Họ Và Tên: Bùi Thị Thanh Phương

MSSV:20110280

Thực hành tuần 1

Đã làm đầy đủ :

1/ Chọn 1 ảnh từ internet bất kỳ và thực hiện các thao tác sau

- Tạo ảnh grayscale
- Tạo ảnh hsv và hiển thị các kênh hue, saturation và value
- Chọn ngưỡng hue để trích xuất đối tượng chủ đạo trong ảnh (hiển thị ảnh màu đối tượng sau khi trích xuất)
- Hiển thị histogram của 3 kênh màu h,s,v và r,g,b

2/ Chọn 1 ảnh khác từ internet bất kỳ và thực hiện các bước sau

- Tạo ảnh xám từ ảnh màu
- Làm mờ ảnh
- Làm nhiễu ảnh
- Hiển thị histogram của ảnh xám và cân bằng histogram, hiển thị ảnh sau khi cân bằng
- Cân bằng 3 kênh màu hsv cùng lúc và hiển thị ảnh kết quả sau khi cân bằng
- Enhance ảnh bằng cách cân bằng histogram kênh s và v
- Thực hiện các biến đổi gamma và hiển thị ảnh màu tương ứng
- Chọn ngưỡng mức tối và ngưỡng mức sáng mà ở đó dưới mức tối sẽ cho tối hơn và trên mức sáng sẽ cho sáng hơn trên kênh màu value trong hsv. Sau đó hiển thị ảnh kết quả sau khi enhance
- Xuất ảnh biên/cạnh của ảnh gốc

Code và kết quả chạy:

```
import numpy as np
import pandas as pd
import cv2
from matplotlib import pyplot as plt
from pylab import imread
from skimage.color import rgb2gray
from google.colab import files
```

```
[ ] def imshows(ImageData, LabelData, rows, cols, gridType = False):
      # Convert ImageData and LabelData to List
      from matplotlib import pyplot as plt
      ImageArray = list(ImageData)
      LabelArray = list(LabelData)
      if(rows == 1 & cols == 1):
        fig = plt.figure(figsize=(20,20))
      else:
        fig = plt.figure(figsize=(cols*8,rows*5))

      for i in range(1, cols * rows + 1):
          fig.add_subplot(rows, cols, i)
          image = ImageArray[i - 1]
          # If the channel number is less than 3, we display as grayscale image
          # otherwise, we display as color image
          if (len(image.shape) < 3):
              plt.imshow(image, plt.cm.gray)
              plt.grid(gridType)
          else:
              plt.imshow(image)
```

```
✓ 1 giây
      else:
          plt.imshow(image)
          plt.grid(gridType)
      plt.title(LabelArray[i - 1])
  plt.show()

def ShowThreeImages(IM1, IM2, IM3):
    imshows([IM1, IM2, IM3], ["Image 1","Image 2", "Image 3"], 1, 3)
def ShowTwoImages(IM1, IM2):
    imshows([IM1, IM2], ["Image 1","Image 2"], 1, 2)
def ShowOneImage(IM):
    imshows([IM], ["Image"], 1, 1)
def ShowListImages(listImage, row, col):
    listCaption = []
    for i in range(len(listImage)):
        listCaption.append(str(i))
    imshows(listImage,listCaption,row,col)
```

```
✓ 38 giây
[4] uploads = files.upload()
```

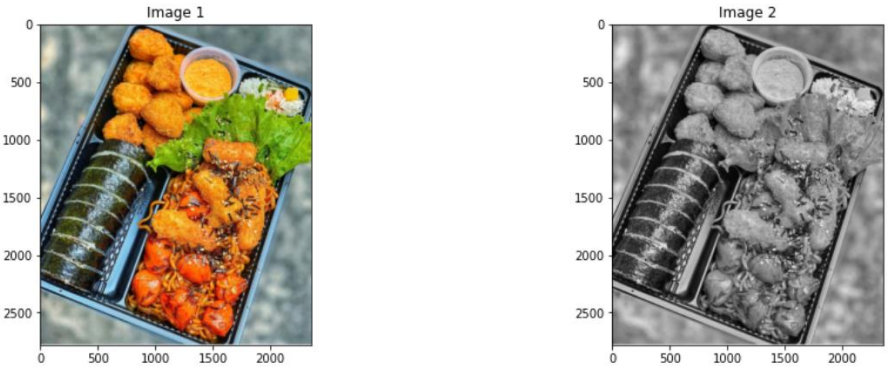
Chọn tệp Sample01.jpg.jpg

- **Sample01.jpg.jpg**(image/jpeg) - 1396958 bytes, last modified: 13/10/2022 - 100% done

```
Saving Sample01.jpg.jpg to Sample01.jpg.jpg
```

