Congratulations! You passed!

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

1 / 1 point

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

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

Expand

Correct
Correct! As you can see the difference between values from the left part and values from the right of this filter is high. When convolving this filter on a grayscale image, the vertical edges 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

- ○ 12583168
- ○ 4194304
- ◉ 4194560
- ○ 12582912

Expand

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 grayscale image, and you use a convolutional layer with 128 filters that are each 3×3. How many parameters does this hidden layer have (including the bias parameters)?

1 / 1 point

- ○ 3584
- ○ 1152
- ◉ 1280
- ○ 75497600

Expand

Correct
Yes, since the input volume has only one channel each filter has $3 \times 3 + 1$ weights including the bias, thus the total is $(3 \times 3 + 1) \times 128$.

4. You have an input volume that is $127 \times 127 \times 16$, and convolve it with 32 filters of 5×5, using a stride of 2 and no padding. What is the output volume?

1 / 1 point

- ○ $62 \times 62 \times 16$
- ○ $123 \times 123 \times 32$

- ○ $123 \times 123 \times 16$
- ◉ $62 \times 62 \times 32$

Expand

Correct

Correct, using the formula $n_H^{[l]} = \frac{n_H^{[l-1]}+2\times p-f}{s} + 1$ with $n_H^{[l-1]} = 127, p = 0, f = 5$, and $s = 2$ we get 62.

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

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

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 9×9, and stride 1. You want to use a "same" convolution. What is the padding?

1 / 1 point

- ○ 6
- ◉ 4
- ○ 8
- ○ 0

Expand

Correct

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

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

- ○ 15x15x16
- ◉ 16x16x16
- ○ 32x32x8
- ○ 16x16x8

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

- ☑ 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.

- ☑ Stride

  ✓ Correct

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

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

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

- [ ] It allows parameters learned for one task to be shared even for a different task (transfer learning).
- [ ] It speeds up the training since we don't need to compute the gradient for convolutional layers.
- [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.

Expand

Correct
Great, you got all the right answers.

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

- ( ) False
- (•) True

Expand

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.