Koala's eye? = Y

Koala's nose? = Y

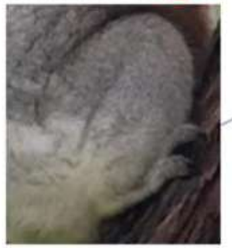
Koala's ears? = Y

Koala's head? = Y

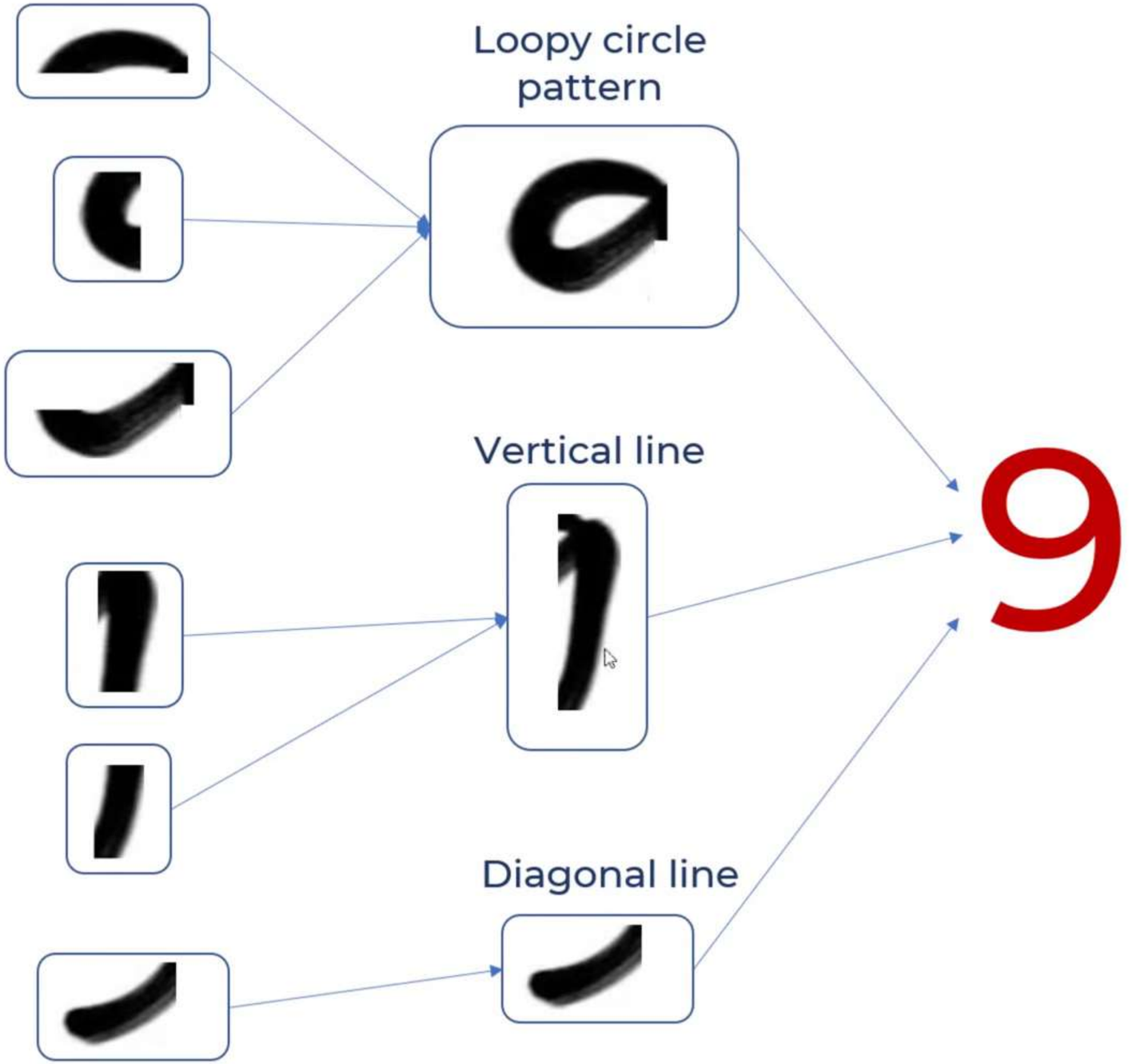
Is it Koala? = Y

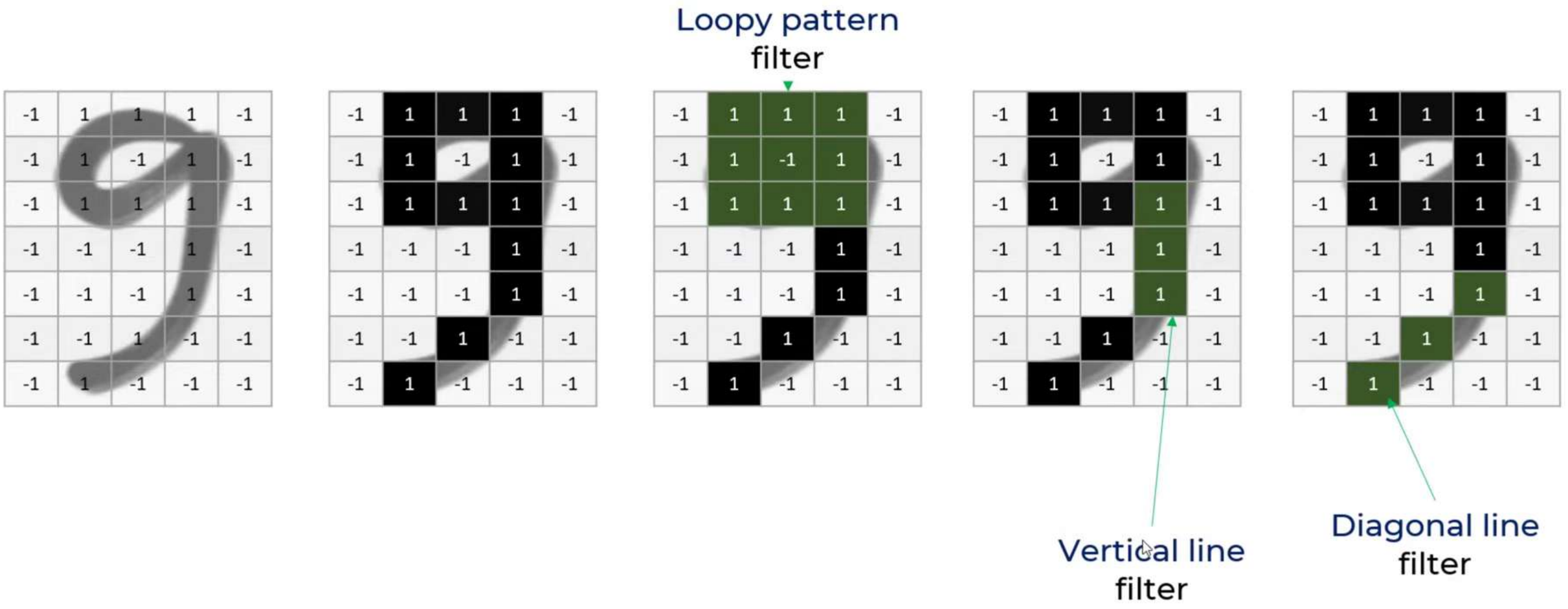
Koala's hands? = Y