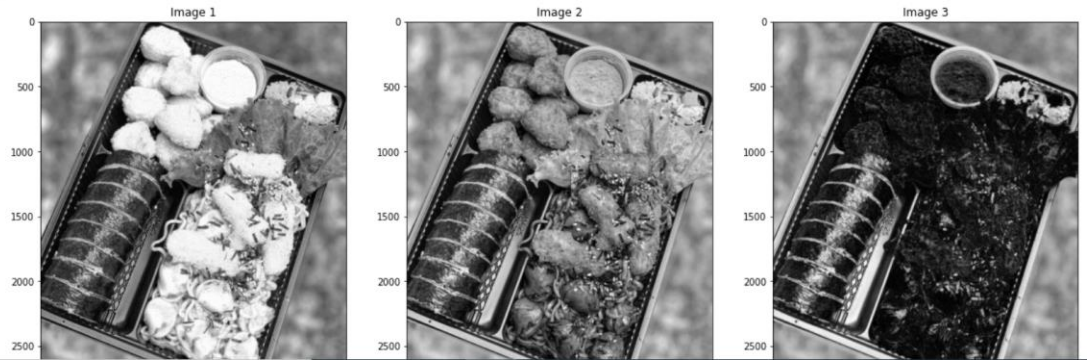
```
[ ] # Read Image
    image_color = imread("Sample01.jpg.jpg")
    # Convert Image into Gray
    image_gray = cv2.cvtColor(image_color, cv2.COLOR_RGB2GRAY)
    # Display Image
```

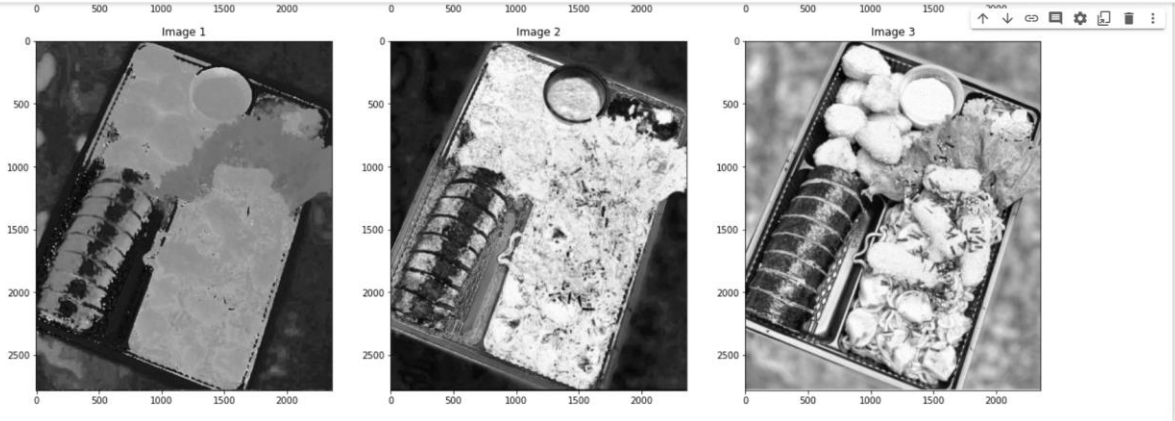
```
# Read Image
image_color = imread("Sample01.jpg.jpg")
# Convert Image into Gray
image_gray = cv2.cvtColor(image_color, cv2.COLOR_RGB2GRAY)
# Display Image
ShowTwoImages(image_color, image_gray)
```



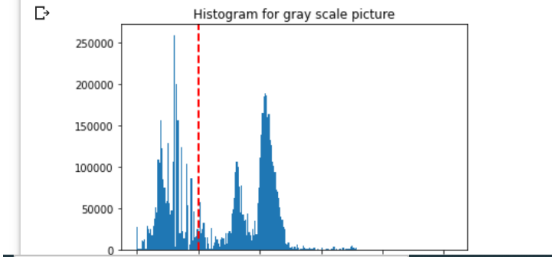

```
[ ] # Convert Image into HSV color spaces
    image_hsv = cv2.cvtColor(image_color, cv2.COLOR_BGR2HSV)

    # Show each channel R, G, and B
```

