Title : Convolutional Neural Network (CNN)

Objectives : To create a cluster classifier to classify fashion clothing into categories.

Problem Statement : CNN uses MNIST fashion Dataset and a create a classifier to classify fashion clothing into categories.

Outcomes :
① To learn about CNN.

Requirements :
1) PC / Laptop
2) Any OS
3) Jupyter Notebook
4) Libraries like [Numpy, pandas, sklearn, seaborn]

Theory :
CNN :
Convolutional Neural Networks are distinguished from other neural networks by their superior performance with image, speech or audio signal inputs.
They have three main types of layers, which are -
1) Convolutional layer.
2) Pooling layer.
3) Fully connected (FC) layer.

1) Convolutional Neural Network: Layer:

This layer applies convolution operations to the input image using learnable filters. By sliding these filters across the input image, it extracts various features such as edges, corners, and textures. The convolutional layer preserves spatial relationships, between pixels, allowing the network to learn hierarchical representations of the input image.

2) Pooling layer:

This layer reduces the dimensionality of the feature maps generated by the convolutional layer. This reduction in dimensionality helps in reducing computational complexity and controlling overfitting. Common pooling operations include Max Pooling, where the maximum value with each region of the feature map is retained, Average Pooling, where the average value is computed, and sum Pooling, where the sum of values is calculated.

3) Fully connected layer:

The fully connected layer is typically found at the end of the CNN architecture. It connects every neuron in one layer to every neuron in the next layer, allowing the network to learn complex patterns and relationships in the data.

Two types of pooling in neural networks are:

1) Max pooling :
This selects the maximum pixel value within a receptive field as the output.

2) Average pooling :
This calculates the average value within the receptive field for the output.

Conclusion :
We have successfully created a classifier using convolutional neural network.