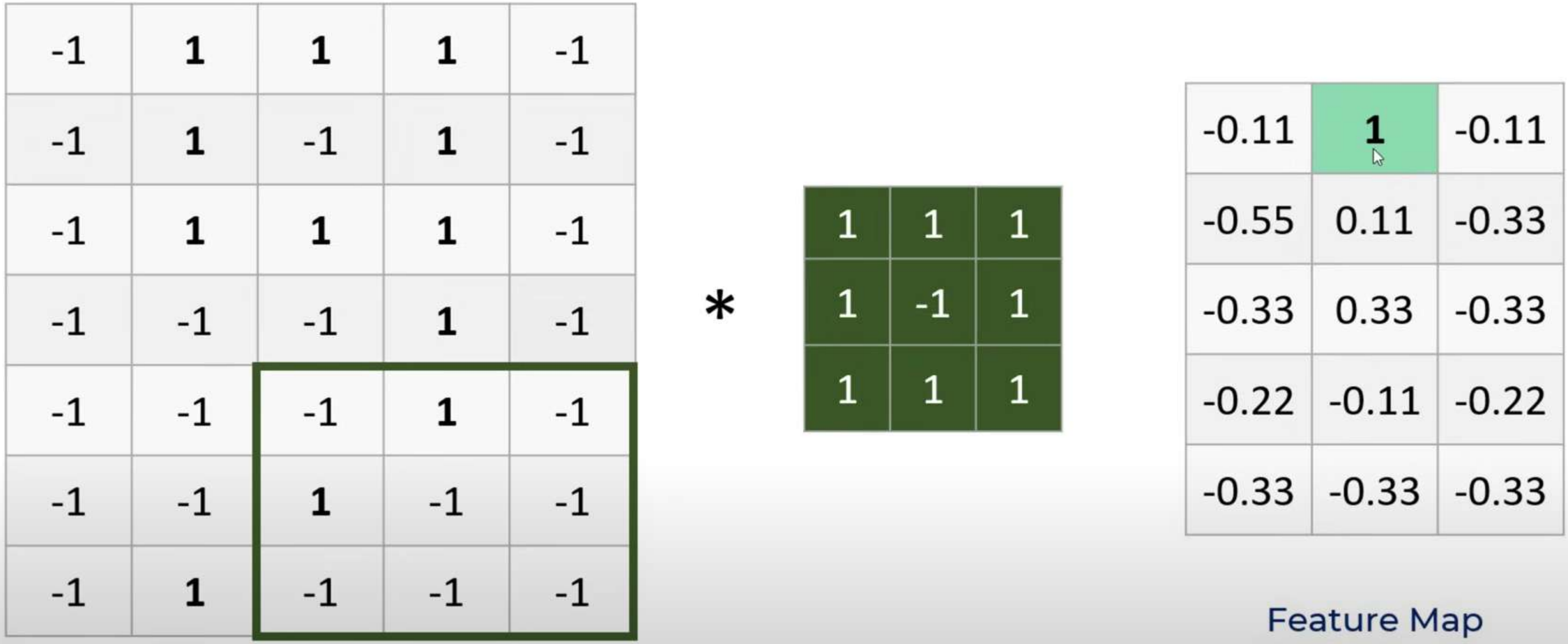
Koala's legs? = Y

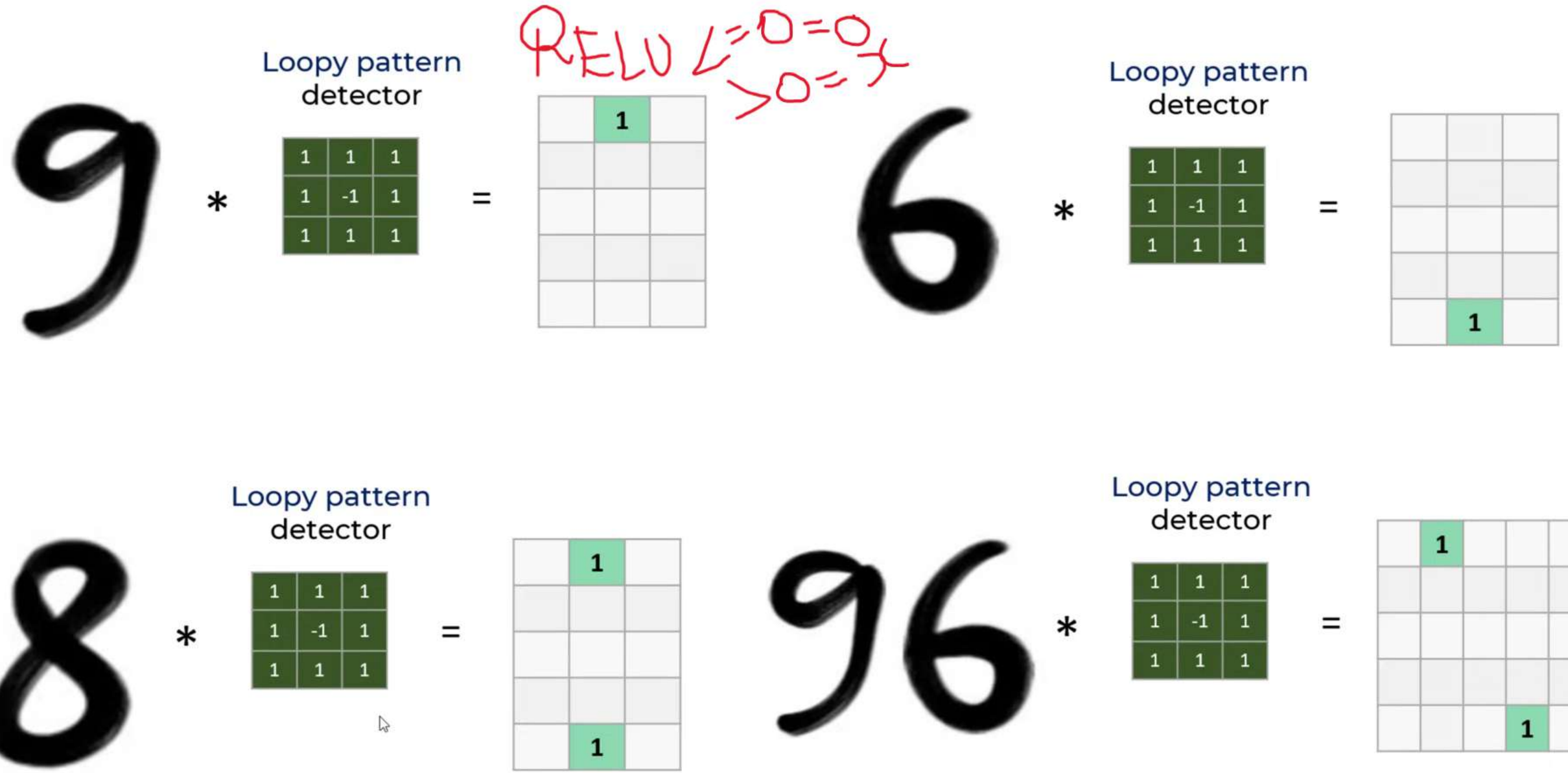


Koala's body? = Y


Loopy circle pattern
Vertical line
Diagonal line
9


Loopy pattern filter
Vertical line filter
Diagonal line filter


-1 1 1 1 -1
-1 1 -1 1 -1
-1 1 1 1 -1
-1 -1 -1 1 -1
-1 -1 -1 1 -1
-1 -1 1 -1 -1
-1 1 -1 -1 -1
*
1 1 1
1 -1 1
1 1 1
-0.11 1 -0.11
-0.55 0.11 -0.33
-0.33 0.33 -0.33
-0.22 -0.11 -0.22
-0.33 -0.33 -0.33
Feature Map


Loopy pattern detector
1 1 1
1 -1 1
1 1 1
RELU L=0=0x
>0=x
Loopy pattern detector
1 1 1
1 -1 1
1 1 1
Loopy pattern detector
1 1 1
1 -1 1
1 1 1
Loopy pattern detector
1 1 1
1 -1 1
1 1 1

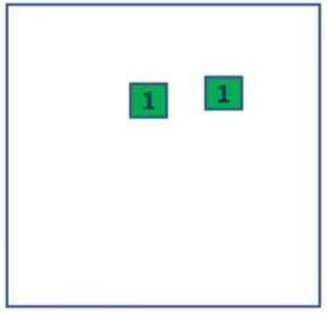
Filters are nothing but the feature detectors

