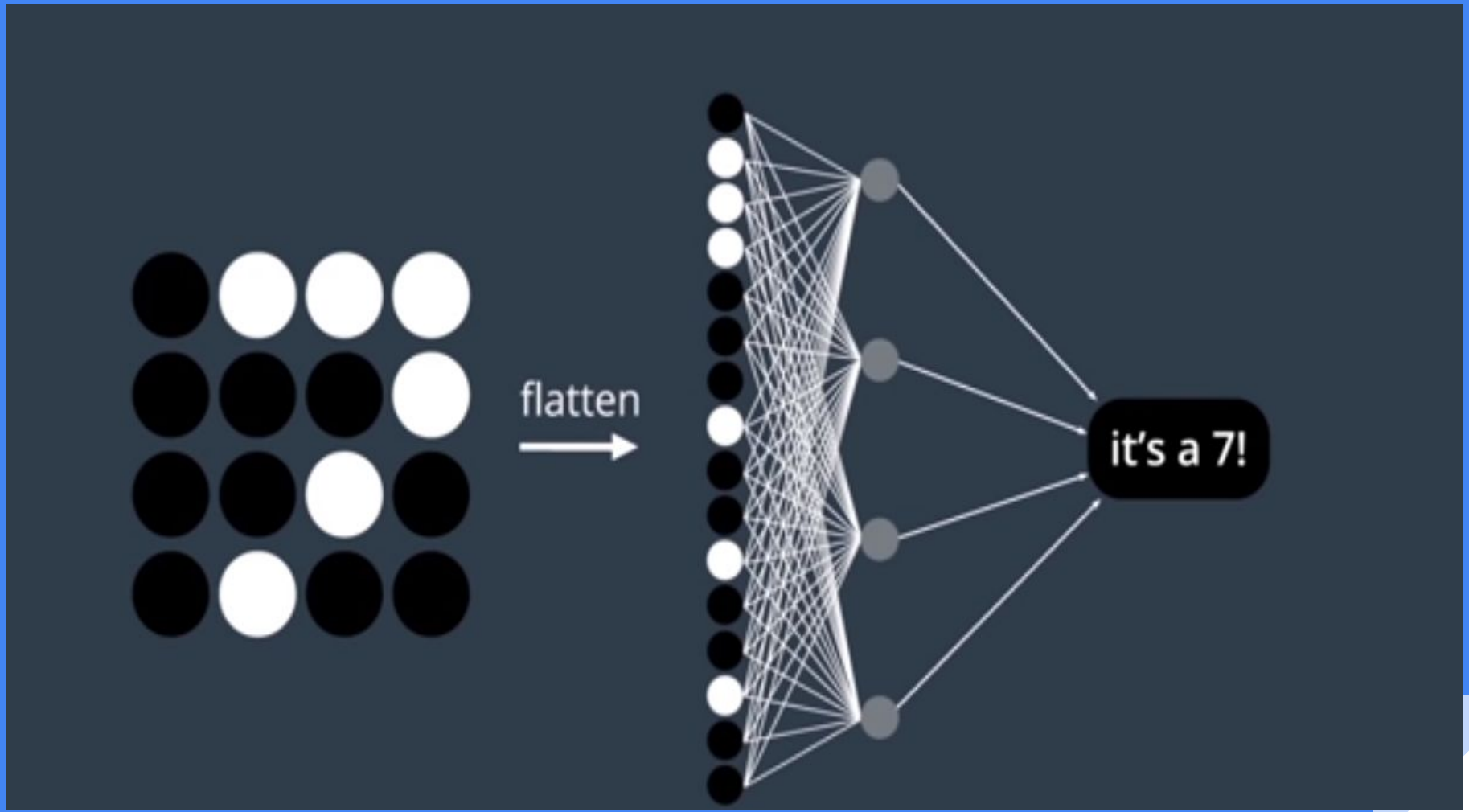
CNN
Convolutional Neural Networks

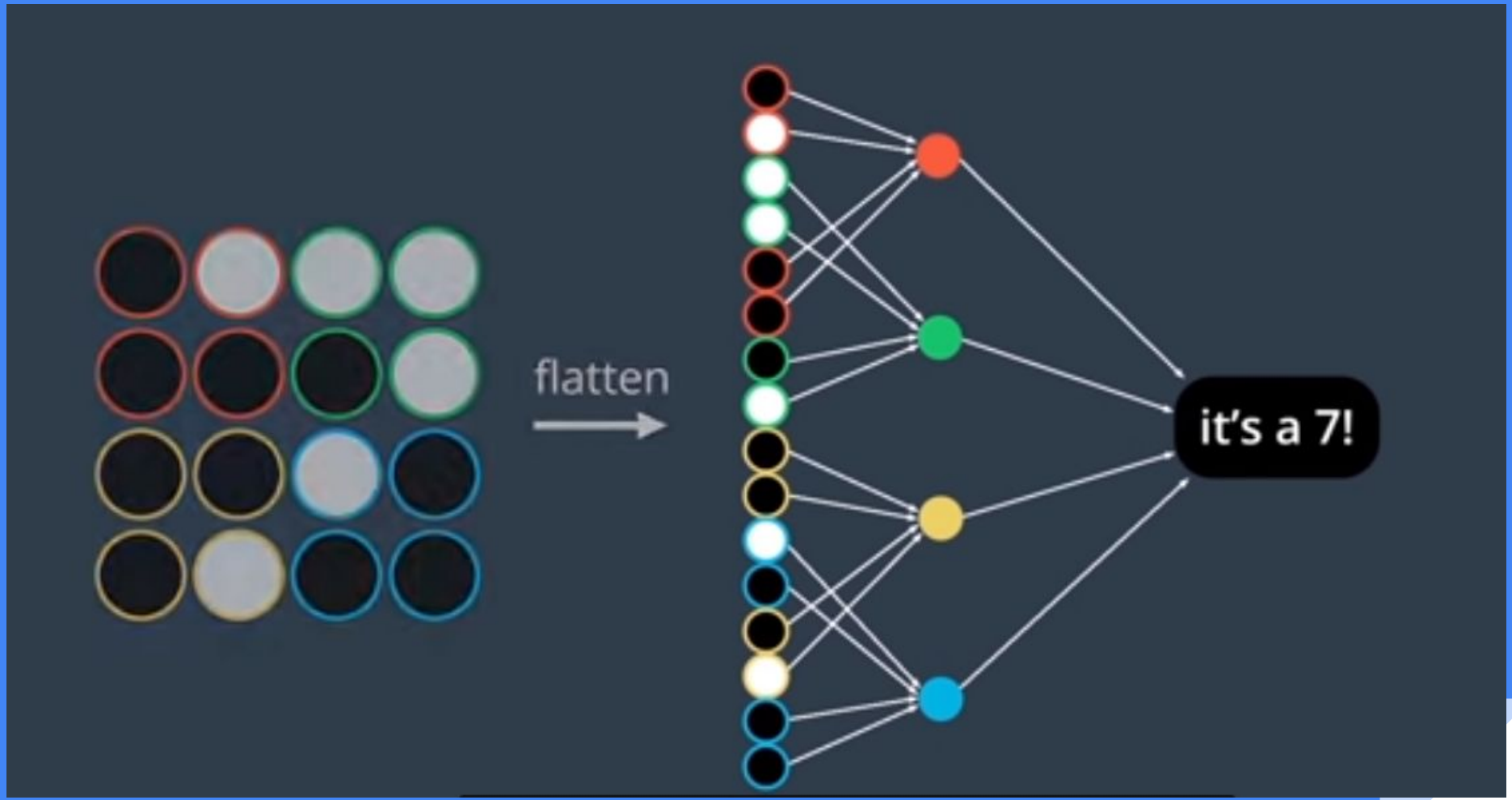
MLPs

- Only use **fully** connected layers
- Only accept **vectors** as input

CNNs

- Also use **sparsely** connected layers
- Also accept **matrices** as input


flatten
it's a 7!


flatten
it's a 7!

