# autoencoders-for-cifar-100-dataset

April 5, 2024

[2]:
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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)
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# 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()
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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
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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
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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
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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
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