Convolution on Color Images

How we use 3D Volumes of Convolution Filters

Convolution on our Grey Scale Image

1	1	0	0	0
1	1	0	0	0
1	1	0	0	0
1	1	0	0	0
1	1	0	0	0

*

1	0	-1
1	0	-1
1	0	-1

=

3	3	0
3	3	0
3	3	0

Input Image   Filter or Kernel   Output or Feature Map

Convolution Operations on Color Images

Sum all the numbers to get the Feature Map Output

1	1	0	0	0
1	1	0	0	0
1	1	0	0	0
1	1	0	0	0
1	1	0	0	0

*

1	0	-1
1	0	-1
1	0	-1

=

3	3	0
3	3	0
3	3	0

Input Image

Filter or Kernel

Output or Feature Map
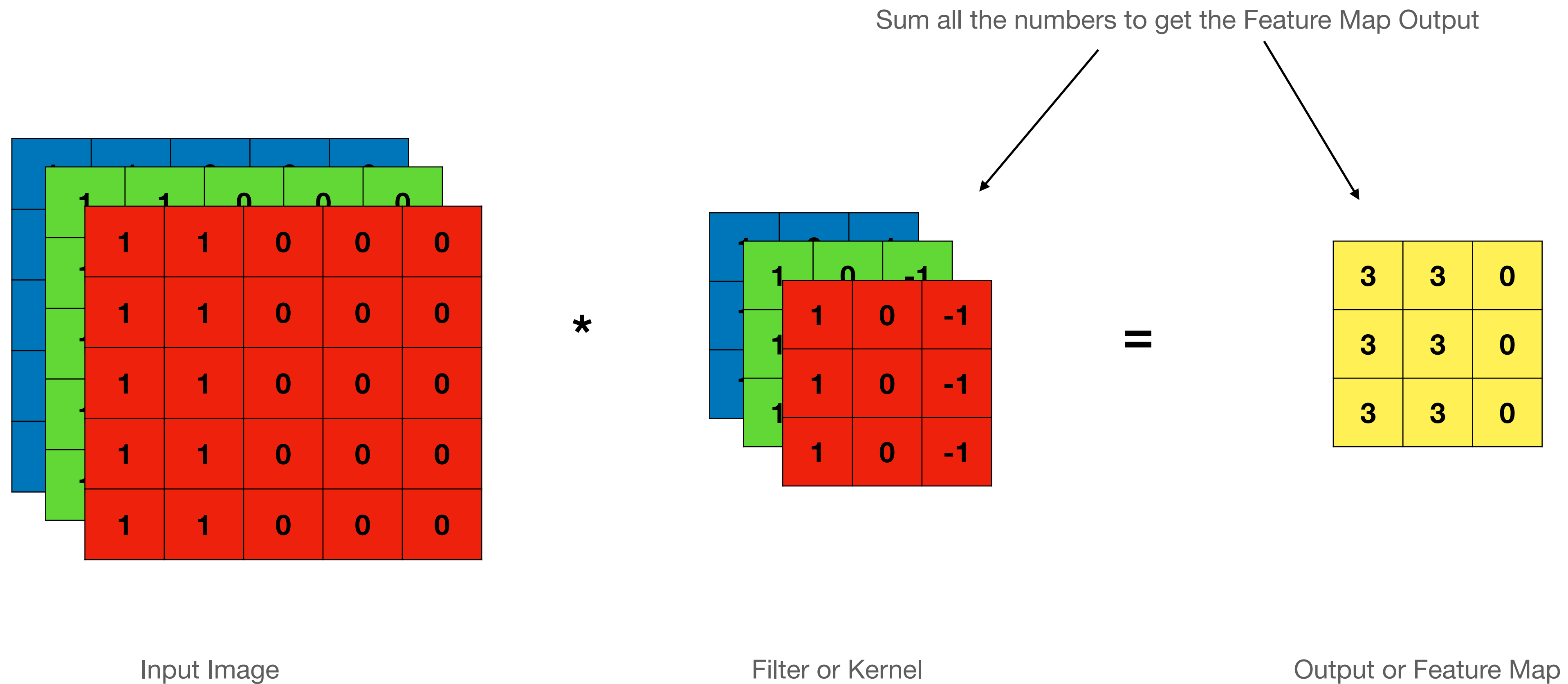
Advantages of Having a Filter For Each Colour

