2D Convolution

A 2D convolution combines two matrices: an **input** (usually an image) and a **kernel/filter** (a small matrix). You slide the kernel over the image, do element-wise multiplication, then sum up the values. The result is a new matrix that highlights features.

Formula in Discrete Case:

$$(I * K)(i,j) = \sum_m \sum_n I(i+m, j+n) K(m,n)$$

Example:

-1	**-2**	**-1**
0	**0**	**0**
1	**2**	**1**

This is the Sobel mask in the horizontal direction (x axis)