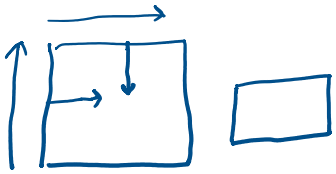
WHAT YOU WILL STUDY IN TODAY VIDEO ?

- What is Pooling Layer?
- Importance of Pooling
- Types of Pooling and When to use which Pooling ?

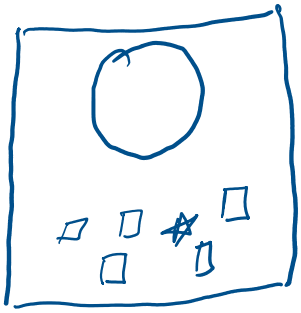
Pooling → reduce spatial dimensions (height & width)

4X4 image
↓ Conv Pooling
1 X 1 feature map

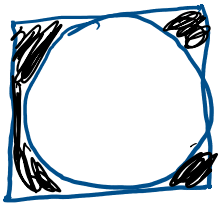


But still retains useful information.

eg.



Original image



feature map (useful ifo)

Poolng →

(To make feature map more better)

* High dimensional data/image
  → feature map size also big

Without Pooling → 64 X 64 image → 62X62 feature map → 62 X 62 (very large)

Pooling → 64X64 image → 62X62 feature map → Pooling → 31X31 feature map → 31X31 (small)

Example: Image → 1000×1000 dimension

① Without Pooling layer (only Conv layer)

Main aim :- 1000×1000 → 1×1

1000×1000 image → 1×1 image = 499 Conv layer + 1 fully connected layer

① Too many params, Training slow

② Inefficient, High computational power

③ Vanishing Gradient Problem

} Sol → Pooling (less layer)

Hero

500 layers

Working

Image (big size) (6X6)

Conv →

feature map (4X4)

1	2	6	7
5	4	9	12
1	3	1	15
0	4	1	2

Max Pooling (common) → Pool = (2X2)

Stride = 2

1	2
5	4

5

6	7
9	12

12

1	3
0	4

4

1	15
1	2

15

New feature map

5	12
4	15

= (2x2)

Drastically reduced

Image 6X6 → Conv → 4X4 → Pool → 2X2 (useful info still retained)

Example resume

1000 X 1000

↓ Conv

998 X 998

↓ Pooling

499X 499

↓ Conv

497 X 497

↓ Pool

248 X 248

↓ Conv

246X 246

↓ Pool

123 X 123

↓ conv

121 X 121

↓ pool

60 X 60

↓ conv

58 X 58

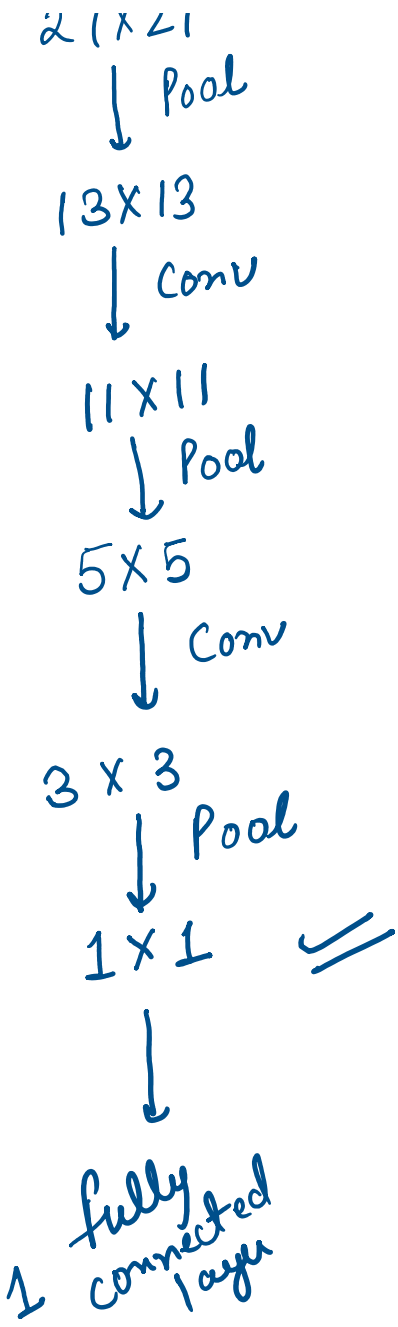
↓ Pool

29 X 29

↓ conv

27 X 27

1 Pool



16 Conv + Pooling Layer + 1 fully connected layer

17 layers

Winner

Types of Pooling

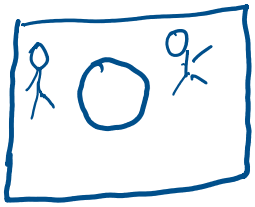
① Max Pooling

5	3
10	14

max value

14

Use case.



object → imp
background → not imp

Max Pooling

eg. face recognition.

② Average Pooling

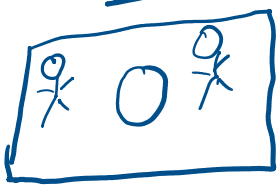
1	2
3	6

average value

$$\Rightarrow \frac{6+3+2+1}{4} = \frac{12}{4}$$

$$\Rightarrow 3$$

Use Case



object as well as background imp.

Average Pooling

eg Medical image MRI, Tumor.