Input Image

*

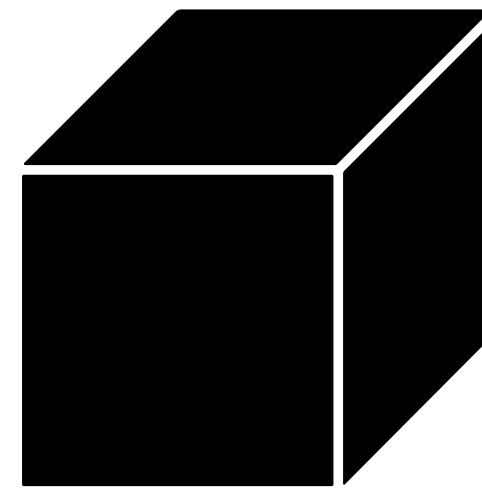Filter or Kernel

=

Output or Feature Map
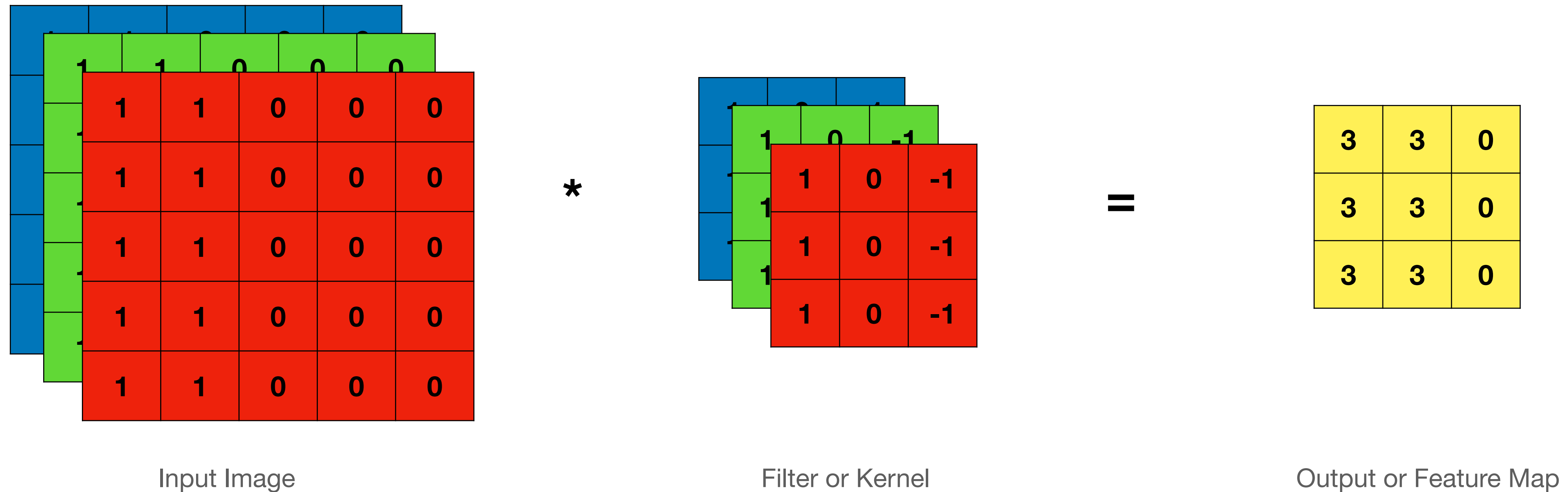
- We can detect features that are specific to a colour

