

# Convolution & Max pooling operation with parameter calculation.

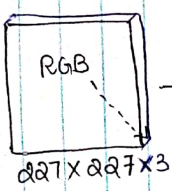
Formula

(no padding)

$$\frac{n-f}{s} + 1$$

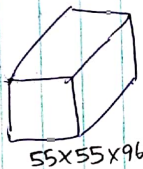


Image



stride = 4  
Filter 11x11  
96 kernels  
convolution 1

$$\frac{227-11}{4} + 1 \text{ (bias)} = 55$$



Parameters involved →

$$((11 \times 11 \times 3) + 1) \times 96 = 34,944$$

Formula

$$\frac{\text{Filter h} \times \text{Filter w}}{\downarrow} \frac{\text{RGB}}{\downarrow} \frac{\text{Bias}}{\downarrow} \rightarrow ((n \times n \times \text{Depth}) + 1) \times \text{no of filters}$$

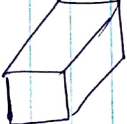
$$\frac{n-f}{s} + 1$$



3x3, stride=2  
Max pooling

$$\frac{(55-3)}{2} + 1 = 27$$

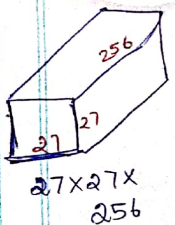
no operations involved



$$\frac{n+2p-f}{s} + 1$$

stride not given, so s=1  
5x5, pad=2  
256 kernel  
convolution 2

$$\frac{27 + (2 \times 2) - 5}{1} + 1 = 27$$



$$((5 \times 5 \times 96) + 1) \times 256 = 6,14,656$$

$$((n \times n \times \text{previous filter/depth}) + 1) \times \text{no of filters}$$

# ① convolution 1 o/p :

o/p size calculation

for RGB depth = 3

$$\text{I/p image} = 227 \times 227 \times 3$$

$$\text{Stride} = 4$$

$$\text{filter} = 11 \times 11$$

$$\text{kernel / no of filters} = 96$$

$$\therefore \text{o/p size} = \frac{n-f}{s} + \text{bias}$$

$$= \frac{227-11}{4} + 1$$

$$= 55$$

$$\therefore \text{o/p size} = 55 \times 55 \times 96$$

Because no of filters = 96, so it creates 96 activation map.  
So depth = 96

parameter calculation

filter size

$$((n \times n \times \text{depth}) + 1) \times \text{No of filters}$$

$$= ((11 \times 11 \times 3) + 1) \times 96$$

$$= 34,944$$