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

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

○ Detect image contrast

○ Detect 45 degree edges

● Detect vertical edges

○ Detect horizontal 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)?

○ 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)?

○ 2501

○ 2600

○ 7500

● 7600

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

○ 29x29x16

● 29x29x32

○ 16x16x16

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

○ 17x17x10

○ 19x19x12

● 19x19x8

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

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?

○ 32x32x8

○ 16x16x8

○ 15x15x16

● 16x16x16

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

○ 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.)

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

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

☐ 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?

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

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

● 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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