Considered 3D Volumes
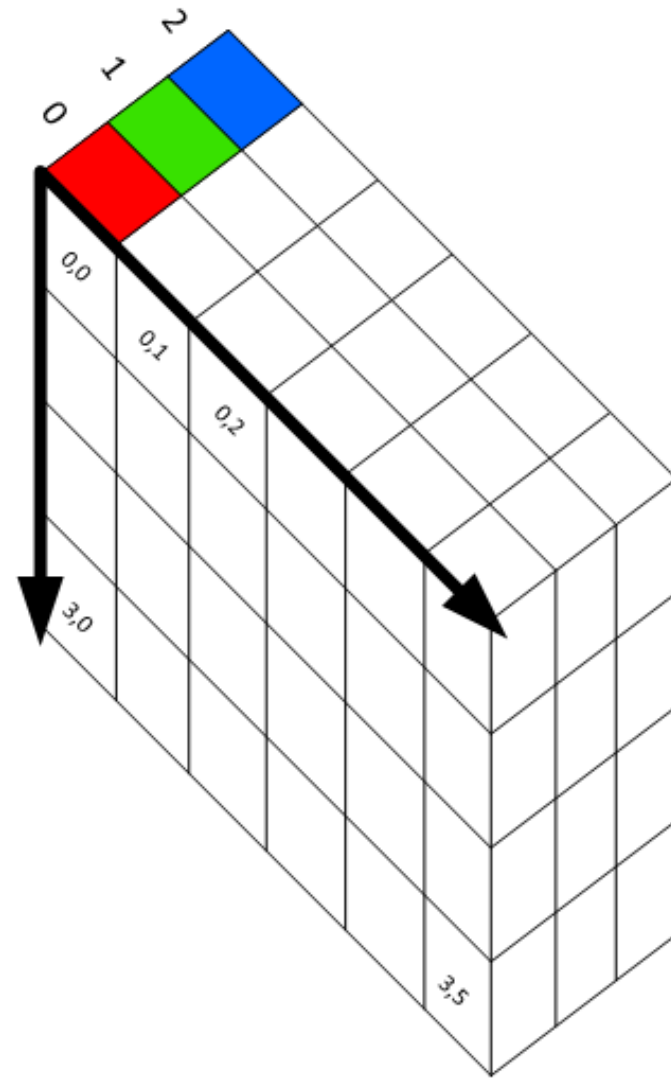
Input Image
5 x 5 x **3**

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Filter or Kernel
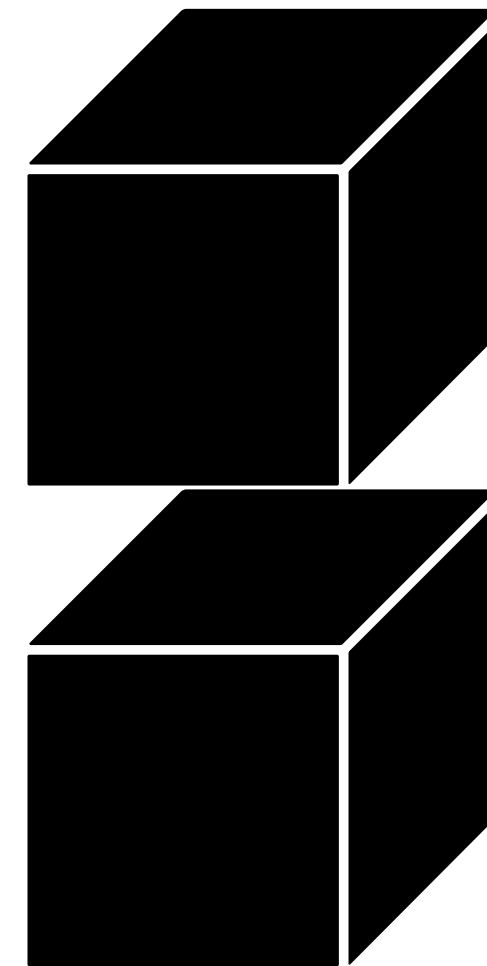3 x 3 x **3**

