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Grade received 80% To pass 80% or higher

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The Basics of ConvNets

Latest Submission Grade 80%

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 45-degree edges.
- Detect horizontal edges.
- Detecting image contrast.
- 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
- 27,000,100
- 27,000,001
- 9,000,100

Expand

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 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
- 75497600
- 3584
- 1280 (selected)

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 63x63x16, and convolve it with 32 filters that are each 7x7, using a stride of 2 and no padding. What is the output volume? 1 / 1 point

- 29x29x16
- 16x16x16
- 16x16x32
- 29x29x32 (selected)

Expand

Correct
Yes, $\frac{63-7+0\times 2}{2} + 1 = 29$ and the number of channels should match the number of filters.

5. You have an input volume that is 31x31x32, and pad it using "pad=1". What is the dimension of the resulting 0 / 1 point

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)? 0 / 1 point

- (•) 32x32x32
- ( ) 33x33x33
- ( ) 33x33x32
- ( ) 31x31x34

Expand

Incorrect
No, the padding is applied to both sides of the height and width of the volume.

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

- ( ) 0
- ( ) 6
- (•) 4
- ( ) 8

Expand

Correct
Yes, when using a padding of 4 the output volume has $n_H = \frac{121-9+2\times4}{1} + 1$.

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

- ( ) 16x16x8
- ( ) 15x15x16
- (•) 16x16x16
- ( ) 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) 0 / 1 point

- [x] It allows parameters learned for one task to be shared even for a different task (transfer learning).
- [ ] It reduces the computations in backpropagation since we omit the convolutional layers in the process.
- [ ] It reduces the total number of parameters, thus reducing overfitting through parameter sharing.
- [x] Convolutional layers are good at capturing translation invariance.

! This should not be selected

No, transfer learning is not bound to ConvNets and can be used with other types of models as you've seen in Course 1-3.

✓ Correct

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

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- [ ] It reduces the total number of parameters, thus reducing overfitting through parameter sharing.
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✓ **Correct**
Yes, this is due in part to applying the same filter all over the image.

Expand

⊗ **Incorrect**
You didn't select all the correct answers

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

- (•) Each activation in the next layer depends on only a small number of activations from the 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
- ( ) Regularization causes gradient descent to set many of the parameters to zero.

Expand

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