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Chapter 8:

8.1 Averaging

Code sách:

```
1 import numpy as np
2 import argparse
3 import cv2
4 from google.colab.patches import cv2_imshow
5
6 ap = argparse.ArgumentParser()
7 ap.add_argument("-f",'--image', required = True,
8                 help ='Path to the image')
9 args = vars(ap.parse_args())
10
11 image = cv2.imread('trex.png')
12 print('Original')
13 cv2_imshow(image)
14
```

```
Original
```

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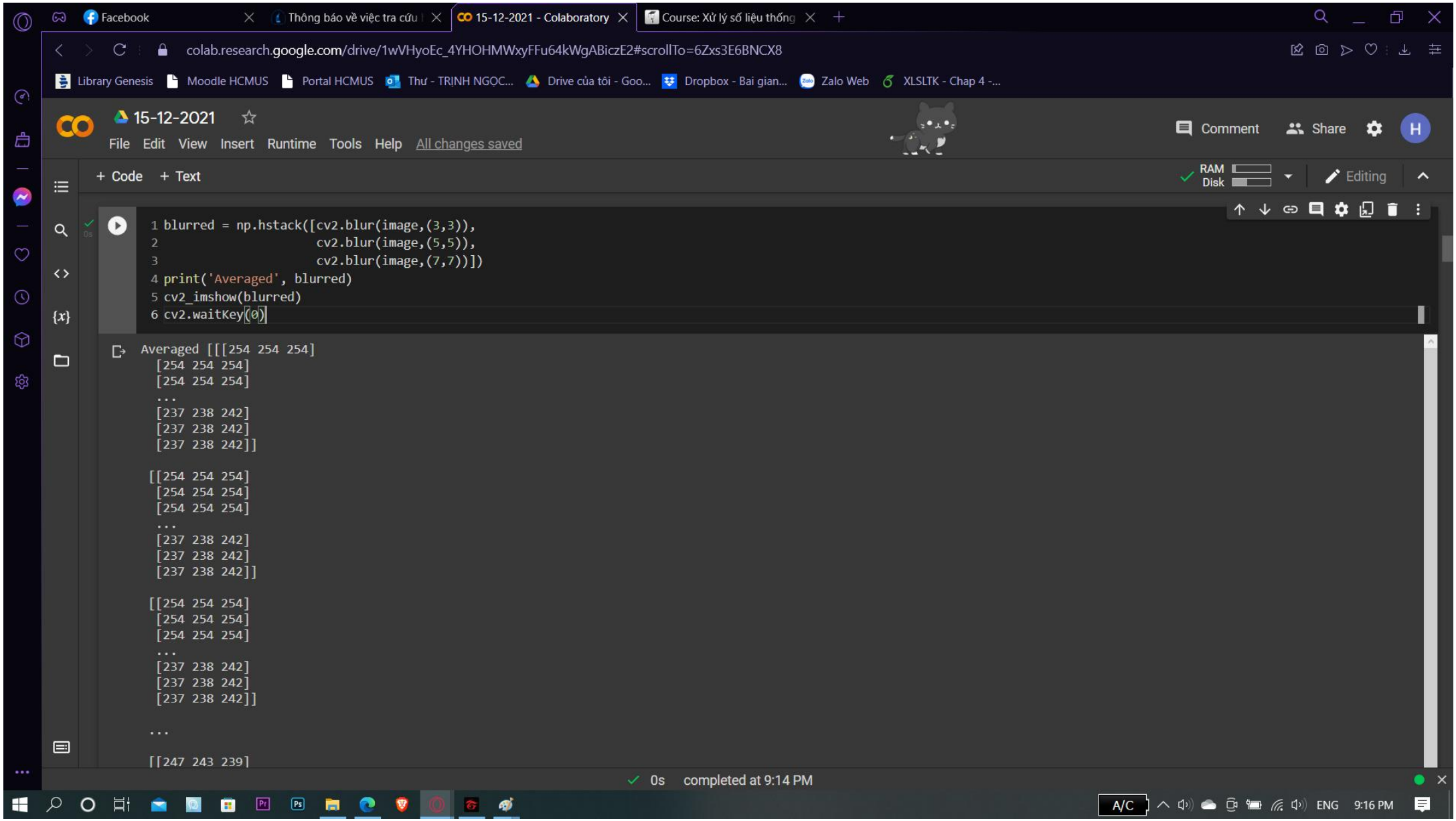
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1 blurred = np.hstack([cv2.blur(image,(3,3)),
2 cv2.blur(image,(5,5)),
3 cv2.blur(image,(7,7))])
4 print('Averaged', blurred)
5 cv2_imshow(blurred)
6 cv2.waitKey(0)
Averaged [[[254 254 254]
[254 254 254]
[254 254 254]
...
[237 238 242]
[237 238 242]
[237 238 242]]
[[254 254 254]
[254 254 254]
[254 254 254]
...
[237 238 242]
[237 238 242]
[237 238 242]]
[[254 254 254]
[254 254 254]
[254 254 254]
...
[237 238 242]
[237 238 242]
[237 238 242]]
...
[[247 243 239]
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```
def Averaging(image):
  blurred = np.hstack([cv2.blur(image,(3,3)),
                       cv2.blur(image,(5,5)),
                       cv2.blur(image,(7,7))])
  return blurred

