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3c. To implement and Autoencoder for compressing and reconstructing MNIST images using latent space representations

```
import numpy as np
import tensorflow as tf
from tensorflow.keras.models import Model
from tensorflow.keras.layers import Input, Dense
from tensorflow.keras.losses import MeanSquaredError


#Data preparation
from tensorflow.keras.datasets import mnist
(x_train, _), (x_test, _) = mnist.load_data()
x_train = x_train.astype("float32")/ 255.0
x_test = x_test.astype("float32")/ 255.0
```

```
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
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```

```
#Flateen the images
x_train = x_train.reshape(x_train.shape[0], -1)
x_test = x_test.reshape(x_test.shape[0], -1)


latent_dim = 64
input_img = Input (shape=(x_train.shape[1],))
encoded = Dense(128, activation='relu')(input_img)
encoded = Dense(latent_dim, activation='relu')(encoded)
decoded = Dense(128, activation='relu')(encoded)
decoded = Dense(x_train.shape[1], activation='sigmoid')(decoded)


autoencoder = Model(input_img, decoded)
encoder = Model(input_img, encoded)


autoencoder.compile(optimizer='adam', loss=MeanSquaredError())
autoencoder.fit(x_train, x_train, epochs=50, batch_size=256, shuffle=True, validation_data=(x_test, x_test))
```

Show hidden output

```
# **5. Visualize Reconstruction**
import matplotlib.pyplot as plt

# Encode and decode test images
encoded_imgs = encoder.predict(x_test)
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(28, 28), cmap="gray")
    plt.title("Original")
    plt.axis("off")

    # Reconstructed images
    ax = plt.subplot(2, n, i + 1 + n)
    plt.imshow(decoded_imgs[i].reshape(28, 28), cmap="gray")
    plt.title("Reconstructed")
    plt.axis("off")
plt.show()
```

```
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```