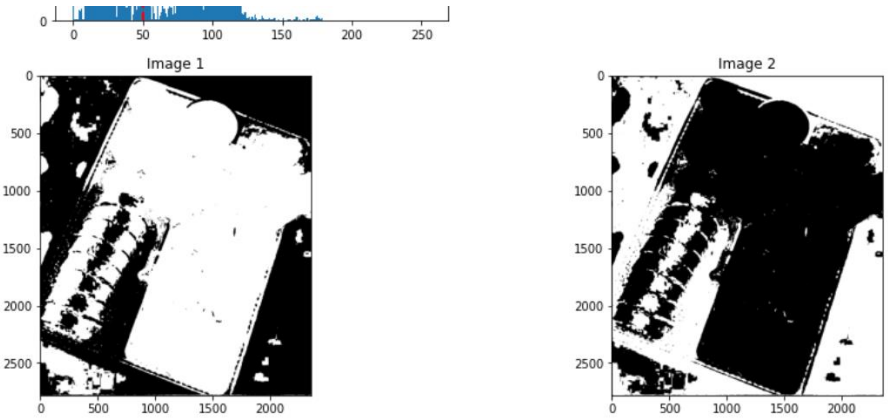
```
# Convert Image into HSV color spaces
image_hsv = cv2.cvtColor(image_color, cv2.COLOR_BGR2HSV)

# Show each channel R, G, and B
ShowThreeImages(image_color[:,:,0],image_color[:,:,1],image_color[:,:,2])

# Show each channel H , S and V
ShowThreeImages(image_hsv[:,:,0],image_hsv[:,:,1],image_hsv[:,:,2])
```



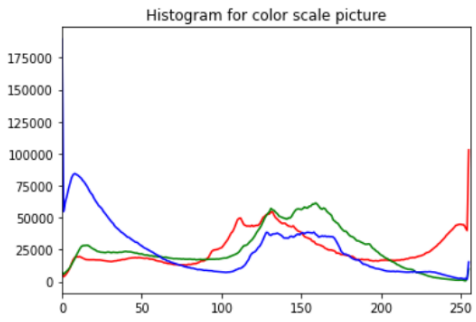


```
hue_img = image_hsv[:,:,0]
hue_threshold = 50

# Show Histogram of Hue Channel
hist = cv2.calcHist([hue_img],[0],None,[256],[0,256])
plt.hist(hue_img.ravel(),256,[0,256])
plt.axvline(x=hue_threshold, color='r', linestyle='dashed', linewidth=2)
plt.title('Histogram for gray scale picture')
plt.show()

# Use threshold to segment object by histogram
hue_binary01 = hue_img > hue_threshold
hue_binary02 = 1 - hue_binary01

ShowTwoImages(hue_binary01, hue_binary02)
```

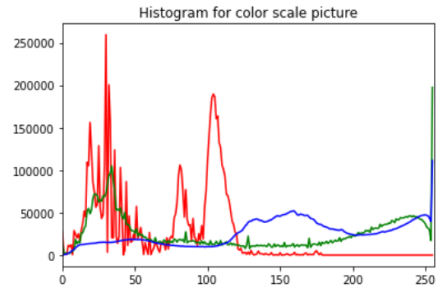





```
color = ('r', 'g', 'b')
for channel,col in enumerate(color):
    histr = cv2.calcHist([image_color],[channel],None,[256],[0,256])
    plt.plot(histr,color = col)
    plt.xlim([0,256])
plt.title('Histogram for color scale picture')
plt.show()
```