image = cv2.imread('trex.png')
result = Averaging(image)
print('Averaged')
cv2_imshow(result)
cv2.waitKey(0)

```

Averaged

-1

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8.2 Gaussian

```
[54]  1 blurred = np.hstack([cv2.GaussianBlur(image, (3,3), 0),
      2                      cv2.GaussianBlur(image, (5,5), 0),
      3                      cv2.GaussianBlur(image, (7,7), 0)])
      4 print('Gaussian')
      5 cv2_imshow(blurred)
      6 cv2.waitKey(0)
```

```
Gaussian
```

```
-1
```

```
1 def Gaussian(image):
```

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[55]

```
def Gaussian(image):
  blurred = np.hstack([cv2.GaussianBlur(image, (3,3), 0),
                       cv2.GaussianBlur(image, (5,5), 0),
                       cv2.GaussianBlur(image, (7,7), 0)])
  return blurred

image = cv2.imread('trex.png')
result = Gaussian(image)
print('Gaussian')
cv2_imshow(result)
cv2.waitKey(0)

```

Gaussian

-1

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8.3 Median

```
1 blurred = np.hstack([cv2.medianBlur(image, 3),
2                      cv2.medianBlur(image, 5),
3                      cv2.medianBlur(image, 7)])
4 print('Median')
5 cv2_imshow(blurred)
6 cv2.waitKey(0)
7
```

```
Median
```

```
-1
```

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```
def Median(image):
  blurred = np.hstack([cv2.medianBlur(image, 3),
                       cv2.medianBlur(image, 5),
                       cv2.medianBlur(image, 7)])
  return blurred

image = cv2.imread('trex.png')
result = Median(image)
print('Median')
cv2_imshow(result)
cv2.waitKey(0)
```

Median

-1

8.4 Bilateral

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8.4 Bilateral

```
[58]  1 blurred = np.hstack([cv2.bilateralFilter(image, 5, 21, 21),
      2                      cv2.bilateralFilter(image, 7, 31, 31),
      3                      cv2.bilateralFilter(image, 9, 41, 41)])
      4 print("Bilateral")
      5 cv2_imshow(blurred)
      6 cv2.waitKey(0)
```

```
Bilateral
```

```
-1
```

```
1 def Bilateral(image):
```

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[59]

```
def Bilateral(image):
  blurred = np.hstack([cv2.bilateralFilter(image, 5, 21, 21),
                       cv2.bilateralFilter(image, 7, 31, 31),
                       cv2.bilateralFilter(image, 9, 41, 41)])
  return blurred

image = cv2.imread('trex.png')
result = Bilateral(image)
print('Bilateral')
cv2_imshow(result)
cv2.waitKey(0)
```

```
Bilateral
```

```
-1
```

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10.1 Laplacian and Sobel

[60]

```
1 import numpy as np
2 import argparse
3 import cv2
4 from google.colab.patches import cv2_imshow
5
6 ap = argparse.ArgumentParser()
7 ap.add_argument("-f",'--image', required = True,
8                 help ='Path to the image')
9 args = vars(ap.parse_args())
10
11 image = cv2.imread('trex.png')
12 image = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
13 print("Original")
14 cv2_imshow(image)
15
16 lap = cv2.Laplacian(image, cv2.CV_64F)
17 lap = np.uint8(np.absolute(lap))
18 print("Laplacian")
19 cv2_imshow(lap)
20 cv2.waitKey(0)
```

```
Original
```