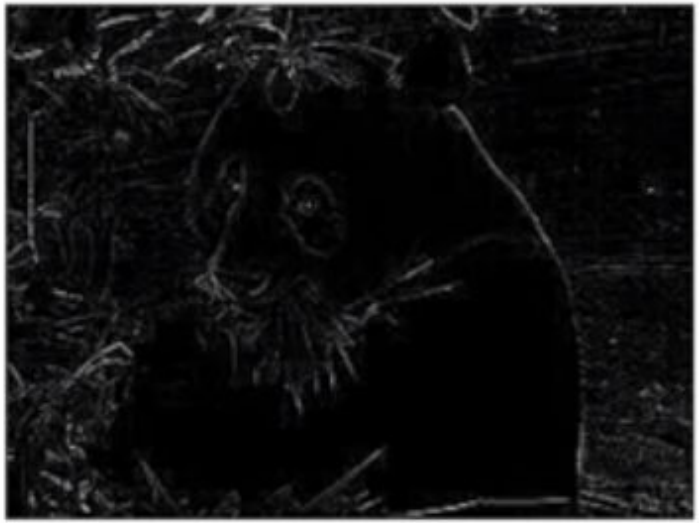
Convolutional Layer

- Used to capture the spatial patterns in the image
    Spatial Patterns:
    1. Color
    2. Shape: Patterns of intensity. Intensity can be light or dark
- Uses filters:

1. Remove irrelevant data
2. Amplify important features

EDGE DETECTION

Emphasize Edges



Edges are areas in an image where the intensity changes very quickly.