Location invariant: It can detect eyes in any location of the image

*

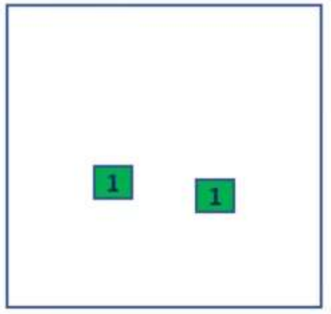
eye
detector

=



eye
detector

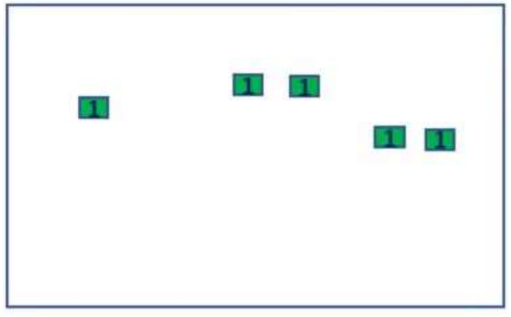
=



eye
detector

*

=



eye

nose

ears

hands

legs

head

body

1

flatten

flatten

1

1

...

Is this Koala?

Feature Extraction

Classification

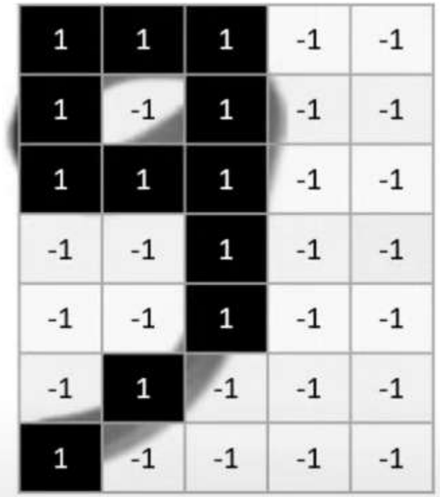
Pooling layer is used to reduce the size

5	1	3	4
8	2	9	2
1	3	0	1
2	2	2	0

8	**9**
3	2

2 by 2 filter with stride = 2

Shifted 9 at different position



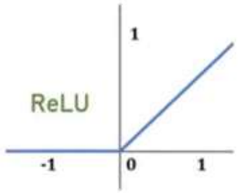
*

Loopy pattern filter

1	1	1
1	-1	1
1	1	1

→

1	-0.11	-0.11
0.11	-0.33	0.33
0.33	-0.33	-0.33
-0.11	-0.55	-0.33
-0.55	-0.33	-0.55



→

1	0	0
0.11	0	0.33
0.33	0	0
0	0	0
0	0	0

Max pooling

→

1	0.33
0.33	0.33
0.33	0
0	0

Benefits of pooling

Reduces dimensions & computation

Reduce overfitting as there are less parameters

Model is tolerant towards variations, distortions

Eye, nose, ears etc

Convolution + ReLU

Pooling

Head, body

Convolution + ReLU

Pooling

flatten

1

1

...

Is this Koala?