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```
1 sobelX = cv2.Sobel(image, cv2.CV_64F, 1, 0)
2 sobelY = cv2.Sobel(image, cv2.CV_64F, 0, 1)
3
4 sobelX = np.uint8(np.absolute(sobelX))
5 sobelY = np.uint8(np.absolute(sobelY))
6
7 sobelCombined = cv2.bitwise_or(sobelX, sobelY)
8
9 print("Sobel X")
10 cv2_imshow(sobelX)
11 print("Sobel Y")
12 cv2_imshow(sobelY)
13 print("Sobel Combined")
14 cv2_imshow(sobelCombined)
15 cv2.waitKey(0)
16
```

```
Sobel Y
```

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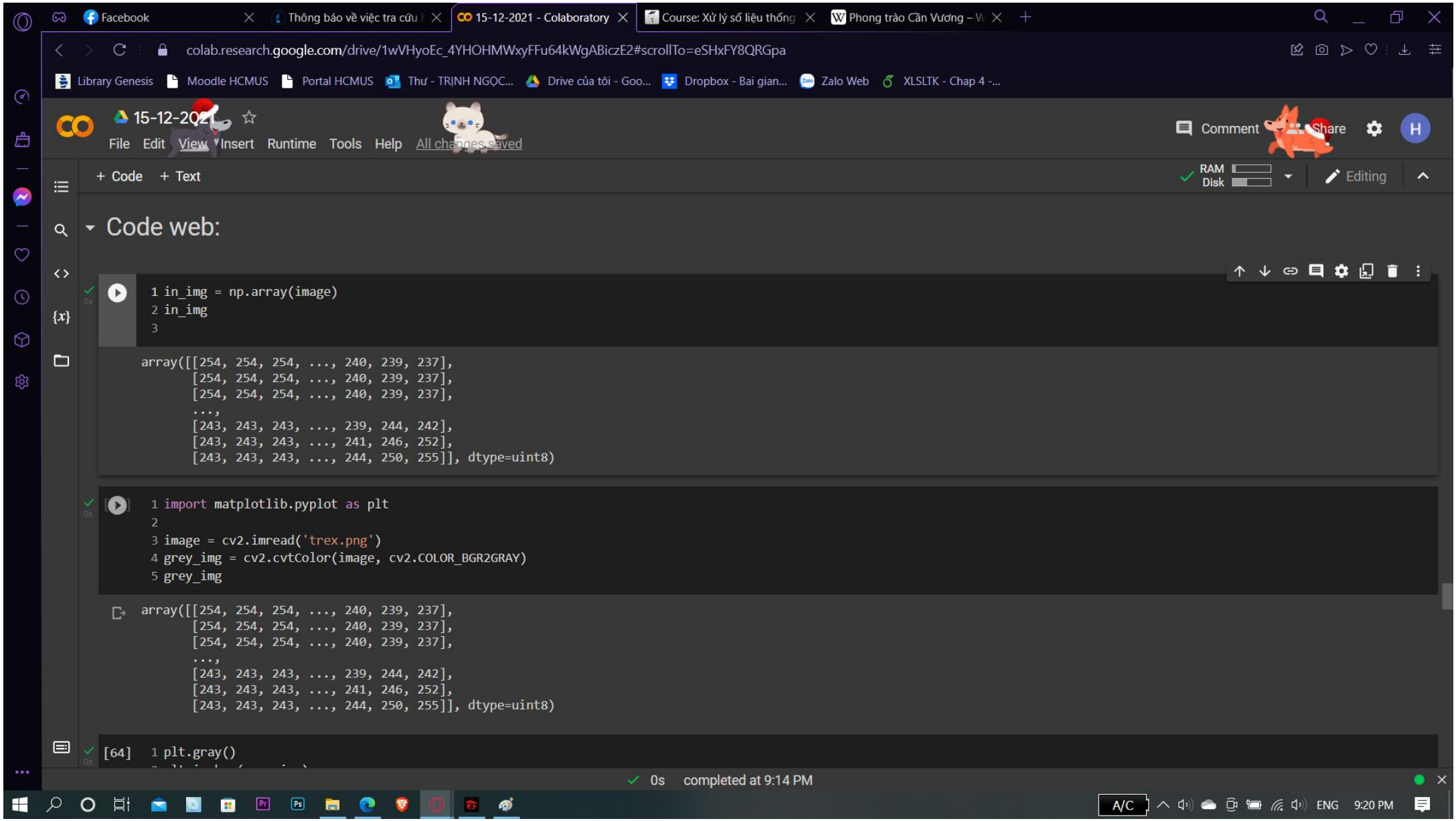
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Code web:
1 in_img = np.array(image)
2 in_img
3
array([[254, 254, 254, ..., 240, 239, 237],
[254, 254, 254, ..., 240, 239, 237],
[254, 254, 254, ..., 240, 239, 237],
...,
[243, 243, 243, ..., 239, 244, 242],
[243, 243, 243, ..., 241, 246, 252],
[243, 243, 243, ..., 244, 250, 255]], dtype=uint8)
1 import matplotlib.pyplot as plt
2
3 image = cv2.imread('trex.png')
4 grey_img = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
5 grey_img
array([[254, 254, 254, ..., 240, 239, 237],
[254, 254, 254, ..., 240, 239, 237],
[254, 254, 254, ..., 240, 239, 237],
...,
[243, 243, 243, ..., 239, 244, 242],
[243, 243, 243, ..., 241, 246, 252],
[243, 243, 243, ..., 244, 250, 255]], dtype=uint8)
[64] 1 plt.gray()
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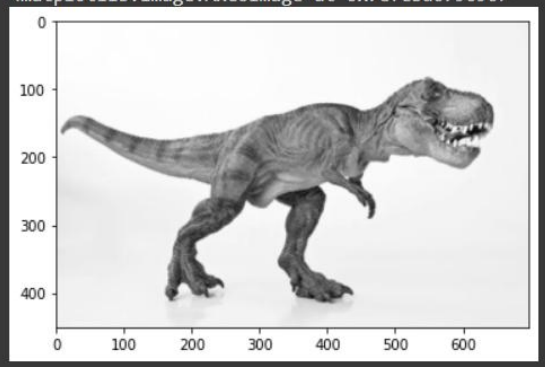
[64]
```
1 plt.gray()
2 plt.imshow(grey_img)
```

