1.

Which of the following kernels can detect vertical edges in a grayscale image?

- [x] [[2, -2]] ← 一正一负，相同大小
- [ ] [[1, 1]]
- [ ] [[-1, -1]]
- [ ] [[2, 0]]

但某个格子与上个格子的差异过大，结果就会非常明显

2.

What can we do to enlarge the receptive field of an element of a feature map?

- [x] Make the network deeper
- [ ] Make the network shallower
- [ ] Make the network denser
- [ ] Add dropout layers to the network

3

Cross-correlation of a single channel image X with a kernel K is equivalent to the convolution of X with which of the following kernels?

- [x] kernel K flipped both horizontally and vertically
- [ ] kernel K flipped horizontally
- [ ] kernel K flipped vertically
- [ ] kernel K itself

4

Alice generates output Y by computing corr2d(X, K) for an image X and kernel K. She gives the image X and output Y to Bob but doesn't tell him what K she used. What function should Bob run gradient descent on to approximately recover K? With respect to which variable should gradients be taken during gradient descent?

- [x] loss(corr2d(X, K), Y) w.r.t. K
- [ ] loss(corr2d(X, K), Y) w.r.t. X
- [ ] loss(corr2d(X, K), Y) w.r.t. Y
- [ ] corr2d(X, K) w.r.t. K

5

If I have a 100x100 image and I use a kernel of shape 5x5 with a padding of 4 along both height and width dimensions, what will be the shape of the output?

- [x] 100x100
- [ ] 104x104
- [ ] 98x98
- [ ] 96x96

$(100+4-5+1)\times(100+4-5+1)$

6

I have a 100x100 image and a kernel of shape 5x5. If I use padding of 4 and stride of 2 along both height and width dimensions, what will be the shape of the output?

- [ ] 200x200
- [x] 50x50
- [ ] 49x49
- [ ] 48x48

$\frac{(100+4-5+1)}{2}\times\frac{(100+4-5+1)}{5}$

$=50\times50$

7

Alice had a grayscale image X to which she applied a kernel a size 5x5 (no padding) and a stride of 2 to get an output of shape 10x10. What was the shape of X?

- [ ] 20x20
- [ ] 24x24
- [ ] 25x25
- [x] shape of X cannot be uniquely determined from the given information

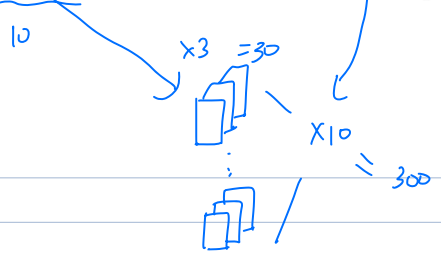
$\left\lfloor \frac{X-5+1}{2} \right\rfloor = 10$

$X =$ any value $\in \{24, 25, 26\}$

8

Ignore biases for this question. Suppose you have a convolution layer whose input is a 1000x1000 RGB color image and you want to have 10 channels in your output. If your kernel has width 5 and height 2, then what is the total number of trainable parameters in this layer?

- [ ] 10
- [ ] 30
- [x] 300
- [ ] 10^6



9

What does setting padding='same' do when creating a conv2D layer in Keras?

- Applies the same amount of padding on all sides of the input image
- **Create an output of the same spatial dimensions as the input image**
- Makes all trainable parameters have the same value in that layer
- Uses the same amount of padding as in the previous layer

10

$$\left(\frac{x_1-1}{2}\right)\downarrow \times \left(\frac{x_2-1}{2}\right)\downarrow$$

What does setting strides=(2, 2) do when creating a conv2D layer in Keras?

- **Spatial dimensions of output will be smaller than those of the input**
- Spatial dimensions of output will be larger than those of the input
- Number of channels in output will be smaller than those in the input
- Number of channels in output will be larger than those in the input