Ex No: 7 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 a simple neural network model using Keras/TensorFlow.
4. Compile and fit the model.
5. Perform prediction with the test dataset.
6. Calculate performance metrics.

Program:

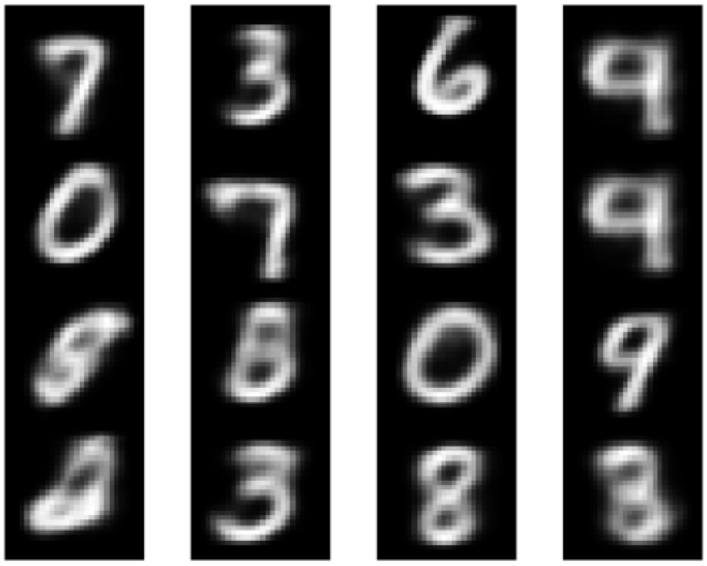
```
from tensorflow.keras.datasets import mnist
from tensorflow.keras.layers import Dense, Input, Flatten,\
                                    Reshape, LeakyReLU as LR,\
                                    Activation, Dropout
from tensorflow.keras.models import Model, Sequential
from matplotlib import pyplot as plt
from IPython import display # If using IPython, Colab or Jupyter
import numpy as np
(x_train, y_train), (x_test, y_test) = mnist.load_data()
x_train = x_train/255.0
x_test = x_test/255.0
# Plot image data from x_train
plt.imshow(x_train[0], cmap = "gray")
plt.show()
LATENT_SIZE = 32
encoder = Sequential([
    Flatten(input_shape = (28, 28)),
    Dense(512),
    LR(),
    Dropout(0.5),
```

```
    Dense(256),
    LR(),
    Dropout(0.5),
    Dense(128),
    LR(),
    Dropout(0.5),
    Dense(64),
    LR(),
    Dropout(0.5),
    Dense(LATENT_SIZE),
    LR()
])
decoder = Sequential([
    Dense(64, input_shape = (LATENT_SIZE,)),
    LR(),
    Dropout(0.5),
    Dense(128),
    LR(),
    Dropout(0.5),
    Dense(256),
    LR(),
    Dropout(0.5),
    Dense(512),
    LR(),
    Dropout(0.5),
    Dense(784),
    Activation("sigmoid"),
    Reshape((28, 28))
])
img = Input(shape = (28, 28))
latent_vector = encoder(img)
output = decoder(latent_vector)
model = Model(inputs = img, outputs = output)
model.compile("nadam", loss = "binary_crossentropy")
```

```
EPOCHS = 60
#Only do plotting if you have IPython, Jupyter, or using Colab
for epoch in range(EPOCHS):
    fig, axs = plt.subplots(4, 4)
    rand = x_test[np.random.randint(0, 10000, 16)].reshape((4, 4, 1, 28, 28))

    display.clear_output() # If you imported display from IPython

    for i in range(4):
        for j in range(4):
            axs[i, j].imshow(model.predict(rand[i, j])[0], cmap = "gray")
            axs[i, j].axis("off")

    plt.subplots_adjust(wspace = 0, hspace = 0)
    plt.show()
    print("-----------", "EPOCH", epoch, "-----------")
    model.fit(x_train, x_train)
```

OUTPUT:

```
1/1 ──────────────────── 0s 23ms/step
1/1 ──────────────────── 0s 20ms/step
1/1 ──────────────────── 0s 19ms/step
1/1 ──────────────────── 0s 19ms/step
1/1 ──────────────────── 0s 20ms/step
1/1 ──────────────────── 0s 19ms/step
1/1 ──────────────────── 0s 22ms/step
1/1 ──────────────────── 0s 19ms/step
1/1 ──────────────────── 0s 19ms/step
1/1 ──────────────────── 0s 18ms/step
1/1 ──────────────────── 0s 19ms/step
1/1 ──────────────────── 0s 24ms/step
1/1 ──────────────────── 0s 19ms/step
1/1 ──────────────────── 0s 19ms/step
1/1 ──────────────────── 0s 18ms/step
1/1 ──────────────────── 0s 20ms/step
```



RESULT:

The autoencoders with Keras/TensorFlow is successfully build.