

CONVOLUTIONAL NEURAL NETWORK

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0				

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1			

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0		

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0				

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1			

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1		

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1				

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1	0			

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1	0	1		

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



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

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



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

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



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

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4			

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2		

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0				

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0			

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0	1		

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0	1	2	

FEATURE MAP

1-CONVOLUTION

0	0	0	0	0	0	0
0	1	0	0	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

INPUT IMAGE



0	0	1
1	0	0
0	1	1

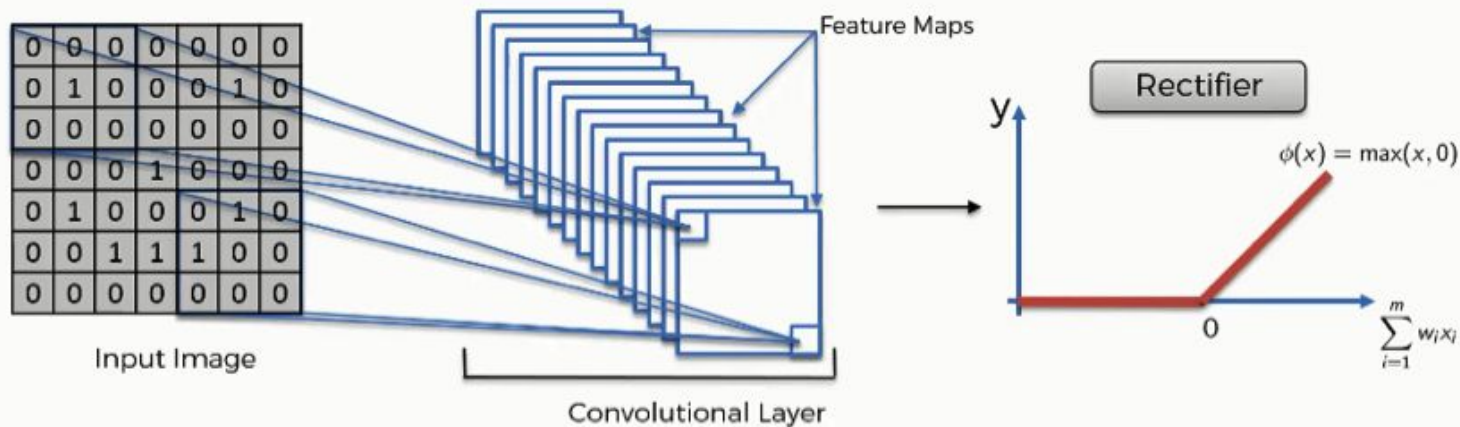
FEATURE
DETECTOR



0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0	1	2	1

FEATURE MAP

2-RELU LAYER



3-POOLING LAYER

0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0	1	2	1

FEATURE MAP

MAX POOLING



1		

POOLED FEATURE
MAP

3-POOLING LAYER

0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0	1	2	1

FEATURE MAP

MAX POOLING



1	1	

POOLED FEATURE
MAP

3-POOLING LAYER

0	1	0	0	0	
0	1	1	1	0	
1	0	1	2	1	
1	4	2	1	0	
0	0	1	2	1	

FEATURE MAP

MAX POOLING



1	1	0

POOLED FEATURE
