Kernel (convolution) the output is called the feature map
- filter that is used to extract the features from the images.
- is a matrix that moves over the input data, performs the dot product with the sub-region of input data, and gets the output as the matrix of dot products.
- moves on the input data by the stride value.

The size obtained in the output is given by the formula:

$$o = \frac{[i - k + 2p]}{s} + 1$$

window = 8 - 1D

o output
i input
k kernel
s stride
p padding

$i = 8$
$k = 3$
$s = 1$
$p = 0$

$$o = \frac{8 - 3 + 2 \cdot 0}{1} + 1 = 6$$

Stride
- the filter is moved across the image left to right, top to bottom, with a one-pixel column change on the horizontal movements, then a one-pixel row change on the vertical movements.
- the amount of movements between aplications of the filter to the input image is referred to as the stride, and it is almost always symmetrical in height and width dimensions.
- the default stride or strides in two dimensions is (1,1) for the height and the width movement.

Padding
- is the best approach, where the number of pixels needed for the convolutional kernel to process the edge pixels are added onto the outside coping the pixels from the edge of the image.
- fix the border effect problem with padding

Pooling
- is required to down sample the detection of features in feature maps
- pooling layers provide an approach to down sampling feature maps by summarizing the presence of features in patches of the feature map.
- two common pooling methods are average pooling and max pooling that summarize the average presence of a feature and the most activated presence of a feature respectively.

Flattening

- once the pooled featured map is obtained, the next step is to flatten it.
- it involves transforming the entire pooled feature map matrix into a single column which is then fed to the neural network for processing