USN NUMBER: 1RVU22CSE187
NAME: Vedansh Maheshwari

| Ex No: 7<br>Date: 11/09/24 | **Autoencoder using the Fashion MNIST Dataset ( With Denoising the dataset)** |
|---|---|

**Objective:**
To build an autoencoder that denoises Fashion MNIST images by compressing them into a lower-dimensional representation and reconstructing the original images from the compressed format.

**Descriptions:**
In this exercise, we broke the implementation down into three steps:

**Data Preparation:**
- Fashion MNIST images are loaded and normalized using TensorFlow Datasets (TFDS).
- Noise is added to the images, and the noisy images are used as inputs to the model, while the clean images are used as targets.

**Model Architecture:**
- **Encoder:** Consists of two Conv2D layers followed by MaxPooling layers, reducing the image size while extracting features.
- **Bottleneck:** A dense representation compresses the information further.
- **Decoder:** Upsamples the compressed representation back to the original image size using Conv2D and UpSampling2D layers.

**Training:**
- The model is compiled with the Adam optimizer and binary cross-entropy loss.
- The training is performed for 40 epochs with a batch size 128.

**Model:**
**Encoder:**
- Two convolutional layers with 64 and 128 filters respectively, each followed by a MaxPooling layer.
- Compresses the image down to a smaller representation.

**Bottleneck:**
- A convolutional layer with 256 filters that acts as the compressed representation layer.

**Decoder:**
- Two convolutional layers that upsample the encoded representation back to the original image size.

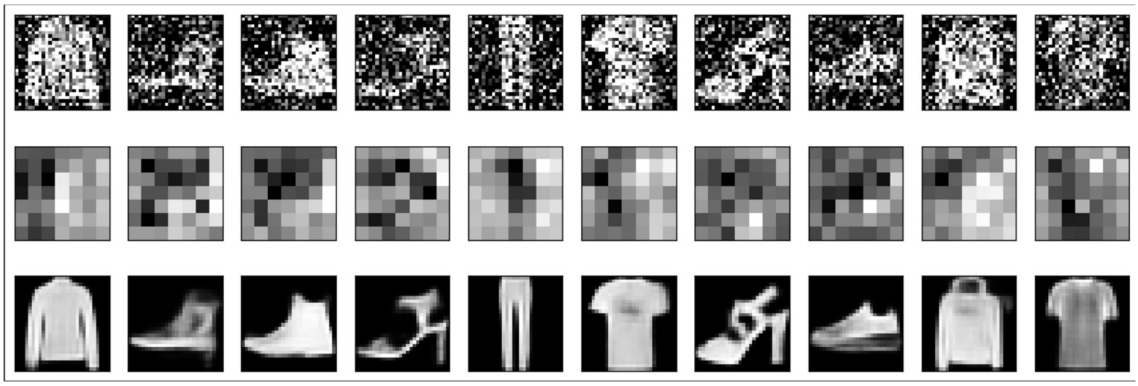
USN NUMBER: 1RVU22CSE187
NAME: Vedansh Maheshwari

Model: "functional"

| Layer (type) | Output Shape | Param # |
|---|---|---|
| input_layer (InputLayer) | (None, 28, 28, 1) | 0 |
| conv2d (Conv2D) | (None, 28, 28, 64) | 640 |
| max_pooling2d (MaxPooling2D) | (None, 14, 14, 64) | 0 |
| conv2d_1 (Conv2D) | (None, 14, 14, 128) | 73,856 |
| max_pooling2d_1 (MaxPooling2D) | (None, 7, 7, 128) | 0 |
| conv2d_2 (Conv2D) | (None, 7, 7, 256) | 295,168 |
| conv2d_4 (Conv2D) | (None, 7, 7, 128) | 295,040 |
| up_sampling2d (UpSampling2D) | (None, 14, 14, 128) | 0 |
| conv2d_5 (Conv2D) | (None, 14, 14, 64) | 73,792 |
| up_sampling2d_1 (UpSampling2D) | (None, 28, 28, 64) | 0 |
| conv2d_6 (Conv2D) | (None, 28, 28, 1) | 577 |

Total params: 739,073 (2.82 MB)
Trainable params: 739,073 (2.82 MB)
Non-trainable params: 0 (0.00 B)

**Result and Analysis:**
The autoencoder learned to denoise the images by reconstructing them from noisy inputs. The clean outputs show that the model effectively removed noise, retaining key details of the original images.



**GitHub Link:**
https://github.com/VedanshMaheshwari/Deep-Learning/blob/main/Labs/Lab%206/Lab06_4_Encoder_Denoising_DISTRI_VedanshM.ipynb