Feature Extraction

Classification

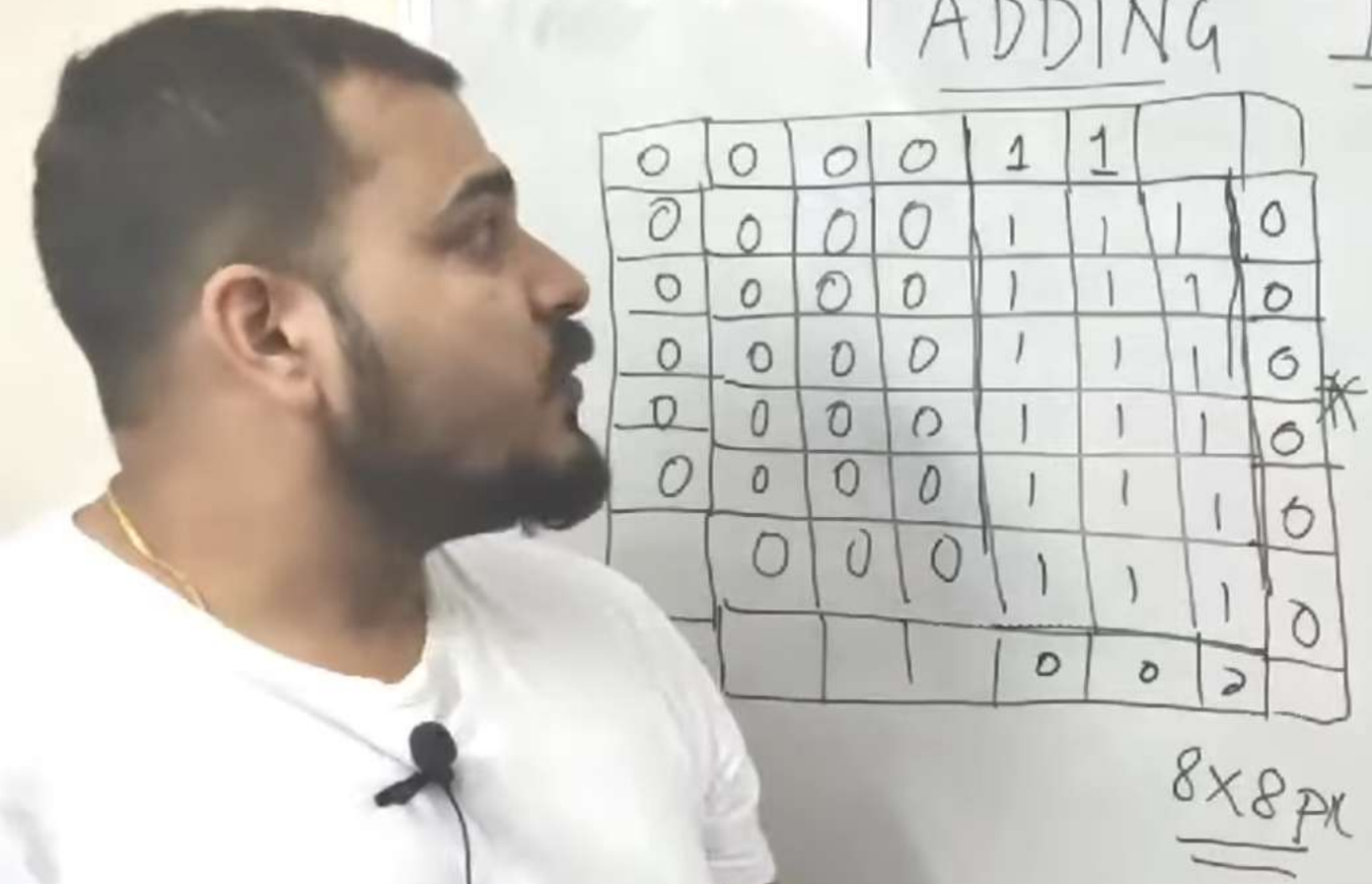
Rotation

Thickness

CNN by itself doesn't take care of rotation and scale

- You need to have rotated, scaled samples in training dataset
- If you don't have such samples than use data augmentation methods to generate new rotated/scaled samples from existing training samples

PADDING IN CNN



0	0	0	0	1	1		
0	0	0	0	1	1	1	0
0	0	0	0	1	1	1	0
0	0	0	0	1	1	1	0
0	0	0	0	1	1	1	0
0	0	0	0	1	1	1	0
	0	0	0	1	1	1	0
				0	0	2	

8x8px

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

3x3 f=3

P=1

$n + 2p - f + 1$

$6 + 2x1 - 3 + 1$

$8 - 3 + 1 = 6$

6x6

	1			
	0	-4	-4	0
	0	-4	-4	0
	0	-4	-4	0
	0	-4	-4	0

4x4