```
<matplotlib.image.AxesImage at 0x7efebd079690>
```




```
1 sobelX = [[-1, 0, 1], [-2, 0, 2], [-1, 0, 1]]
2 sobelY =  [[1, 2, 1], [0, 0, 0], [-1, -2, -1]]
```

[66]
```
1 def getCoord(kernel):
2   center_filter = [1, 1]
3   xRows = [0, 0, 1, -1, 1, -1, 1, -1]
4   yCols = [-1, 1, 0, 0, -1, -1, 1, 1]
5   for k in range(8):
6     pixel_in_filter_x = center_filter[0] + xRows[k]
7     pixel_in_filter_y = center_filter[1] + yCols[k]
8     print('(Cor {}, {} - value: {}'.format(pixel_in_filter_x,
```

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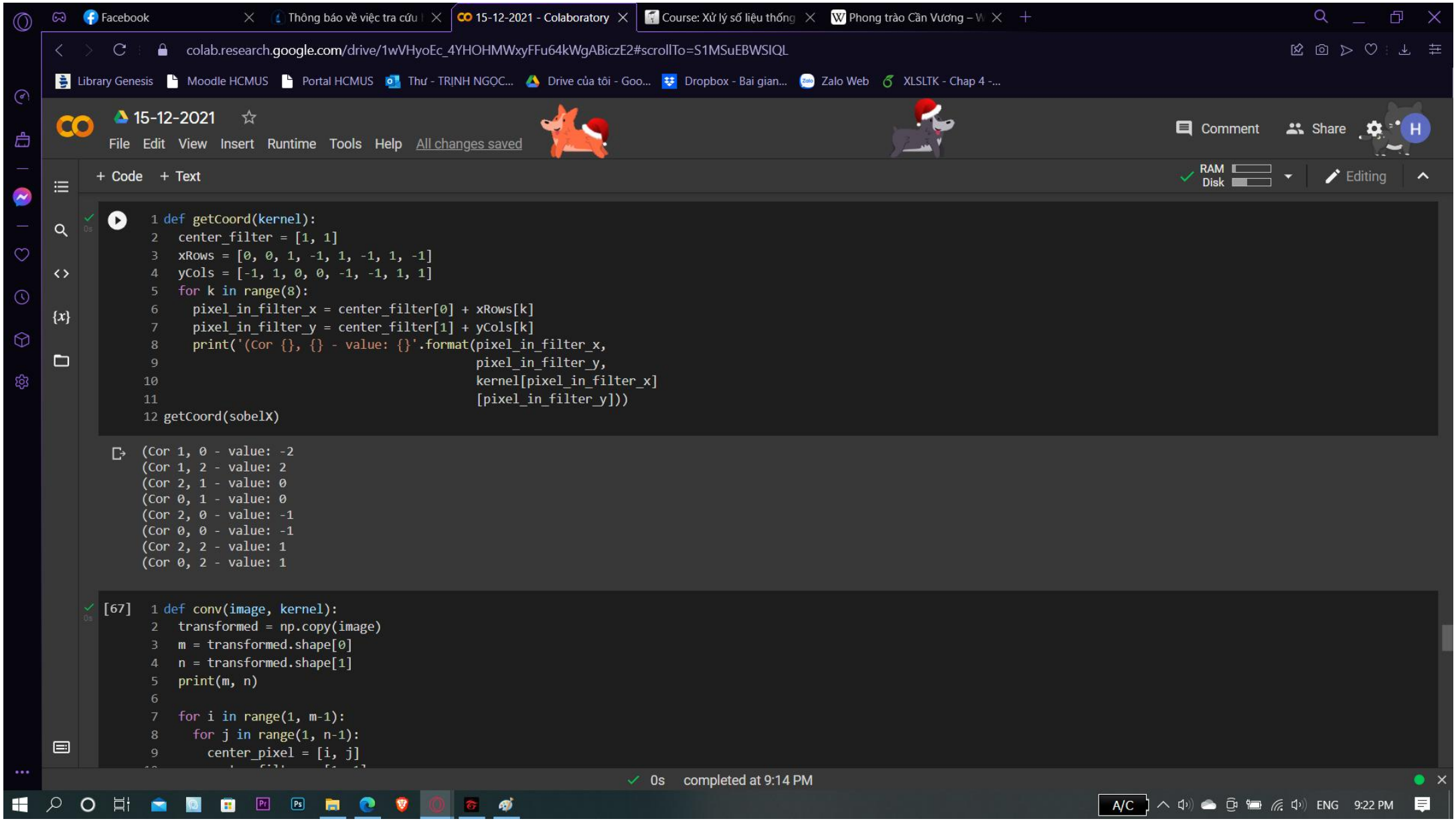
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1 def getCoord(kernel):
2 center_filter = [1, 1]
3 xRows = [0, 0, 1, -1, 1, -1, 1, -1]
4 yCols = [-1, 1, 0, 0, -1, -1, 1, 1]
5 for k in range(8):
6 pixel_in_filter_x = center_filter[0] + xRows[k]
7 pixel_in_filter_y = center_filter[1] + yCols[k]
8 print('(Cor {}, {} - value: {}'.format(pixel_in_filter_x,
9 pixel_in_filter_y,
10 kernel[pixel_in_filter_x]
11 [pixel_in_filter_y]))
12 getCoord(sobelX)
(Cor 1, 0 - value: -2
(Cor 1, 2 - value: 2
(Cor 2, 1 - value: 0
(Cor 0, 1 - value: 0
(Cor 2, 0 - value: -1
(Cor 0, 0 - value: -1
(Cor 2, 2 - value: 1
(Cor 0, 2 - value: 1
[67]
1 def conv(image, kernel):
2 transformed = np.copy(image)
3 m = transformed.shape[0]
4 n = transformed.shape[1]
5 print(m, n)
6
7 for i in range(1, m-1):
