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

$$\begin{bmatrix} -1 & -1 & 2 \\ -1 & 2 & 1 \\ 2 & 1 & 1 \end{bmatrix}$$

- (●) Detect 45-degree edges.
- ( ) Detect vertical edges.
- ( ) Detect horizontal edges.
- ( ) Detecting image contrast.

Correct
Correct. Notice that there is a high delta between the values in the top left part and the ones in the bottom right part. When convolving this filter on a grayscale image, the edges forming a 45-degree angle with the horizontal will be detected.

2. Suppose your input is a 128 by 128 grayscale image, and you are not using a convolutional network. If the first hidden layer has 256 neurons, each one fully connected to the input, how many parameters does this hidden layer have (including the bias parameters)? 1 / 1 point

- ( ) 12582912
- (●) 4194560
- ( ) 12583168
- ( ) 4194304

Correct
Correct, the number of inputs for each unit is 128×128 since the input image is grayscale, so we need $128 \times 128 \times 256$ parameters for the weights and 256 parameters for the bias thus $128 \times 128 \times 256 + 256 = 4194560$.

3. Suppose your input is a 256 by 256 color (RGB) image, and you use a convolutional layer with 128 filters that are each 7×7. How many parameters does this hidden layer have (including the bias parameters)? 1 / 1 point

- 18816
- 1233125504
- 6400
- (selected) 18944

Correct
Yes, you have $7 \times 7 \times 3 + 1$ weights per filter with the bias. Given that you have 128 filters, you get $(7 \times 7 \times 3 + 1) \times 128 = 18944$.

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

- $118 \times 118 \times 16$
- $118 \times 118 \times 32$
- (selected) $40 \times 40 \times 32$
- $40 \times 40 \times 16$

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 31x31x32, and pad it using "pad=1". What is the dimension of the resulting volume (after padding)? 1 / 1 point

- (selected) 33x33x32
- 33x33x33

- 33x33x33
- 32x32x32
- 31x31x34

Correct
Yes, if the padding is 1 you add 2 to the height dimension and 2 to the width dimension.

6. You have a volume that is $121 \times 121 \times 32$, and convolve it with 32 filters of 5×5, and a stride of 1. You want to use a "same" convolution. What is the padding? **1 / 1 point**

- 3
- 0
- 2
- 5

Correct
Yes, when using a padding of 2 the output volume has $n_H = \frac{121-5+4}{1} + 1$.

7. You have an input volume that is 66x66x21, and apply max pooling with a stride of 3 and a filter size of 3. What is the output volume? **1 / 1 point**

- $21 \times 21 \times 21$
- $66 \times 66 \times 7$
- $22 \times 22 \times 21$
- $22 \times 22 \times 7$

Correct
Yes, using the formula $n_H^{[l]} = \frac{n_H^{[l-1]}+2\times p-f}{s} + 1$ with $p = 0, f = 3, s = 3$ and $n_H^{[l-1]} = 66$.

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.

- [x] Stride

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

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

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

- [x] Convolutional layers are good at capturing translation invariance.

Correct
Yes, this is due in part to applying the same filter all over the image.

- [x] It reduces the total number of parameters, thus reducing overfitting through parameter sharing.

Correct
Yes, a convolutional layer uses parameters sharing and has usually a lot fewer parameters than a fully-connected layer.

- [ ] It reduces the computations in backpropagation since we omit the convolutional layers in the process.

10. The sparsity of connections and weight sharing are mechanisms that allow us to use fewer parameters in a convolutional layer making it possible to train a network with smaller training sets. True/False? 1 / 1 point

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10. The sparsity of connections and weight sharing are mechanisms that allow us to use fewer parameters in a convolutional layer making it possible to train a network with smaller training sets. True/False? **1 / 1 point**

- (•) True
- ( ) False

Correct
Yes, weight sharing reduces significantly the number of parameters in a neural network, and sparsity of connections allows us to use a smaller number of inputs thus reducing even further the number of parameters.