

**Ex No: 7**

**Date: 06-09-2024**

## **BUILD AUTOENCODERS WITH KERAS/TENSORFLOW**

### **AIM:**

To build autoencoders with Keras/TensorFlow.

### **PROCEDURE:**

1. Download and load the dataset.
2. Perform analysis and preprocessing of the dataset.
3. Build autoencoders using Keras/TensorFlow.
4. Compile and fit the model.
5. Perform prediction with the test dataset.
6. Calculate performance metrics.

### **PROGRAM:**

```
import numpy as np

from keras.layers import Input, Dense

from keras.models import Model

# Define input dimension

input_dim = 784 # For example, flattened 28x28 MNIST images

# Define encoding dimension

encoding_dim = 32

# Input layer

input_img = Input(shape=(input_dim,))
```

```
# Encoder layers

encoded = Dense(128, activation='relu')(input_img)

encoded = Dense(64, activation='relu')(encoded)

encoded = Dense(encoding_dim, activation='relu')(encoded)


# Decoder layers

decoded = Dense(64, activation='relu')(encoded)

decoded = Dense(128, activation='relu')(decoded)

decoded = Dense(input_dim, activation='sigmoid')(decoded)


# Autoencoder model

autoencoder = Model(input_img, decoded)


# Separate encoder model

encoder = Model(input_img, encoded)


# Compile the model

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


# Generate dummy data for demonstration

x_train = np.random.random((1000, input_dim))

x_test = np.random.random((200, input_dim))


# Train the autoencoder

autoencoder.fit(x_train, x_train,
```

```
epochs=50,

batch_size=256,

shuffle=True,

validation_data=(x_test, x_test))

# Use the encoder to encode some input

encoded_imgs = encoder.predict(x_test)

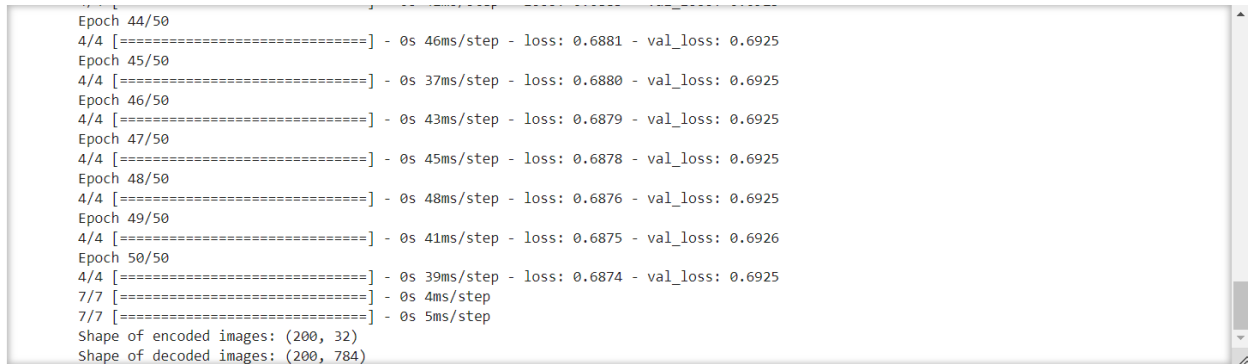
# Use the autoencoder to reconstruct some input

decoded_imgs = autoencoder.predict(x_test)

print("Shape of encoded images:", encoded_imgs.shape)

print("Shape of decoded images:", decoded_imgs.shape)
```

### OUTPUT:



```
Epoch 44/50
4/4 [=====] - 0s 46ms/step - loss: 0.6881 - val_loss: 0.6925
Epoch 45/50
4/4 [=====] - 0s 37ms/step - loss: 0.6880 - val_loss: 0.6925
Epoch 46/50
4/4 [=====] - 0s 43ms/step - loss: 0.6879 - val_loss: 0.6925
Epoch 47/50
4/4 [=====] - 0s 45ms/step - loss: 0.6878 - val_loss: 0.6925
Epoch 48/50
4/4 [=====] - 0s 48ms/step - loss: 0.6876 - val_loss: 0.6925
Epoch 49/50
4/4 [=====] - 0s 41ms/step - loss: 0.6875 - val_loss: 0.6926
Epoch 50/50
4/4 [=====] - 0s 39ms/step - loss: 0.6874 - val_loss: 0.6925
7/7 [=====] - 0s 4ms/step
7/7 [=====] - 0s 5ms/step
Shape of encoded images: (200, 32)
Shape of decoded images: (200, 784)
```

### RESULT:

Thus, an autoencoder using Keras/TensorFlow was successfully implemented.