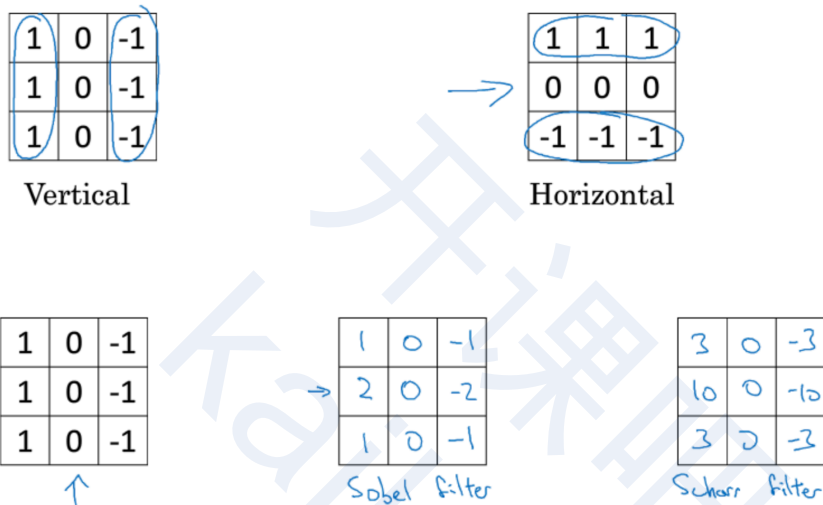


1. What do you think applying this filter to a grayscale image will do?

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

- A. Detect horizontal edges
- B. Detect 45 degree edges
- C. Detect image contrast
- D. Detect vertical edges

这个题目有一定的迷惑性，课程上列举的边缘检测过滤器有如下几种：



都不符合题目中的过滤器，但如果我们仔细观察这个矩阵，会发现其基本按照列对称，但符号相反，可以判断出是用来实现垂直边缘检测，所以答案是选项4。

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)

- A. 9,000,001
- B. 9,000,100
- C. 27,000,001
- D. 27,000,100

这个题目需要注意输入是RGB通道，所以 $300 \times 300 \times 3 \times 100 = 27000000$ ，加上bias: 1×100 ，和是27000100，答案是选项4。

3. Suppose your input is a 300 by 300 color(RGB) image, and you use a convolutional layer with 100 filters that are each 5*5. How many parameters does this hidden layer have(including the bias parameters)

- A. 2501

- B. 2600
- C. 7500
- D. 7600

这个题目不要被输入图像的宽高所迷惑，对于卷积网络而言，我们就是需要找到过滤器中的参数值，本题中过滤器大小为 5×5 ，一个过滤器的参数为 25×3 (通道数和输入图像相同，数量是3)，加上bias，就是76，最后的答案就是 76×100 ，答案是选项4。

4. You have an input volume that is $63 \times 63 \times 16$, and convolve it with 32 filters that are each 7×7 , using a stride of 2 and no padding. What is the output volume?
- A. $16 \times 16 \times 16$
 - B. $16 \times 16 \times 32$
 - C. $29 \times 29 \times 32$
 - D. $29 \times 29 \times 16$

这个使用 $(n+2p-f)/s+1$ 公式计算， $n=63$, $p=0$, $f=7$, $s=2$ ，结果是29，卷积计算输出的通道数等于过滤器的个数，所以答案是选项3。

5. You have an input volume that is $15 \times 15 \times 8$, and pad it using “pad=2”,. What is dimension of the resulting volume(after padding)?
- A. $17 \times 17 \times 8$
 - B. $19 \times 19 \times 12$
 - C. $17 \times 17 \times 10$
 - D. $19 \times 19 \times 8$

填充后，宽高都要增加 $2p$ ，通道数量不受影响，所以答案是选项4: $19 \times 19 \times 8$

6. You have an input volume that is $63 \times 63 \times 16$, and convolve it with 32 filters that are each 7×7 , using a stride of 1, you want to use a “same” convolution. What is the padding?
- A. 1
 - B. 2
 - C. 3
 - D. 7

根据公式 $2p-f+1=0$ ，可以计算出 $p=3$ ，所以答案是选项3。

7. You have an input volume that is $32 \times 32 \times 16$, and apply max pooling with a stride of 2 and a filter of 2. What is the output volume?
- A. $15 \times 15 \times 16$
 - B. $16 \times 16 \times 8$
 - C. $16 \times 16 \times 16$
 - D. $32 \times 32 \times 8$

这个题目比较容易，同样使用 $(n+2p-f)/s+1$ ，不改变通道数，答案是选项3。

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

- A. True
- B. False

池化层没有需要求解的参数，但有超参数，比如过滤器大小、步长、选择max pooling还是average pooling，同样影响反向梯度递减运算的结果，所以答案是选项2：False。

9. In lecture we talked about “parameters sharing” as a benefit of using convolutional networks. Which of the following statements about parameter sharing in ConvNets are true?(Check all that apply)

- A. It allows parameters learned for one task to be shared even for a different task(transfer learning).
- B. It reduces that total number of parameters, thus reducing overfitting.
- C. It allows gradient descent to set many of the parameters to zero, thus making the connection sparse.
- D. It allows a feature detector to be used in multiple locations throughout the whole input image/input volume

选项1明显错误，一个任务上学习到的参数无法直接应用到另外一个任务上。

参数越多，需要的训练样本越多，才能避免过拟合，减少参数可以避免过拟合是正确的。

课程上并没有说梯度递减计算出的参数值为0，而是说会减少参数，所以这个选项是错误的。

这个在课程上有讲到： *A feature detector(such as a vertical edge detector) that's useful in one part of the image is probably useful in another part of the image.*

综合以上，该题的答案是： 2、4