2D Convolution

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? Convolution

Applies 2D mask to 2D image

Still weighted sum

Choice of weights determines the effect

$$Output(x, y) = \sum_{i=-N}^{N} \sum_{j=-N}^{N} weight(i, j) * input(x - i, y - j)$$

2D Convolution - ?

1	4	7	4	1
4	16	26	16	4
7	26	41	26	7
4	16	26	16	4
1	4	7	4	1

$\frac{1}{273}$

*   =

Convolution for ?

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

* =

Edge detection
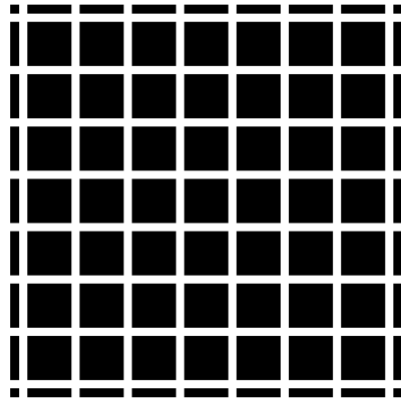
1	0	-1
2	0	-2
1	0	-1

* =

Convolution 'Explains' | ? |

Edge enhancement in human vision

Centre-surround receptors - convolved with retinal image

Hermann grid illusion – full explanation more complex

Lecture Overview

1. Convolution extension for | ? |

2. Two of many applications: smoothing and edge detection