8 for j in range(1, n-1):
9 center_pixel = [i, j]
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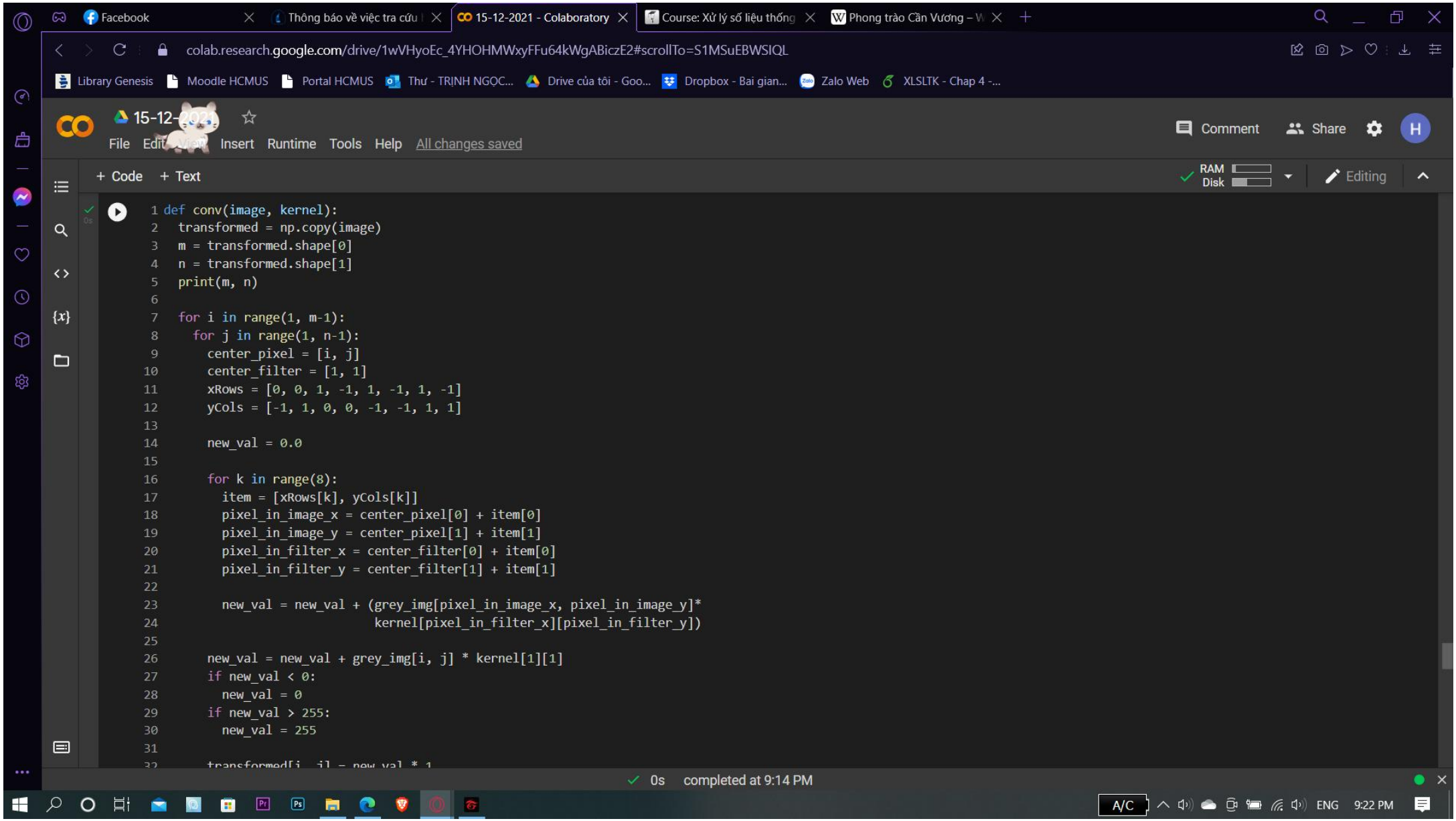
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1 def conv(image, kernel):
2 transformed = np.copy(image)
3 m = transformed.shape[0]
4 n = transformed.shape[1]
5 print(m, n)
6
7 for i in range(1, m-1):
8 for j in range(1, n-1):
9 center_pixel = [i, j]
10 center_filter = [1, 1]
11 xRows = [0, 0, 1, -1, 1, -1, 1, -1]
12 yCols = [-1, 1, 0, 0, -1, -1, 1, 1]
13
14 new_val = 0.0
15
16 for k in range(8):
17 item = [xRows[k], yCols[k]]
18 pixel_in_image_x = center_pixel[0] + item[0]
19 pixel_in_image_y = center_pixel[1] + item[1]
20 pixel_in_filter_x = center_filter[0] + item[0]
21 pixel_in_filter_y = center_filter[1] + item[1]
22
23 new_val = new_val + (grey_img[pixel_in_image_x, pixel_in_image_y]*
24 kernel[pixel_in_filter_x][pixel_in_filter_y])
25
26 new_val = new_val + grey_img[i, j] * kernel[1][1]
27 if new_val < 0:
28 new_val = 0
29 if new_val > 255:
30 new_val = 255
31
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```
[67]  27      if new_val < 0:
      28        new_val = 0
      29      if new_val > 255:
      30        new_val = 255
      31
      32      transformed[i, j] = new_val * 1
      33    return transformed
      34
```

```
1 result = conv(grey_img, sobelX)
2 cv2_imshow(result)
3
```

```
451 697
```

