

# COMPUTER VISION

## CONVOLUTION ON IMAGES

# AGENDA

This video lecture focuses on understanding importance and designing following parameters for a convolution neural network:

- Filter
- Padding
- Stride
- Pooling
- Feature map

# INDEX

1. FILTER

2. PADDING

3. STRIDE

4. POOLING

## 1. FILTER

$$\text{output width} = \frac{W - F_w + 2P}{S_w} + 1$$

$$\text{output height} = \frac{H - F_h + 2P}{S_h} + 1$$

**W:** Width | **Fh:** Filter Height | **Fw:** Filter Height | **P:** Padding | **S:** Stride

RGB Image	Filter 1 (4 filters)	Convolution layer 1	Filter 2	Convolution layer 2	Filter 3	Convolution layer 3
32x32x3	2x2x4 (s=2)	16x16x4	2x2x8 (s=2)	8x8x8	8x32	2x2x32 (s=2)

2. PADDING



1 Layer of padding

10	20	30	20	80	120	50	60	70	80
0	10	20	80	0	20	0	170	190	200
20	80	200	90	100	200	190	180	10	20
200	90	255	255	255	255	255	60	70	100
150	0	255	255	255	255	255	80	70	90
170	0	0	40	40	30	0	50	20	90
180	190	10	20	60	0	120	40	10	10
1	100	0	60	0	50	100	50	60	30
20	110	110	60	20	40	80	60	30	10
60	60	0	230	0	20	200	70	180	200



0	0	0	0	0	0	0	0	0	0	0	0
0	10	20	30	20	80	120	50	60	70	80	0
0	0	10	20	80	0	20	0	170	190	200	0
0	20	80	200	90	100	200	190	180	10	20	0
0	200	90	255	255	255	255	255	60	70	100	0
0	150	0	255	255	255	255	255	80	70	90	0
0	170	0	0	40	40	30	0	50	20	90	0
0	180	190	10	20	60	0	120	40	10	10	0
0	1	100	0	60	0	50	100	50	60	30	0
0	20	110	110	60	20	40	80	60	30	10	0
0	60	60	0	230	0	20	200	70	180	200	0
0	0	0	0	0	0	0	0	0	0	0	0

3. STRIDE



STRIDE = 1

10	20	30	20	80	120	50	60	70	80
0	10	20	80	0	20	0	170	190	200
20	80	200	90	100	200	190	180	10	20
200	90	255	255	255	255	255	60	70	100
150	0	255	255	255	255	255	80	70	90
170	0	0	40	40	30	0	50	20	90
180	190	10	20	60	0	120	40	10	10
1	100	0	60	0	50	100	50	60	30
20	110	110	60	20	40	80	60	30	10
60	60	0	230	0	20	200	70	180	200

STRIDE = 2

10	20	30	20	80	120	50	60	70	80
0	10	20	80	0	20	0	170	190	200
20	80	200	90	100	200	190	180	10	20
200	90	255	255	255	255	255	60	70	100
150	0	255	255	255	255	255	80	70	90
170	0	0	40	40	30	0	50	20	90
180	190	10	20	60	0	120	40	10	10
1	100	0	60	0	50	100	50	60	30
20	110	110	60	20	40	80	60	30	10
60	60	0	230	0	20	200	70	180	200

## 4. POOLING

MAX POOLING = 3 x 3

60	70	80
170	190	200
180	10	20



200

MIN POOLING = 3 x 3

60	70	80
170	190	200
180	10	20



10

AVERAGE POOLING = 3 x 3

60	70	80
170	190	200
180	10	20



108

# SUMMARY

## “PARAMETERS”

Feature extraction from an image highly depends on how well the parameters of filters, padding, stride, pooling etc. are designed.

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