

# The basics of ConvNets

TOTAL POINTS 10

1. What do you think applying this filter to a grayscale image will do?

1 point

$$\begin{bmatrix} 0 & 1 & -1 & 0 \\ 1 & 3 & -3 & -1 \\ 1 & 3 & -3 & -1 \\ 0 & 1 & -1 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 1 & -1 & 0 \\ 1 & 3 & -3 & -1 \\ 1 & 3 & -3 & -1 \\ 0 & 1 & -1 & 0 \end{bmatrix}$$

- Detect horizontal edges
- Detect image contrast
- Detect 45 degree edges
- Detect vertical edges

2. Suppose your input is a 300 by 300 color (RGB) image, and you are not using a convolutional network. If the first hidden layer has 100 neurons, each one fully connected to the input, how many parameters does this hidden layer have (including the bias parameters)?

1 point

- 9,000,001
- 9,000,100
- 27,000,001
- 27,000,100

3. Suppose your input is a 300 by 300 color (RGB) image, and you use a convolutional layer with 100 filters that are each 5x5. How many parameters does this hidden layer have (including the bias parameters)?

1 point

- 2501
- 2600

7500

7600

4. You have an input volume that is  $63 \times 63 \times 16$ , and convolve it with 32 filters that are each  $7 \times 7$ , using a stride of 2 and no padding. What is the output volume?

1 point

$16 \times 16 \times 16$

$16 \times 16 \times 32$

$29 \times 29 \times 32$

$29 \times 29 \times 16$

5. You have an input volume that is  $15 \times 15 \times 8$ , and pad it using “pad=2.” What is the dimension of the resulting volume (after padding)?

1 point

$19 \times 19 \times 8$

$17 \times 17 \times 10$

$17 \times 17 \times 8$

$19 \times 19 \times 12$

6. You have an input volume that is  $63 \times 63 \times 16$ , and convolve it with 32 filters that are each  $7 \times 7$ , and stride of 1. You want to use a “same” convolution. What is the padding?

1 point

1

2

3

7

7. You have an input volume that is  $32 \times 32 \times 16$ , and apply max pooling with a stride of 2 and a filter size of 2. What is the output volume?

1 point

$16 \times 16 \times 8$

$15 \times 15 \times 16$

16x16x16

32x32x8

8. Because pooling layers do not have parameters, they do not affect the backpropagation (derivatives) calculation.

1 point

True

False

9. In lecture we talked about “parameter sharing” as a benefit of using convolutional networks. Which of the following statements about parameter sharing in ConvNets are true? (Check all that apply.)

1 point

It reduces the total number of parameters, thus reducing overfitting.

It allows a feature detector to be used in multiple locations throughout the whole input image/input volume.

It allows parameters learned for one task to be shared even for a different task (transfer learning).

It allows gradient descent to set many of the parameters to zero, thus making the connections sparse.

10. In lecture we talked about “sparsity of connections” as a benefit of using convolutional layers. What does this mean?

1 point

Regularization causes gradient descent to set many of the parameters to zero.

Each layer in a convolutional network is connected only to two other layers

Each filter is connected to every channel in the previous layer.

Each activation in the next layer depends on only a small number of activations from the previous layer.