# Quiz: The Basics of ConvNets

**Congratulations! You passed!**

| Grade received | Latest Submission Grade | To pass |
|---|---|---|
| 100% | 100% | 80% or higher |

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**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.

Expand

**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 color (RGB) image, and you are not using a convolutional network. If the first hidden layer has 64 neurons, each one fully connected to the input, how many parameters does this hidden layer have (including the bias parameters)? **1 / 1 point**

- (•) 3145792
- ( ) 3145728
- ( ) 1048576
- ( ) 1048640

Expand

**Correct**

Correct, the number of inputs for each unit is $128 \times 128 \times 3$ since the input image is RGB, so we need $128 \times 128 \times 3 \times 64$ parameters for the weights and $64$ parameters for the bias parameters, thus $128 \times 128 \times 3 \times 64 + 64 = 3145792$.

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
- ( ) 7500
- ( ) 2501
- (•) 7600

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 $4 \times 4$, using a stride of 3 and no padding. What is the output volume? 1 / 1 point

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

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

- 31x31x34
- 33x33x32
- 32x32x32
- 33x33x33

Expand

**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 $64 \times 64 \times 32$, and convolve it with 40 filters of $9 \times 9$, and stride 1. You want to use a "same" convolution. What is the padding? **1 / 1 point**

- 0
- 8
- 6
- 4 (selected)

Expand

**Correct**
Yes, when using a padding of 4 the output volume has $n_H = \frac{64-9+2\times4}{1} + 1$.

7. You have an input volume that is 128x128x12, and apply max pooling with a stride of 4 and a filter size of 4. What is the output volume? **1 / 1 point**

- $128 \times 128 \times 3$
- $64 \times 64 \times 12$
- $32 \times 32 \times 3$
- $32 \times 32 \times 12$ (selected)

Expand

**Correct**
Yes, using the formula $n_H^{[l]} = \frac{n_H^{[l-1]}+2\times p-f}{s} + 1$ with $p = 0, f = 4, s = 4$ and $n_H^{[l-1]} = 32$.

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

- [ ] Number of filters.
- [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.

- [ ] Average weights.
- [x] Filter size.

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

Expand

✓ **Correct**
Great, you got all the right answers.

**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.

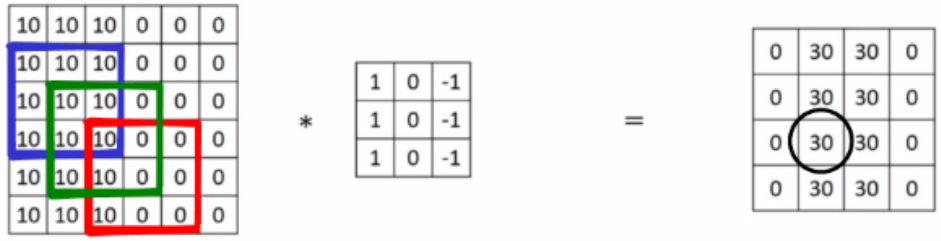
- [x] Convolutional layers provide sparsity of connections.

✓ **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.

Correct
Great, you got all the right answers.

**10.** The following image depicts the result of a convolution at the right when using a stride of 1 and the filter is shown right next. **1 / 1 point**




On which pixels does the circled pixel of the activation at the right depend?

- (•) It depends on the pixels enclosed by the green square.
- ( ) It depends on the pixels enclosed by the red square.
- ( ) It depends on the pixels enclosed by the blue square.
- ( ) It depends on all the pixels of the image on the left.

Expand

Correct
Yes, this is the position of the filter when we move it two pixels down and one to the right.