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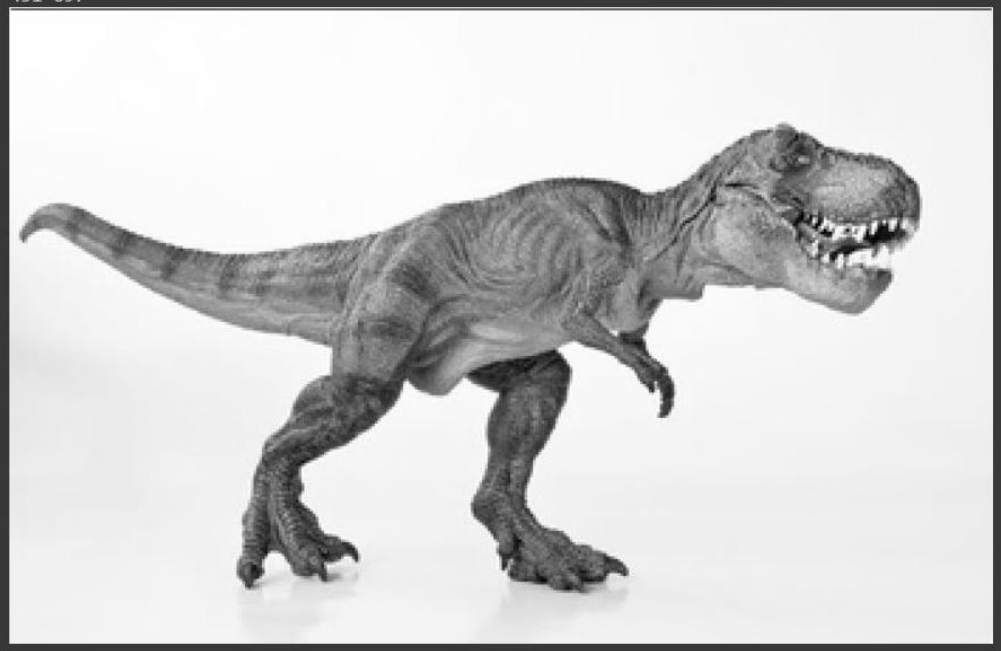
```
[69]  1 result1 = conv(grey_img, sobelY)
      2 cv2_imshow(result1)
      3
```

```
451 697
```



```
[70]  1 import numpy as np
```

