Domain	Possible visual data
Manufacturing	product images, surface defects, assembly-line videos
Operations	site monitoring, logistics images, plant activity
Maintenance	equipment photos, corrosion, cracks, thermal images
Process Engineering	gauges, pipes, flows, visual process anomalies
Inspection	defect detection, compliance checks
Laboratory	microscope images, sample classification
IT	document OCR, access systems, visual analytics
HSE	PPE detection, unsafe acts, fire/smoke detection
Industrial Security	CCTV, perimeter detection, anomaly detection
Supply Chain	package recognition, warehouse monitoring
Finance/Planning/HR	document image processing, ID verification, dashboards

Vertical edge detection

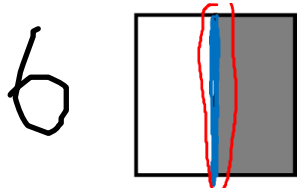
10	10	10	0	0	0
10	10	10	0	0	0
10	10	10	0	0	0
10	10	10	0	0	0
10	10	10	0	0	0
10	10	10	0	0	0

*

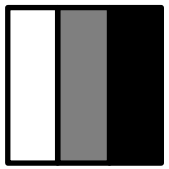
1	0	-1
1	0	-1
1	0	-1

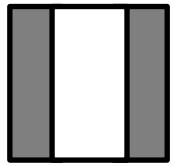
=

0	30	30	0
0	30	30	0
0	30	30	0
0	30	30	0

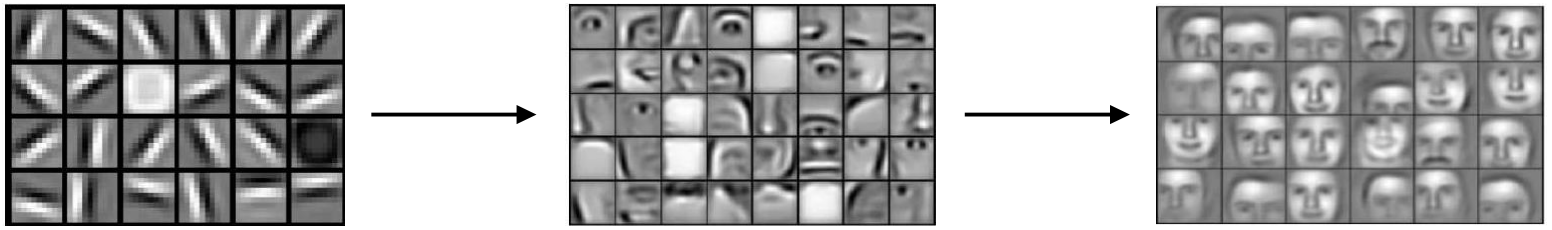


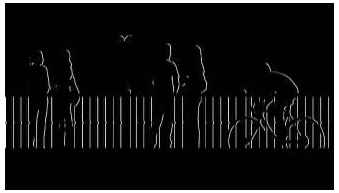
*



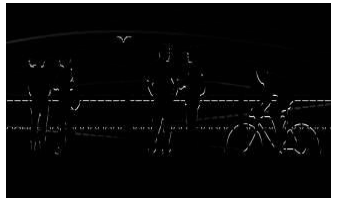


Edge detection example





vertical edges



horizontal edges

f1

f2

$$\begin{bmatrix} 1 & 0 & -1 \\ 0 & 0 & 0 \\ -1 & 0 & 1 \end{bmatrix} \qquad \begin{bmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

$$\begin{bmatrix} -1 & -1 & -1 \\ -1 & 8 & -1 \\ -1 & -1 & -1 \end{bmatrix} \qquad \begin{bmatrix} 0 & -1 & 0 \\ -1 & 5 & -1 \\ 0 & -1 & 0 \end{bmatrix} \qquad \frac{1}{16}\begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 1 \end{bmatrix}$$

Number of parameters

$(K_h \times K_w \times C_{in} + 1) C_{out}$

$[W - K + 1]$

1

If you have 10 filters that are 3 x 3 x 3 in one layer of a neural network, how many parameters does that layer have?

2

input image	kernel	output size
224 x 224 x 3	5 x 5 stride = 2 padding = 2	?