**Assignment – 10**

1. Why don't we start all of the weights with zeros?

Ans: Initializing all weights with zeros would lead to symmetry breaking issues. Symmetry breaking is important because it helps each neuron to learn different features of the input data. If all weights are the same, each neuron would learn the same feature, which hampers the learning process.

1. Why is it beneficial to start weights with a mean zero distribution?

Ans: Starting weights with a mean zero distribution helps to break symmetry and prevents any specific neuron from dominating the learning process initially. It allows each neuron to learn different features independently, which aids in better convergence during training.

1. What is dilated convolution, and how does it work?

Ans: Dilated convolution is a variant of convolutional operation where the kernel has spaces between the weights, known as dilation rate.

It helps in enlarging the receptive field of neurons without increasing the number of parameters.

The dilation rate controls the spacing between the kernel weights, allowing the network to capture multi-scale features.

4. What is TRANSPOSED CONVOLUTION, and how does it work?

Ans: Transposed convolution, also known as deconvolution, is an operation used to upsample feature maps.

It reverses the process of convolution by applying a convolution operation while padding the input to increase its spatial dimensions.

Transposed convolution is often used in tasks like image segmentation and image generation.

5.Explain Separable convolution

Ans: Separable convolution decomposes the standard convolution into two separate operations: depthwise convolution and pointwise convolution.

Depthwise convolution applies a single convolutional filter per input channel.

Pointwise convolution applies 1x1 convolutions to combine the output of the depthwise convolution, allowing for more efficient computation.

6.What is depthwise convolution, and how does it work?

Ans: Depthwise convolution is a type of convolution operation where each input channel is convolved with its own separate set of filters.

It helps reduce computational cost by applying fewer parameters compared to standard convolution, especially in scenarios with a large number of input channels.

7.What is Depthwise separable convolution, and how does it work?

Ans: Depthwise separable convolution is a combination of depthwise convolution and pointwise convolution.

It first applies depthwise convolution to independently process each input channel, followed by pointwise convolution to combine the outputs across channels.

Depthwise separable convolution offers a good trade-off between computational efficiency and expressive power.

8.Capsule networks are what they sound like.

Ans: Capsule networks are a type of neural network architecture that utilizes capsules, which are groups of neurons representing specific features of an input.

Capsules aim to capture hierarchical relationships between features by modeling the spatial relationships and pose of features in the input data.

9. Why is POOLING such an important operation in CNNs?

Ans: Pooling is crucial in CNNs for several reasons:

It reduces spatial dimensions, leading to a smaller number of parameters and improved computational efficiency.

It helps capture invariant features by summarizing information in a local neighborhood.

It aids in controlling overfitting by introducing spatial hierarchies and promoting translation invariance.

10. What are receptive fields and how do they work?

Ans: Receptive fields in CNNs refer to the area of the input image that affects the activation of a particular neuron in the network.

Each neuron in a CNN is associated with a receptive field, which is determined by the size of the convolutional kernels and the stride used in the network architecture.

Receptive fields help neurons capture information from different parts of the input image and are essential for feature learning and hierarchical representation.