

CSC 412 Machine Learning and Knowledge Discovery

Exercise III

1. The table below presents a network. Answer the questions below:

Layer	Type	Maps	Size	Kernel size	Stride	Padding	Activation
Out	Fully connected	–	1,000	–	–	–	Softmax
F10	Fully connected	–	4,096	–	–	–	ReLU
F9	Fully connected	–	4,096	–	–	–	ReLU
S8	Max pooling	256	6×6	3×3	2	valid	–
C7	Convolution	256	13×13	3×3	1	same	ReLU
C6	Convolution	384	13×13	3×3	1	same	ReLU
C5	Convolution	384	13×13	3×3	1	same	ReLU
S4	Max pooling	256	13×13	3×3	2	valid	–
C3	Convolution	256	27×27	5×5	1	same	ReLU
S2	Max pooling	96	27×27	3×3	2	valid	–
C1	Convolution	96	55×55	11×11	4	valid	ReLU
In	Input	3 (RGB)	227×227	–	–	–	–

- (a) What is this network used for?
- (b) What is the input size n ?
- (c) What is the number of parameters of Layer **C1**?
- (d) How many neurons in Layer **C1**?
- (e) What is the number of parameters of Layer **C7**?
- (f) What is the number of parameters of Layer **Out**?
- (g) We see two padding types: `valid` and `same`. Which one uses zero padding?
- (h) In the Layer **C1**, if we set Kernel size 5×5 and Stride 2. What is the new size of this layer?

Answer:

- (a) Image Classification (b) $227 \times 227 \times 3$ (c) $(11 \times 11 \times 3 + 1) \times 96$ (d) $55 \times 55 \times 96$ (e) $(3 \times 3 \times 384 + 1) \times 256$
(f) $4096 \times 1000 + 1000$ (g) `same` (h) $\approx 110 \times 110$

2. What are the computed values of the next layers?

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

(a) Input Image

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

(b) Filter (Kernel)

(1)	-1	-1	-1
-1	-1	-2	(2)
-1	(3)	-2	1
-1	0	(4)	3

(c) Convolutional Layer

(5)	(6)
(7)	(8)

(d) Max Pooling

(a) What are the missing values (1), (2), (3), and (4)? (Let stride be 1 and no zero padding)

(b) What are the values of the max pooling layer (d) after? (Kernel size 2×2 ; Stride 2)

Answer:

(a) $-1, 1, -1, -4$ (b) $-1, 1, 0, 3$