nm-random-numbers-generations

April 5, 2024

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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 mnist  # Import MNIST dataset

# Load the MNIST dataset
(x_train, _), (x_test, _) = mnist.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_flat = x_train.reshape((len(x_train), np.prod(x_train.shape[1:])))
x_test_flat = 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=(x_train_flat.shape[1],))
encoded = Dense(encoding_dim, activation='relu')(input_img)
decoded = Dense(x_train_flat.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_flat, x_train_flat, epochs=50, batch_size=256,␣
 ↪shuffle=True, validation_data=(x_test_flat, x_test_flat))

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

# Encode the test images
encoded_imgs = encoder.predict(x_test_flat)
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# Decode the encoded images
decoded_imgs = autoencoder.predict(x_test_flat)

# Display original and reconstructed images
n = 10  # Number of samples 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], cmap='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(28, 28), cmap='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 [==============================] - 10s 31ms/step - loss: 0.2753 -
val_loss: 0.1892
Epoch 2/50
235/235 [==============================] - 6s 26ms/step - loss: 0.1706 -
val_loss: 0.1535
Epoch 3/50
235/235 [==============================] - 5s 20ms/step - loss: 0.1447 -
val_loss: 0.1347
Epoch 4/50
235/235 [==============================] - 2s 9ms/step - loss: 0.1298 -
val_loss: 0.1227
Epoch 5/50
235/235 [==============================] - 3s 14ms/step - loss: 0.1195 -
val_loss: 0.1140
Epoch 6/50
235/235 [==============================] - 2s 10ms/step - loss: 0.1124 -
val_loss: 0.1082
Epoch 7/50
235/235 [==============================] - 2s 9ms/step - loss: 0.1074 -
val_loss: 0.1041
Epoch 8/50
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235/235 [==============================] - 2s 10ms/step - loss: 0.1037 -
val_loss: 0.1009
Epoch 9/50
235/235 [==============================] - 2s 10ms/step - loss: 0.1009 -
val_loss: 0.0984
Epoch 10/50
235/235 [==============================] - 3s 13ms/step - loss: 0.0988 -
val_loss: 0.0968
Epoch 11/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0974 -
val_loss: 0.0956
Epoch 12/50
235/235 [==============================] - 2s 9ms/step - loss: 0.0966 -
val_loss: 0.0949
Epoch 13/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0960 -
val_loss: 0.0944
Epoch 14/50
235/235 [==============================] - 2s 9ms/step - loss: 0.0956 -
val_loss: 0.0942
Epoch 15/50
235/235 [==============================] - 3s 12ms/step - loss: 0.0953 -
val_loss: 0.0939
Epoch 16/50
235/235 [==============================] - 3s 11ms/step - loss: 0.0951 -
val_loss: 0.0937
Epoch 17/50
235/235 [==============================] - 2s 9ms/step - loss: 0.0949 -
val_loss: 0.0936
Epoch 18/50
235/235 [==============================] - 2s 9ms/step - loss: 0.0948 -
val_loss: 0.0936
Epoch 19/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0947 -
val_loss: 0.0935
Epoch 20/50
235/235 [==============================] - 3s 11ms/step - loss: 0.0946 -
val_loss: 0.0934
Epoch 21/50
235/235 [==============================] - 3s 11ms/step - loss: 0.0945 -
val_loss: 0.0933
Epoch 22/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0944 -
val_loss: 0.0932
Epoch 23/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0944 -
val_loss: 0.0932
Epoch 24/50
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235/235 [==============================] - 2s 10ms/step - loss: 0.0943 -
val_loss: 0.0931
Epoch 25/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0943 -
val_loss: 0.0930
Epoch 26/50
235/235 [==============================] - 3s 13ms/step - loss: 0.0943 -
val_loss: 0.0930
Epoch 27/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0942 -
val_loss: 0.0930
Epoch 28/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0942 -
val_loss: 0.0930
Epoch 29/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0942 -
val_loss: 0.0929
Epoch 30/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0941 -
val_loss: 0.0929
Epoch 31/50
235/235 [==============================] - 3s 13ms/step - loss: 0.0941 -
val_loss: 0.0929
Epoch 32/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0941 -
val_loss: 0.0929
Epoch 33/50
235/235 [==============================] - 2s 9ms/step - loss: 0.0940 -
val_loss: 0.0928
Epoch 34/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0940 -
val_loss: 0.0928
Epoch 35/50
235/235 [==============================] - 2s 9ms/step - loss: 0.0940 -
val_loss: 0.0928
Epoch 36/50
235/235 [==============================] - 3s 13ms/step - loss: 0.0940 -
val_loss: 0.0928
Epoch 37/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0940 -
val_loss: 0.0928
Epoch 38/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0939 -
val_loss: 0.0928
Epoch 39/50
235/235 [==============================] - 2s 9ms/step - loss: 0.0939 -
val_loss: 0.0927
Epoch 40/50
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235/235 [==============================] - 2s 10ms/step - loss: 0.0939 -
val_loss: 0.0928
Epoch 41/50
235/235 [==============================] - 3s 14ms/step - loss: 0.0939 -
val_loss: 0.0927
Epoch 42/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0939 -
val_loss: 0.0926
Epoch 43/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0939 -
val_loss: 0.0928
Epoch 44/50
235/235 [==============================] - 2s 9ms/step - loss: 0.0939 -
val_loss: 0.0927
Epoch 45/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0938 -
val_loss: 0.0927
Epoch 46/50
235/235 [==============================] - 3s 14ms/step - loss: 0.0938 -
val_loss: 0.0926
Epoch 47/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0938 -
val_loss: 0.0927
Epoch 48/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0938 -
val_loss: 0.0926
Epoch 49/50
235/235 [==============================] - 2s 9ms/step - loss: 0.0938 -
val_loss: 0.0926
Epoch 50/50
235/235 [==============================] - 2s 10ms/step - loss: 0.0938 -
val_loss: 0.0926
313/313 [==============================] - 0s 1ms/step
313/313 [==============================] - 1s 2ms/step
```