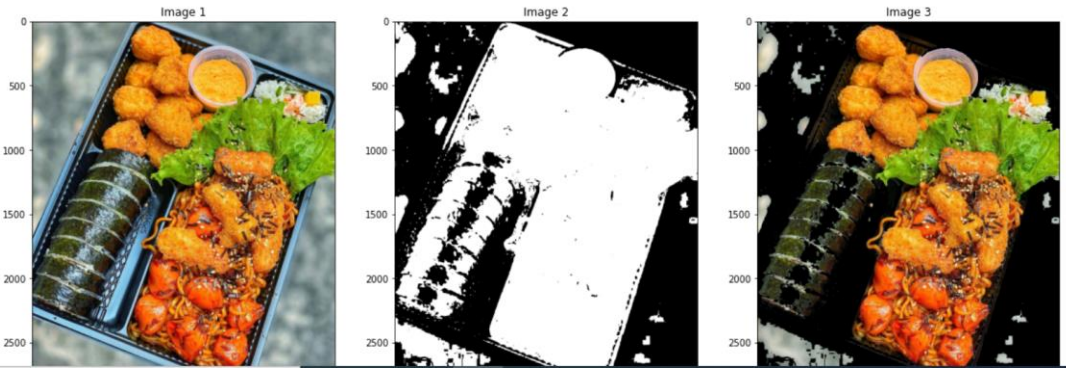


```
color = ('r', 'g', 'b')
for channel,col in enumerate(color):
    histr = cv2.calcHist([image_hsv],[channel],None,[256],[0,256])
    plt.plot(histr,color = col)
    plt.xlim([0,256])
plt.title('Histogram for color scale picture')
plt.show()
```




```
def SegmentColorImageByMask(IM, Mask):
    Mask = Mask.astype(np.uint8)
    result = cv2.bitwise_and(IM, IM, mask = Mask)
    return result
```

```
hue_binary01_rgb = SegmentColorImageByMask(image_color, hue_binary01)
ShowThreeImages(image_color, hue_binary01, hue_binary01_rgb)
```




```
[12] uploads = files.upload()
```

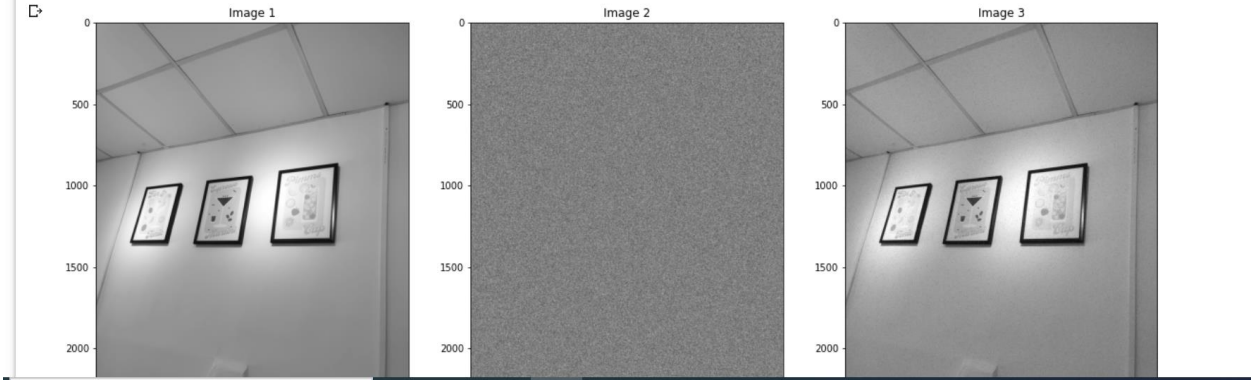
Chọn tệp Sample02.jpg

- **Sample02.jpg**(image/jpeg) - 464928 bytes, last modified: 13/10/2022 - 100% done

```
Saving Sample02.jpg to Sample02.jpg
```

