

# The basics of ConvNets

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

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

- ☐ Detect image contrast.
  - ☐ Detect horizontal edges.
  - ☒ Detect vertical edges.
  - ☐ Detect 45 degree edges.
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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)?

- ☐ 9,000,001
  - ☐ 9,000,100
  - ☐ 27,000,001
  - ☒ 27,000,100
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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)?

- ☐ 2501
  - ☐ 2600
  - ☐ 7500
  - ☒ 2600
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4. You have an input volume that is 63x63x16, and convolve it with 32 filters that are each 7x7, using a stride of 2 and no padding. What is the output volume?

- ☐ 16x16x32
  - ☐ 16x16x16
  - ☐ 29x29x16
  - ☒ 29x29x32
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5. You have an input volume that is 15x15x8, and pad it using "pad=2." What is the dimension of the resulting volume (after padding)?

- ☐ 17x17x8
  - ☐ 19x19x12
  - ☐ 17x17x10
  - ☒ 19x19x8
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6. You have an input volume that is 63x63x16, and convolve it with 32 filters that are each 7x7, and stride of 1. You want to use a “same” convolution. What is the padding?

- ☐ 1
  - ☐ 2
  - ☒ 3
  - ☐ 7
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7. You have an input volume that is 32x32x16, and apply max pooling with a stride of 2 and a filter size of 2. What is the output volume?

- ☐ 15x15x6
  - ☐ 16x16x8
  - ☒ 16x16x16
  - ☐ 32x32x8
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8. Because pooling layers do not have parameters, they do not affect the backpropagation (derivatives) calculation.

- ☐ True
  - ☒ False
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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.)

- ☐ It allows parameters learned for one task to be shared even for a different task (transfer learning).
  - ☒ It reduces the total number of parameters, thus reducing overfitting.
  - ☐ It allows gradient descent to set many of the parameters to zero, thus making the connections sparse.
  - ☒ It allows a feature detector to be used in multiple locations throughout the whole input image/input volume.
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10. In lecture we talked about “sparsity of connections” as a benefit of using convolutional layers. What does this mean?

- ☐ 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 activation in the next layer depends on only a small number of activations from the previous layer.
  - ☐ Each filter is connected to every channel in the previous layer.
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