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colab.research.google.com/drive/1wVHyoEc_4YHOHMWxyFFu64kWgABiczE2#scrollTo=JbMAMdlcX-u2

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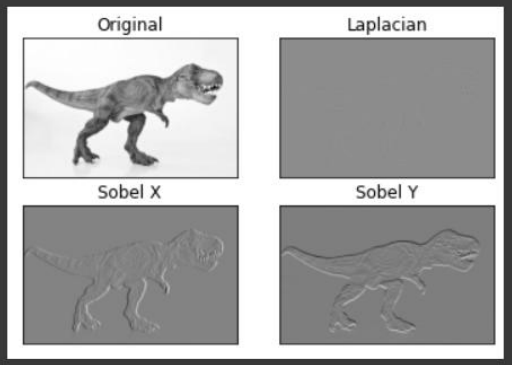
```
1 import numpy as np
2 import cv2 as cv
3 from matplotlib import pyplot as plt
4 img = cv2.imread('trex.png',0)
5 laplacian = cv.Laplacian(img,cv.CV_64F)
6 sobelx = cv.Sobel(img,cv.CV_64F,1,0,ksize=5)
7 sobely = cv.Sobel(img,cv.CV_64F,0,1,ksize=5)
8 plt.subplot(2,2,1),plt.imshow(img,cmap = 'gray')
9 plt.title('Original'), plt.xticks([]), plt.yticks([])
10 plt.subplot(2,2,2),plt.imshow(laplacian,cmap = 'gray')
11 plt.title('Laplacian'), plt.xticks([]), plt.yticks([])
12 plt.subplot(2,2,3),plt.imshow(sobelx,cmap = 'gray')
13 plt.title('Sobel X'), plt.xticks([]), plt.yticks([])
14 plt.subplot(2,2,4),plt.imshow(sobely,cmap = 'gray')
15 plt.title('Sobel Y'), plt.xticks([]), plt.yticks([])
16 plt.show()
```



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