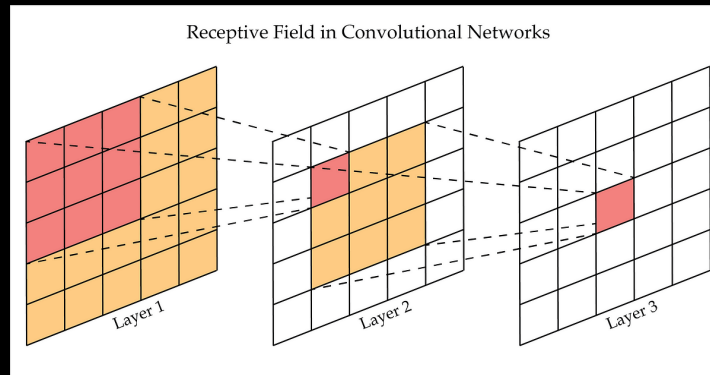


A receptive field is the area in the input space that affects the output of a given neuron. In CNNs, as we move deeper into the network, each neuron's receptive field grows, meaning it considers a larger portion of the image.

Each layer in a CNN applies convolutional filters that process small local regions, but due to multiple layers stacking, higher layers cover a wider portion of the input image.

- 1.
- 2.



Types of Receptive Field

1. Local
2. Global

## Receptive Fields

Formula :-

$$R_L = R_{L-1} + (K_L - 1) \times S_{L-1}$$

$R_L$  = Receptive Field of current layer

$R_{L-1}$  = Receptive Field of previous layer

$K_L$  = Kernel Size of current layer

$S_{L-1}$  = Total stride of previous layer

Example :-

CNN

Layer 1 :-  $3 \times 3$  ,  $S = 1$

Layer 2 :-  $3 \times 3$  ,  $S = 1$

Layer 3 :-  $3 \times 3$  ,  $S = 1$

$$RF_1 = 1 + (3 - 1) \times 1 = 3$$

$$RF_2 = 3 + (3 - 1) \times 1 = 5$$

$$RF_3 = 5 + (3 - 1) \times 1 = 7$$

Layer 3 neuron =  $7 \times 7$

## Local RF

3x3 kernel

Input image  
32, 32, 3

$$\text{LRF} = 3 \times 3$$

## Global RF

5-layer CNN

3x3 kernel,  $s=1$

## RF

Layer 1 :-  $3 \times 3$

Layer 2 :-  $5 \times 5$

3 :-  $7 \times 7$

Layer 4 :-  $9 \times 9$

Layer 5 :-  $11 \times 11$