CONVOLUTION KERNELS

0	-1	0
-1	4	-1
0	-1	0

edge detection filter

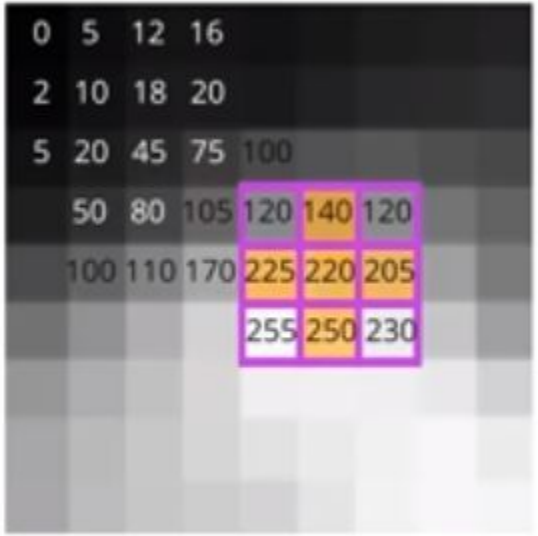
CONVOLUTION

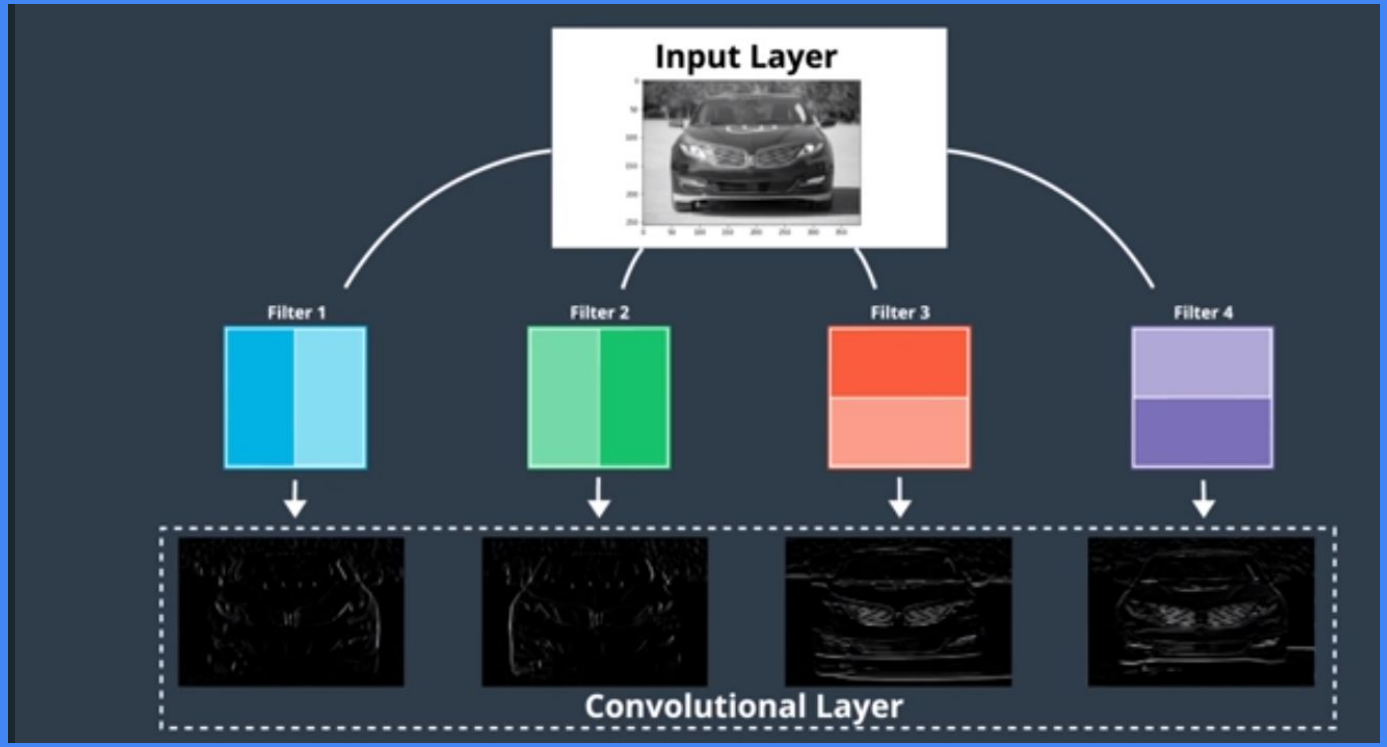
Weights

0	-1	0
-1	4	-1
0	-1	0

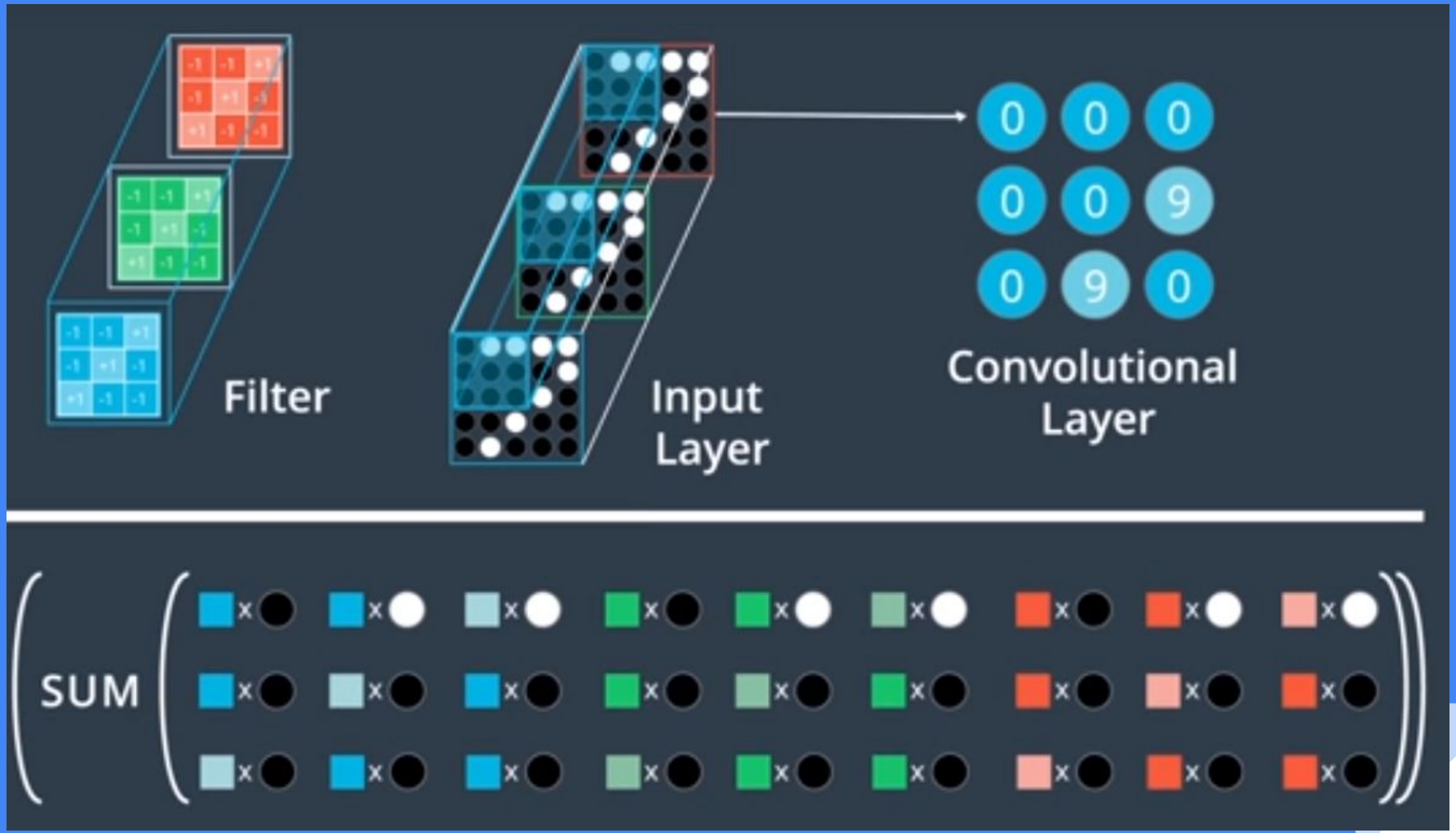
0	-140	0
-225	880	-205
0	-250	0

= *60*