MAP

3-POOLING LAYER

0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0	1	2	1

FEATURE MAP

MAX POOLING



1	1	0
4		

POOLED FEATURE
MAP

3-POOLING LAYER

0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0	1	2	1

FEATURE MAP

MAX POOLING



1	1	0
4	2	

POOLED FEATURE
MAP

3-POOLING LAYER

0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0	1	2	1

FEATURE MAP

MAX POOLING



1	1	0
4	2	1

POOLED FEATURE
MAP

3-POOLING LAYER

0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0	1	2	1

FEATURE MAP

MAX POOLING



1	1	0
4	2	1
0		

POOLED FEATURE
MAP

3-POOLING LAYER

0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0	1	2	1

FEATURE MAP

MAX POOLING



1	1	0
4	2	1
0	2	

POOLED FEATURE
MAP

3-POOLING LAYER

0	1	0	0	0
0	1	1	1	0
1	0	1	2	1
1	4	2	1	0
0	0	1	2	1

FEATURE MAP

MAX POOLING



1	1	0
4	2	1
0	2	1

POOLED FEATURE
MAP

4-FLATTENING

1	1	0
4	2	1
0	2	1

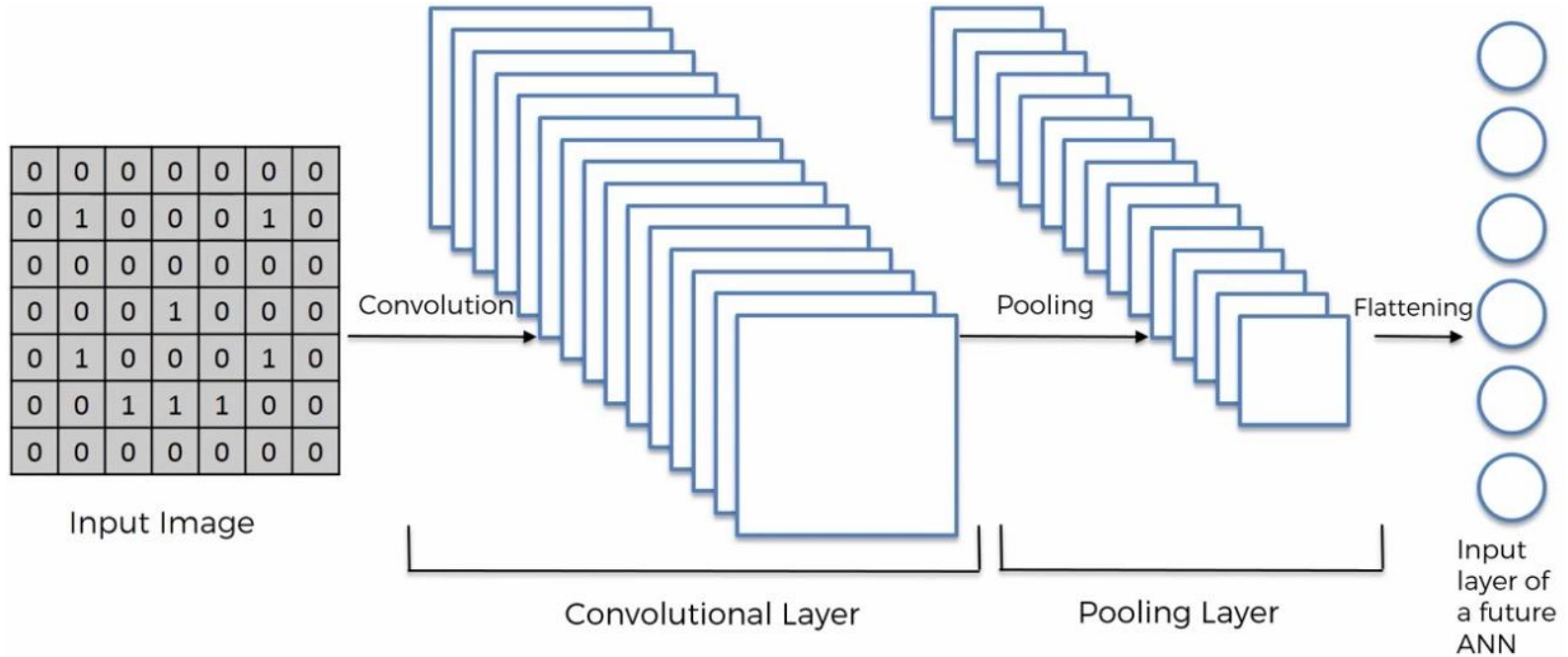
Pooled Feature Map

FLATTENING

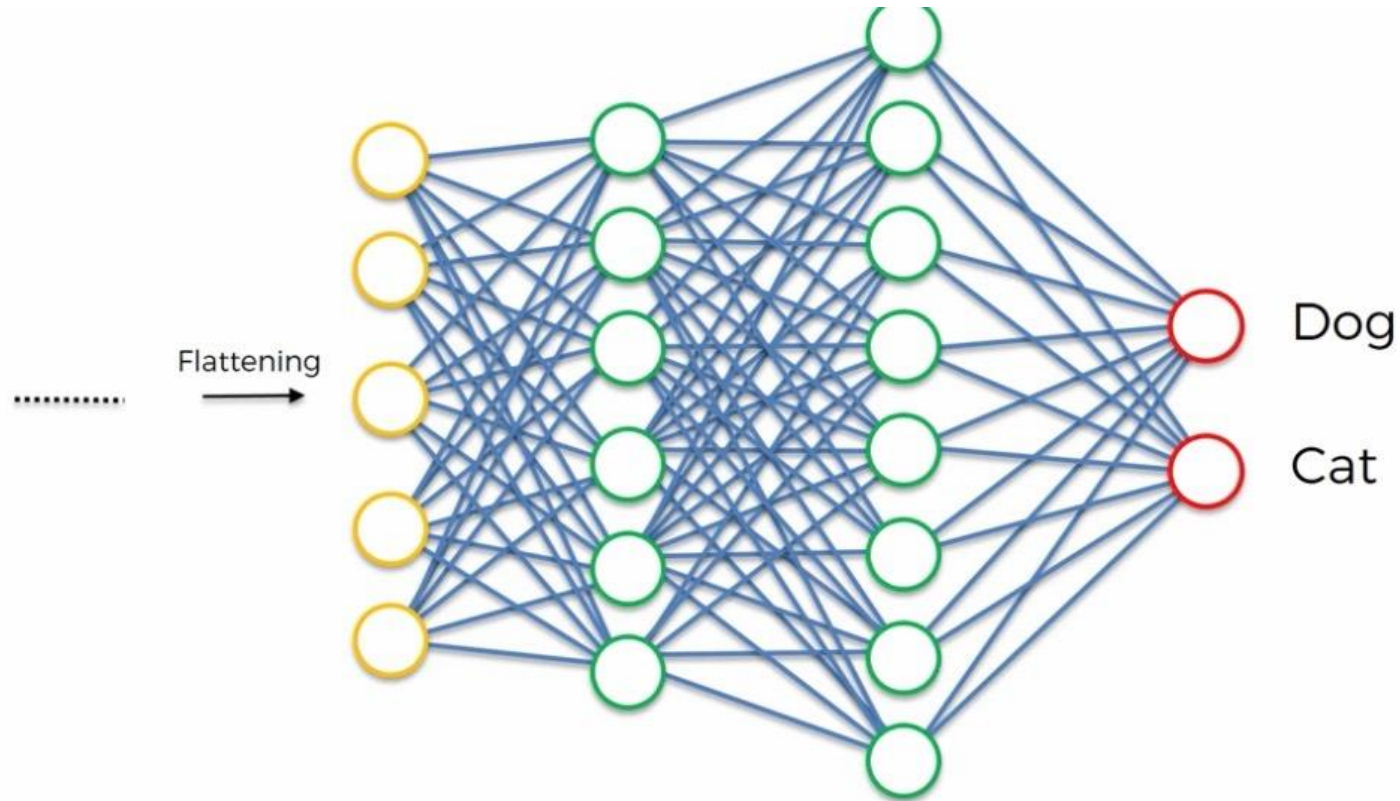


1
1
0
4
2
1
0
2
1

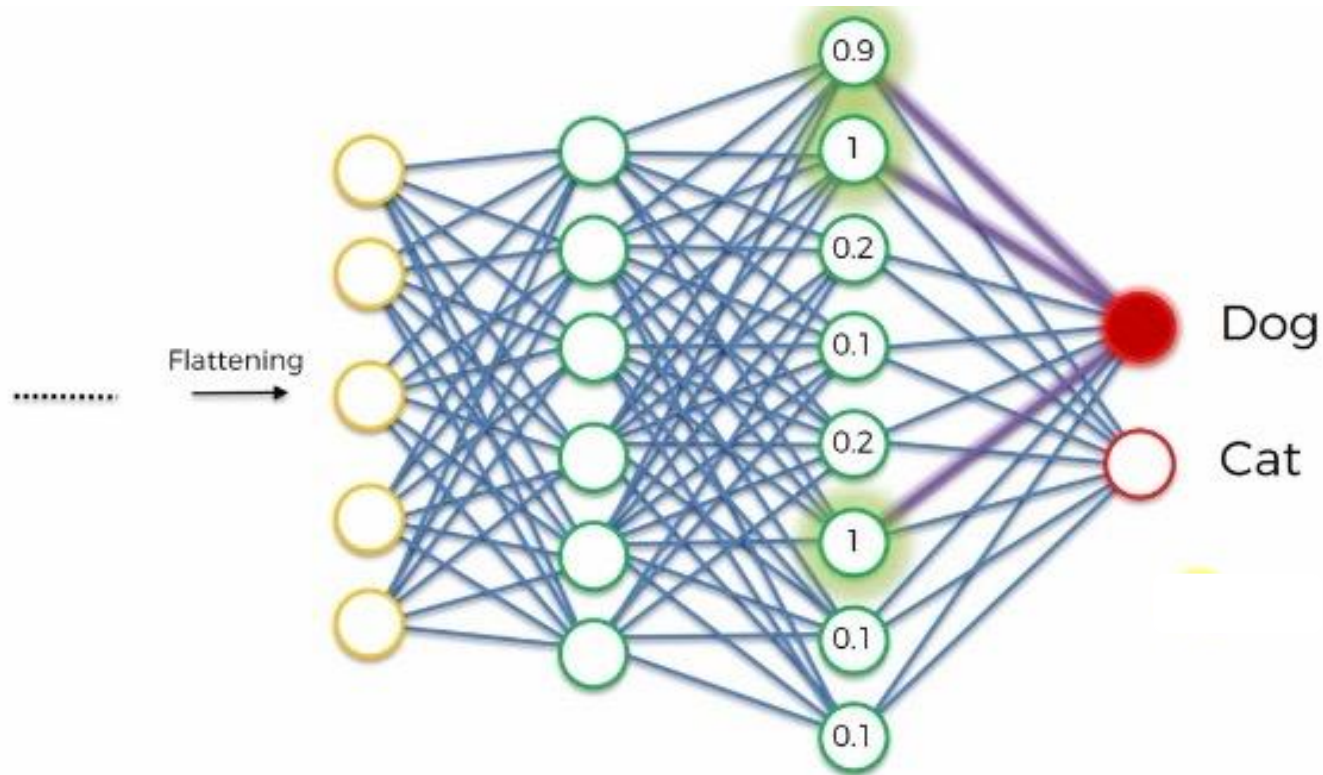
5-FULL CONNECTION



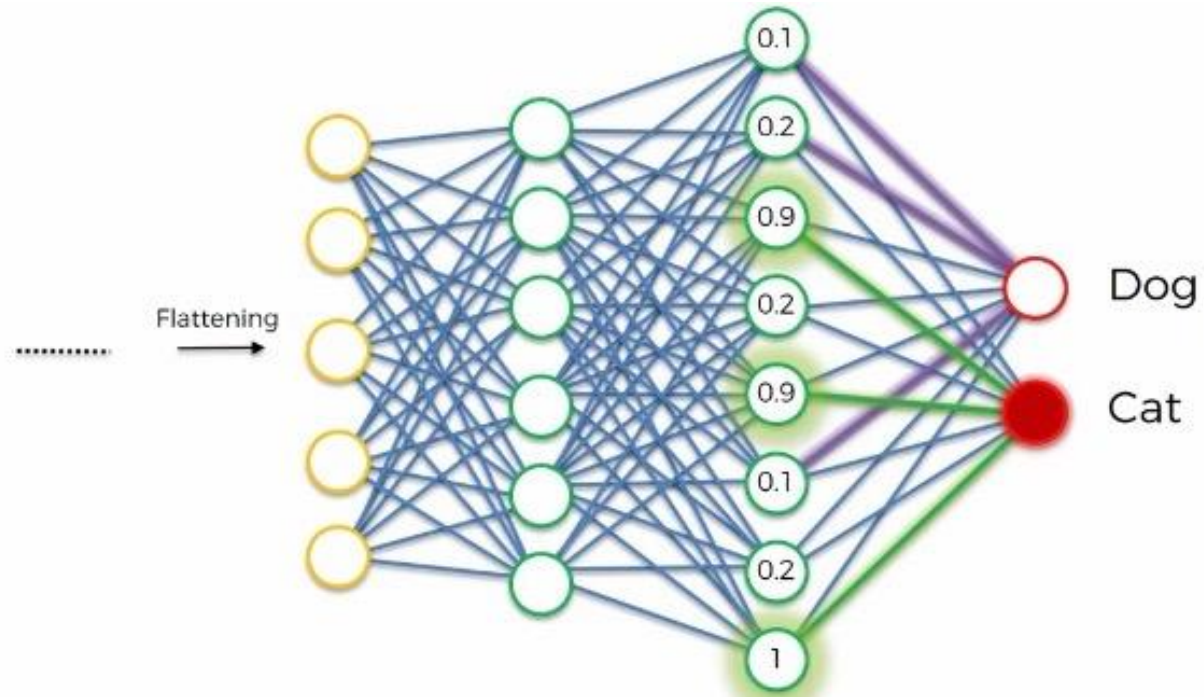
5-FULL CONNECTION



5-FULL CONNECTION



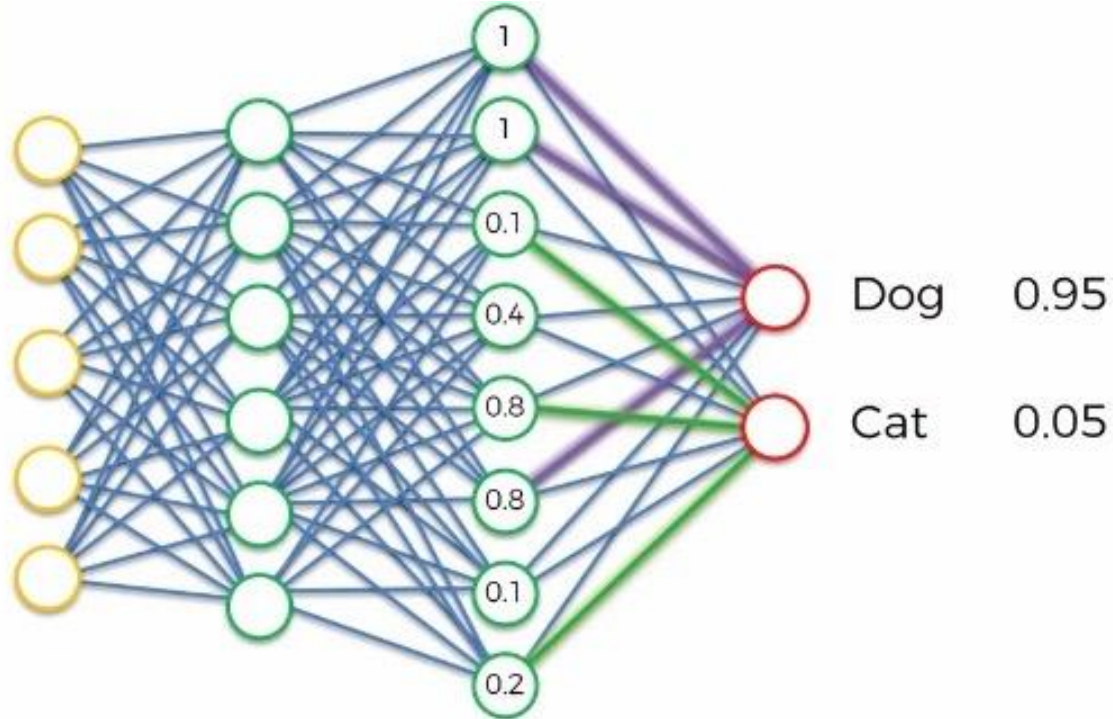
5-FULL CONNECTION



5-FULL CONNECTION



Flattening
→



5-FULL CONNECTION



Flattening
→