=

3	3	0
3	3	0
3	3	0

Output or Feature Map
3 x 3

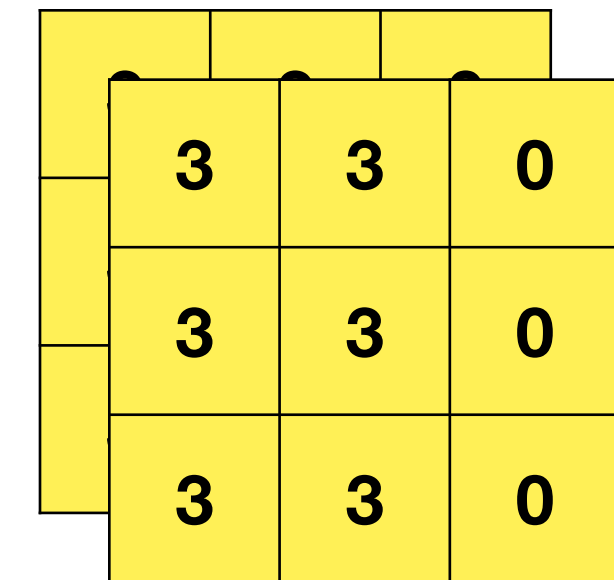# How Multiple Filters Affect Our Output
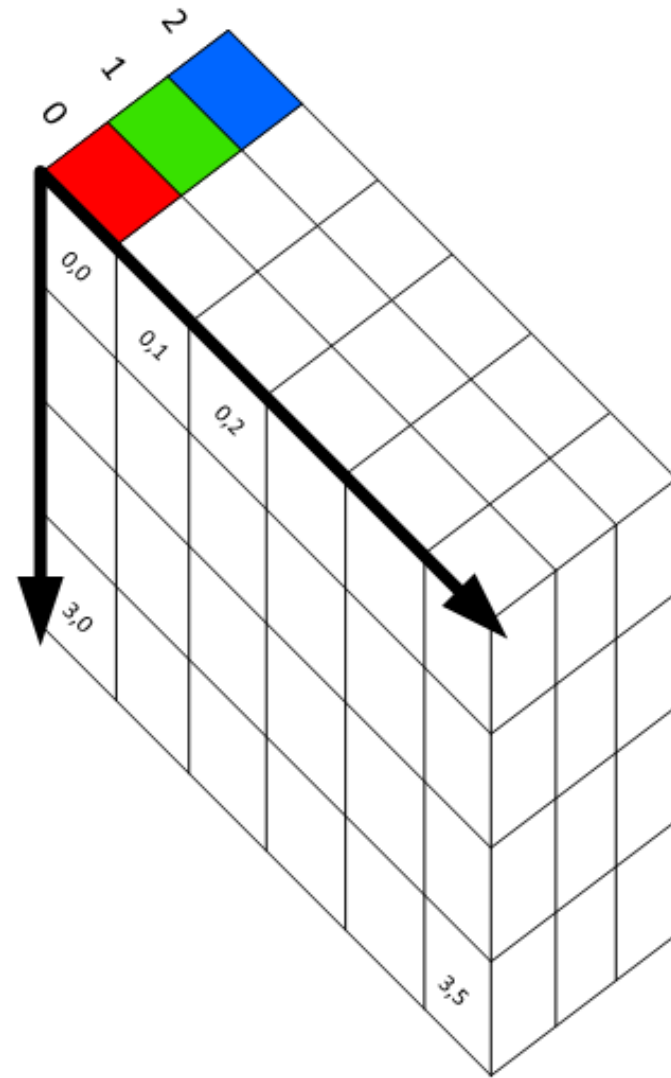
Input Image
5 x 5 x **3**

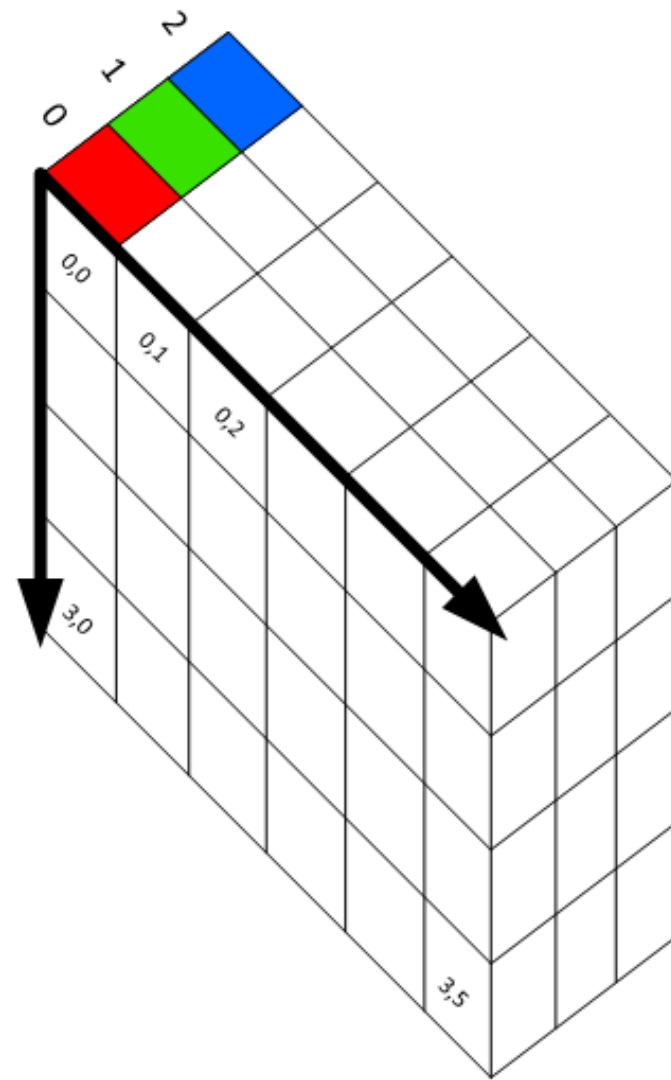**2** Filters or Kernels
3 x 3 x **3** x **2**

