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

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

- ○ Detecting image contrast.
- ○ Detect 45-degree edges.
- ◉ Detect horizontal edges.
- ○ Detect vertical edges.

Expand

✓ Correct

Correct. There is a high difference between the values in the top part from those in the bottom part of the matrix. When convolving this filter on a grayscale image, the horizontal edges will be detected.

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 / 1 point

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

Expand

Correct

Correct, the number of weights is $300 \times 300 \times 3 \times 100 = 27,000,000$, when you add the bias terms (one per neuron) you get $27,000,100$.

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 / 1 point

- 2600
- 2501
- 7600
- 7500

Expand

Correct

Correct, you have $25 \times 3 = 75$ weights and 1 bias per filter. Given that you have 100 filters, you get 7,600 parameters for this layer.

4. You have an input volume that is $121 \times 121 \times 16$, and convolve it with 32 filters of 4×4, using a stride of 3 and no padding. What is the output volume?

1 / 1 point

- $118 \times 118 \times 32$
- $118 \times 118 \times 16$
- $40 \times 40 \times 32$
- $40 \times 40 \times 16$

Expand

Correct

Correct, using the formula $n_H^{[l]} = \frac{n_H^{[l-1]} + 2 \times p - f}{s} + 1$ with $n_H^{[l-1]} = 121, p = 0, f = 4$, and $s = 3$ we get 40

5. You have an input volume that is 61x61x32, and pad it using "pad=3". What is the dimension of the resulting volume (after padding)? 1 / 1 point

- (●) 67x67x32
- ( ) 64x64x32
- ( ) 64x64x35
- ( ) 61x61x35

Expand

Correct
Yes, if the padding is 3 you add 6 to the height dimension and 6 to the width dimension.

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 / 1 point

- ○ 1
- ○ 2
- ○ 7
- ◉ 3

Expand

Correct

Correct, you need to satisfy the following equation: $n_H - f + 2 \times p + 1 = n_H$ as you want to keep the dimensions between the input volume and the output volume.

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? 1 / 1 point

- 16x16x8
- 32x32x8
- 15x15x16
- 16x16x16 (selected)

Expand

Correct

Correct, using the following formula: $n_H^{[l]} = \frac{n_H^{[l-1]} + 2 \times p - f}{s} + 1$

8. Which of the following are hyperparameters of the pooling layers? (Choose all that apply) 1 / 1 point

- [ ] $W^{[l]}$ weights.
- [x] Whether it is max or average.

  ✓ **Correct**

  Yes, these are the two types of pooling discussed in the lectures, and choosing which to use is considered a hyperparameter.

- [ ] $b^{[l]}$ bias.
- [x] Stride

  ✓ **Correct**

  Yes, although usually, we set $f = s$ this is one of the hyperparameters of a pooling layer.

9. Which of the following are true about convolutional layers? (Check all that apply) 1 / 1 point

- [x] It allows a feature detector to be used in multiple locations throughout the whole input volume.

  ✓ **Correct**

  Yes, since convolution involves sliding the filter throughout the whole input volume the feature detector is computed over all the volume.

- [x] Convolutional layers provide sparsity of connections.

  ✓ **Correct**

  Yes, this happens since the next activation layer depends only on a small number of activations from the previous layer.

- [ ] It speeds up the training since we don't need to compute the gradient for convolutional layers.

Expand

Correct
Great, you got all the right answers.

10. In lecture we talked about "sparsity of connections" as a benefit of using convolutional layers. What does this mean? 1 / 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.

Expand

Correct

Yes, each activation of the output volume is computed by multiplying the parameters from with a volumic slice of the input volume and then summing all these together.