196 [==============================] - 6s 32ms/step - loss: 0.5893 - val\_loss: 0.5893  
Epoch 42/50  
196/196 [==============================] - 6s 31ms/step - loss: 0.5893 - val\_loss: 0.5893  
Epoch 43/50  
196/196 [==============================] - 7s 34ms/step - loss: 0.5893 - val\_loss: 0.5893  
Epoch 44/50  
196/196 [==============================] - 6s 29ms/step - loss: 0.5893 - val\_loss: 0.5892  
Epoch 45/50  
196/196 [==============================] - 7s 35ms/step - loss: 0.5893 - val\_loss: 0.5892  
Epoch 46/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5893 - val\_loss: 0.5894  
Epoch 47/50  
196/196 [==============================] - 7s 36ms/step - loss: 0.5893 - val\_loss: 0.5894  
Epoch 48/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5893 - val\_loss: 0.5895  
Epoch 49/50  
196/196 [==============================] - 7s 36ms/step - loss: 0.5893 - val\_loss: 0.5892  
Epoch 50/50  
196/196 [==============================] - 6s 30ms/step - loss: 0.5893 - val\_loss: 0.5894  
313/313 [==============================] - 1s 2ms/step  
313/313 [==============================] - 1s 2ms/step