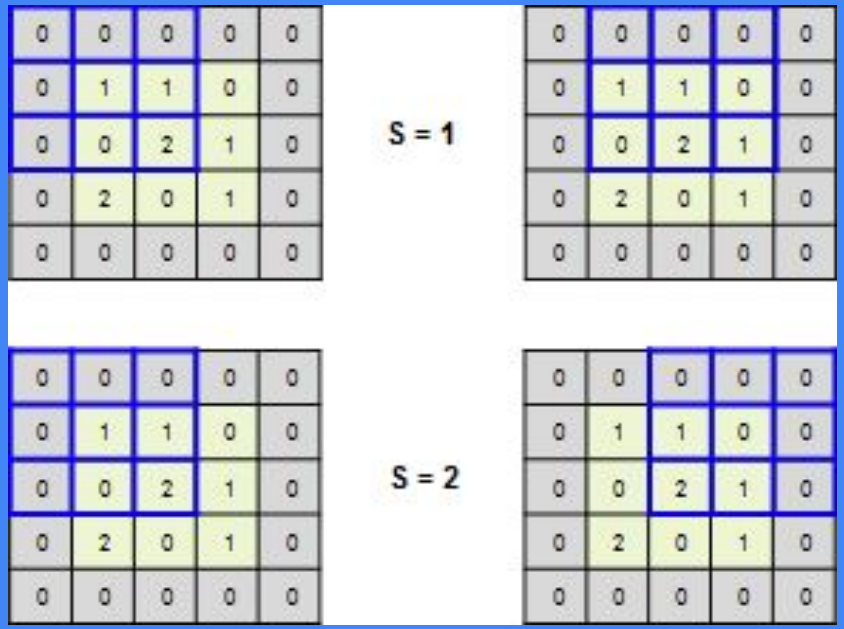


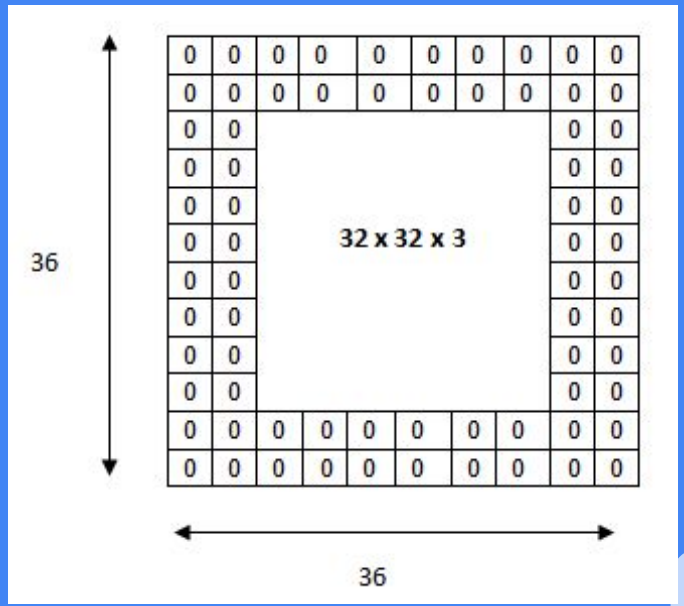

Input Layer
Filter 1
Filter 2
Filter 3
Filter 4
Convolutional Layer

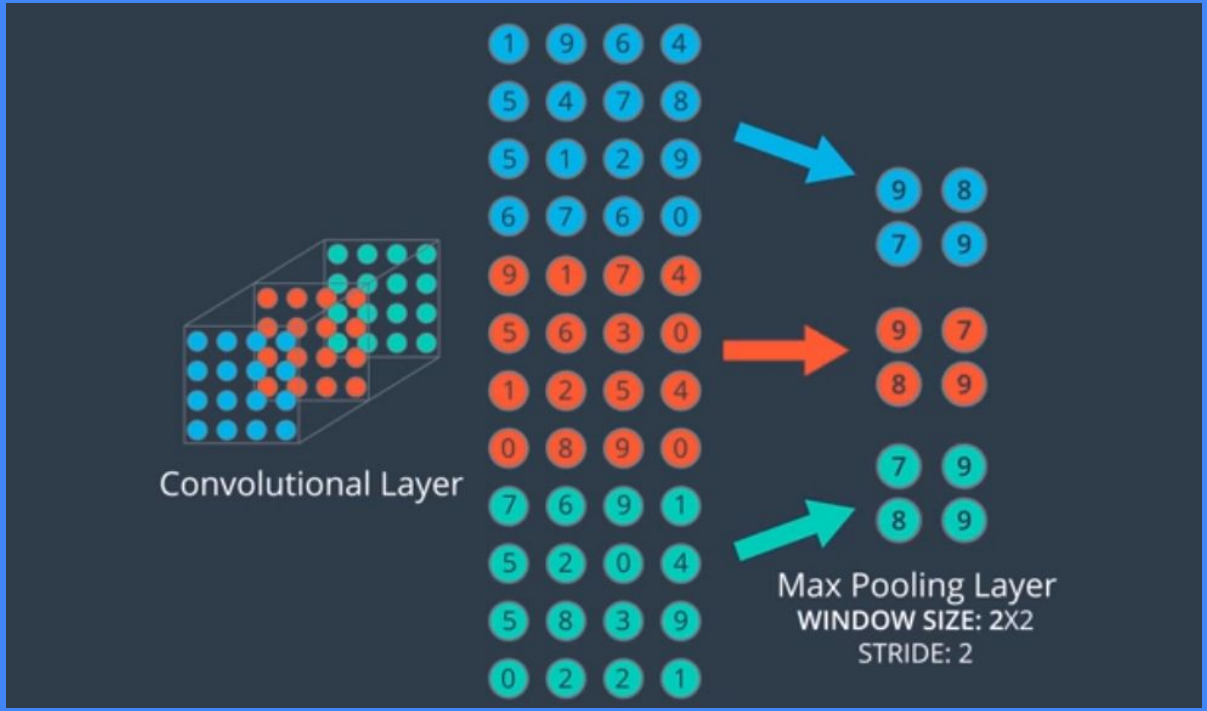
Convolution in RGB images


Filter
Input Layer
0 0 0
0 0 9
0 9 0
Convolutional Layer
SUM

STRIDE AND PADDING






1 9 6 4
5 4 7 8
5 1 2 9
6 7 6 0
9 1 7 4
5 6 3 0
1 2 5 4
0 8 9 0
7 6 9 1
5 2 0 4
5 8 3 9
0 2 2 1
9 8
7 9
9 7
8 9
7 9
8 9
Convolutional Layer
Max Pooling Layer
WINDOW SIZE: 2X2
STRIDE: 2


Input Image
conv 1
maxpool
conv 2
maxpool
flatten
fully- connected layer
CAR
predicted class