Congratulations! You passed!

Grade received 90% **Latest Submission Grade** 90% **To pass** 80% or higher

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

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

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

- ○ 3145728
- ◉ 3145792
- ○ 1048640
- ○ 1048576

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 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**

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

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

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

Expand

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

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)?

1 / 1 point

- ○ 19x19x12
- ○ 17x17x10
- ◉ 19x19x8
- ○ 17x17x8

Expand

Correct
Correct, padding is applied over the height and the width of the input image. If the padding is two, you add 4 to the height dimension and 4 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?

0 / 1 point

- ○ 3
- ○ 2
- ○ 0
- ◉ 5

Expand

Incorrect
No, remember that when using padding of 5 then 10 is added to each dimension.

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
- ○ 16x16x8
- ○ 32x32x8

Expand

Correct

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

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

1 / 1 point

- ○ True
- ◉ False

Expand

Correct

Everything that influences the loss should appear in the backpropagation because we are computing derivatives. In fact, pooling layers modify the input by choosing one value out of several values in their input volume. Also, to compute derivatives for the layers that have parameters (Convolutions, Fully-Connected), we still need to backpropagate the gradient through the Pooling layers.

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

1 / 1 point

- [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.
- [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.

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 activation in the next layer depends on only a small number of activations from the previous layer

previous layer.

- Each filter is connected to every channel in the previous layer.
- Each layer in a convolutional network is connected only to two other layers

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.