Output or Feature Map
3 x 3 x **2**

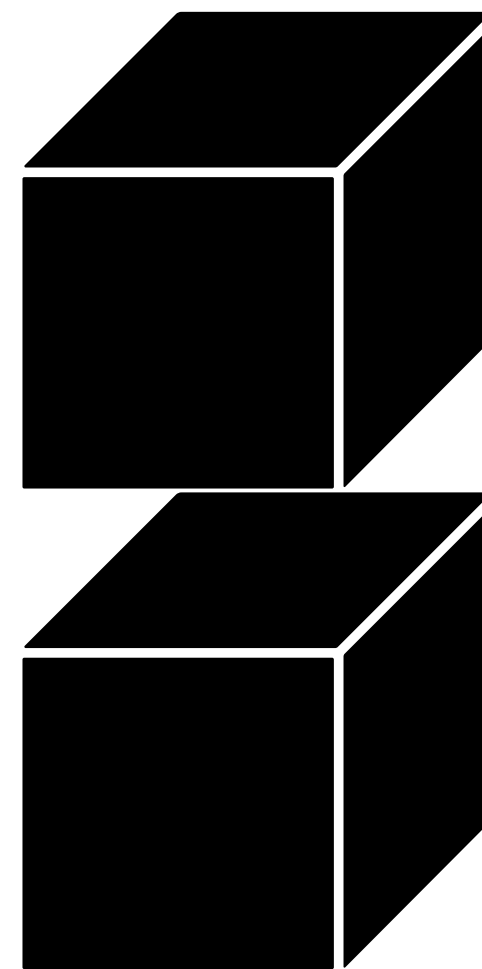# Calculating Output Size for 3D Conv Volumes

$$(n \times n \times n_c) * (f \times f \times n_c) = (n - f + 1) \times (n - f + 1) \times n_f$$

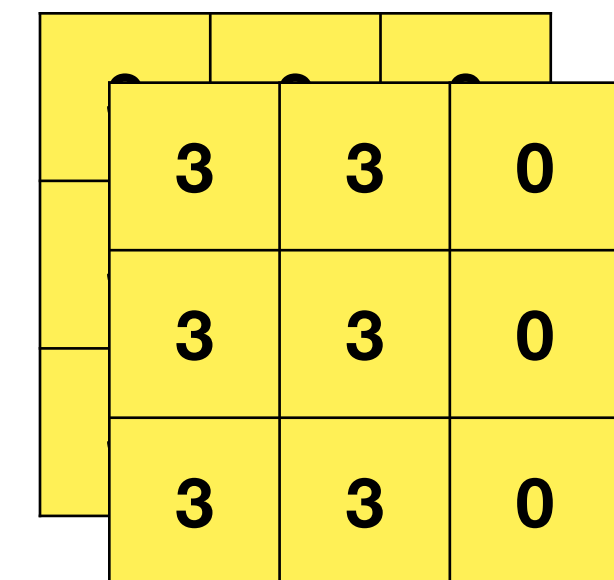$$(5 \times 5 \times 3) * (3 \times 3 \times 3) = 3 \times 3 \times 2$$

3	3	0
3	3	0
3	3	0

Input Image
5 x 5 x **3**

*

2 Filters or Kernels
3 x 3 x **3** x **2**

=

Output or Feature Map
3 x 3 x **2**

Next...

Kernel Size and Depth