KUBRA IQBAL

Homework 7

1) K = number of filters
F = their spatial event
S = the stride
P = the amount of zero padding

$W2 * H2 * P2$

The layer produces a volume of size

$W_2 = (W1 - F + 2*P) / S + 1$

$H_2 = (H1 - F + 2*P)/(S+1)$

$D2 = k$

Where W_2, H_2 and D_2 — are the width, height & depth of output.

2) S → size of feature map

Dimensions (30, 30, 100)

Calcution = $3 * 3 * 1 = 10$

$10 * 100 = 1000$ parameters

3) Filter

1.0	1.0	1.0	1.0
1.0	1.0	1.0	1.0
1.0	1.0	1.0	1.0
1.0	1.0	1.0	1.0

Image

0	0	0	0	0	0
0	2	2	2	2	0
0	2	2	2	2	0
0	2	2	2	2	0
0	0	0	0	0	0
0	0	0	0	0	0

Size of O/P

i/p = 6x6 Stride = 1

$$= \frac{6-4+2(0)}{1} + 1 = \frac{2}{1} + 1 = 3$$

0	0	0	0	0	0
0	2	2	2	2	2
0	2	2	2	2	2
0	2	2	2	2	2
0	0	0	0	0	0
0	0	0	0	0	0

φ

1	1	1	1
1	1	1	1
-1	-1	-1	-1
-1	-1	-1	-1

Relu Max (0, x)

$=$

-6	-6	-4
6	6	4
12	12	8

(1) $0+0+0+0+0+2+2+2-0-2-2-2-0-2-2$
$-2=-6$

(2) $0+0+0+0+2+2+2+0-2-2-2-0-2-2-2-0$
$=-6$

(3) $0+0+0+0+2+2+0+0-2-2-0-0-2-2-0-0$
$=-4$

(4) $0+2+2+2+0+2+2+2+0-2-2-2+0+0+0+0$
$=6$

(5) $2+2+2+0+2+2+2+0-2-2-2-0-0-0-0-0$
$=6$

(6) $2+2+0+0+2+2+0+0-2-2-0-0-0-0-0-0$
$=4$

(7) $0+2+2+2+0+2+2+2-0-0-0-0-0-0-0-0$
$=6+6=12$

(8) $2+2+2+0+2+2+2+0-0-0=12$

(9) $2+2+0+0+2+2+0+0-0=8$

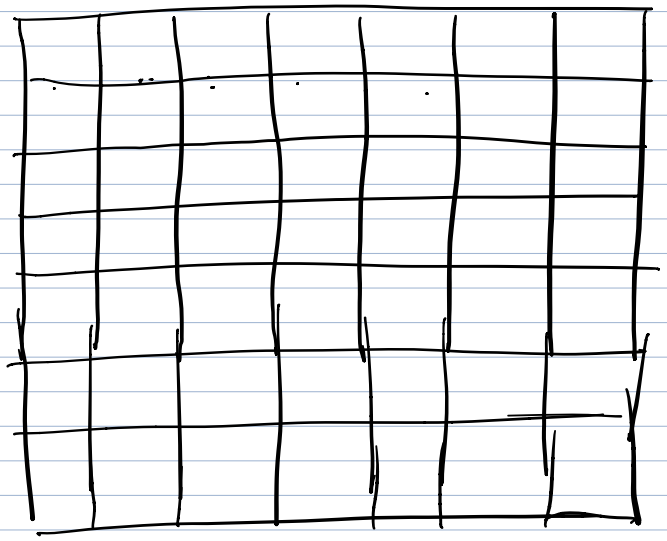
-6	-6	-8
6	6	4
12	12	8

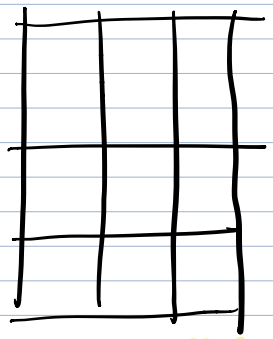
Applying Relu $f(x) = \max(0, x)$

0	0	0
6	6	4
12	12	8

3b) It helps in sharpening the edge of the image.

4) 7x7 input volume.





3x3 output volume

Normally the strides would be increased if they want their respective fields to overlap less and if they want saptial dimensions.

As we keep applying conv layers — the size of the volume will decrease faster.

We can apply zero padding of size (2) to that layer. Zero Padding pads the input volume with zeros around the border.

If we do that then this would result in a $36 \times 36 \times 3$ input volume.

$$\text{Zero padding} = \frac{(k-2)}{2}$$

$$\left[O = \frac{(W - K + 2e)}{S} + 1 \right]$$

$$\left(\frac{7 - 3 + 2[P]}{2} \right) + 1 = 7$$

$$\frac{7 - 3 + 2p}{2} = 6$$

$$4 + 2p = 12$$

$$(2 + p)\, 2 = 12$$

$$\boxed{P = 4}$$

5) Calculation

		Parameter
0	input	0
1	conv2d 1	2423
2	maxpool 1	0
3	conv d 2	25632
4	maxpool 2	0
5	dense 1	410112
6	output	5130

(1) Con 2d_1 => $(5 \times 5 \times 3) + 1 = 76$

$= 76 \times 32 = 2423$

(2) Con 2d-2 $\rightarrow (14 - (5-1)) = 10$

$= (5 \times 5 \times 32 + 1) \times 32 = 25632$

(3) Dense 1 $\rightarrow$ 512 (output) $\rightarrow (32 \times 5 \times 5 \times 1) \times 512$

$\Rightarrow 410112$

(4) Dense 2 = 10 (output) $\rightarrow (512 + 1) \times 10$

$= 5130$

Input layer has nothing to learn, at its core. The main purpose it has is to provide the input images shape. - So no learnable parameters here. The number of parameters = 0

Conventional layers = They consider a convolutional layer that takes 1 feature maps at the input and has a (k) feature maps as output.

Filter size ⟶ n x m