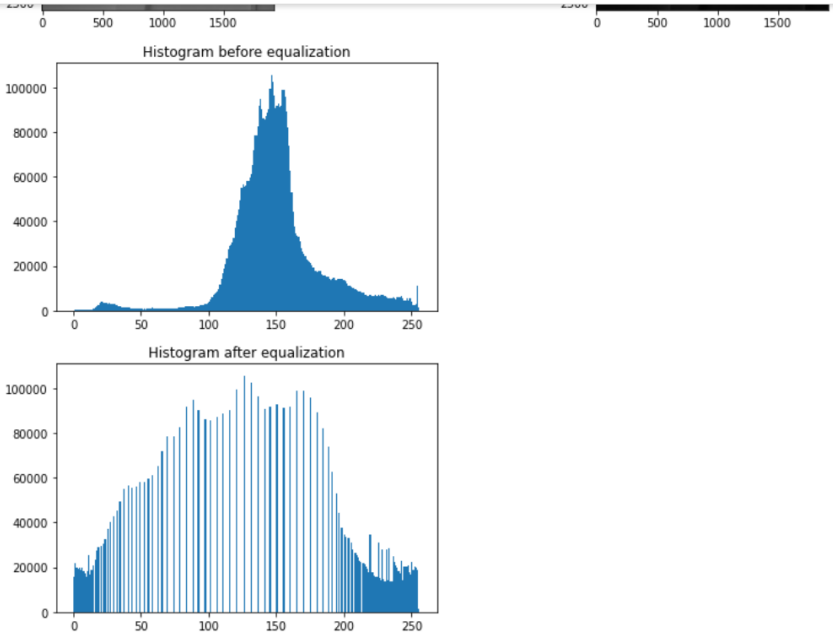
```
# Read Image
image_color = imread("Sample02.jpg")
# Convert Image into Gray
image_gray = cv2.cvtColor(image_color, cv2.COLOR_RGB2GRAY)

# Display Image
ShowTwoImages(image_color, image_gray)
```

```python
# Create Noise Image
noise = np.random.random(image_gray.shape)
image_noise = image_gray.copy()
image_noise[noise > 0.99] = 255
image_noise[noise < 0.01] = 0

ShowThreeImages(image_gray, noise, image_noise)
```




```python
# Create Blurred Image
from skimage.filters.rank import median
from skimage.morphology import disk

image_blurred = median(image_gray, disk(10))
ShowTwoImages(image_gray, image_blurred)
```

```
from skimage import data, exposure
image_equalization = exposure.equalize_hist(image_gray)
image_equalization = np.float32(image_equalization * 255)
ShowTwoImages(image_gray, image_equalization)

hist = cv2.calcHist([image_gray],[0],None,[256],[0,256])
plt.hist(image_gray.ravel(),256,[0,256])
plt.title('Histogram before equalization')
plt.show()

hist = cv2.calcHist([image_equalization],[0],None,[256],[0,256])
plt.hist(image_equalization.ravel(),256,[0,256])
plt.title('Histogram after equalization')
plt.show()
```



```python
def histogram_equalize(img):
    r, g, b = cv2.split(img)
    red = cv2.equalizeHist(r)
    green = cv2.equalizeHist(g)
    blue = cv2.equalizeHist(b)
    return cv2.merge((red, green, blue))
```

```python
image_equalization_color = histogram_equalize(image_color)
ShowTwoImages(image_color, image_equalization_color)
```

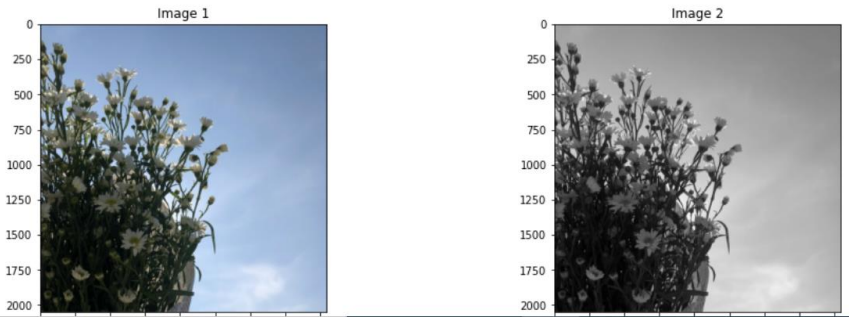

```python
uploads = files.upload()
```

Chọn tệp Sample03.jpg

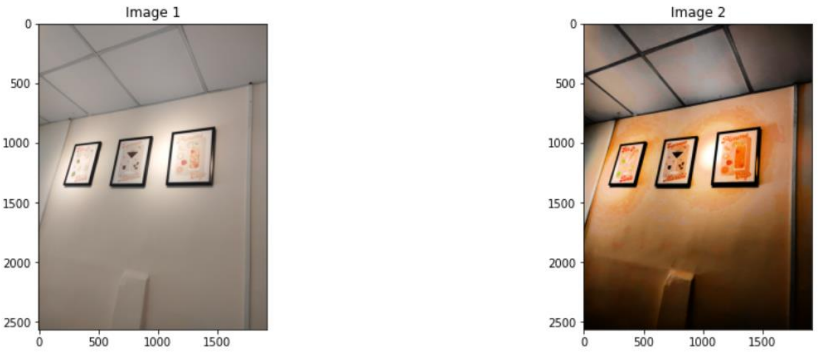
- **Sample03.jpg**(image/jpeg) - 458483 bytes, last modified: 13/10/2022 - 100% done

```
Saving Sample03.jpg to Sample03.jpg
```

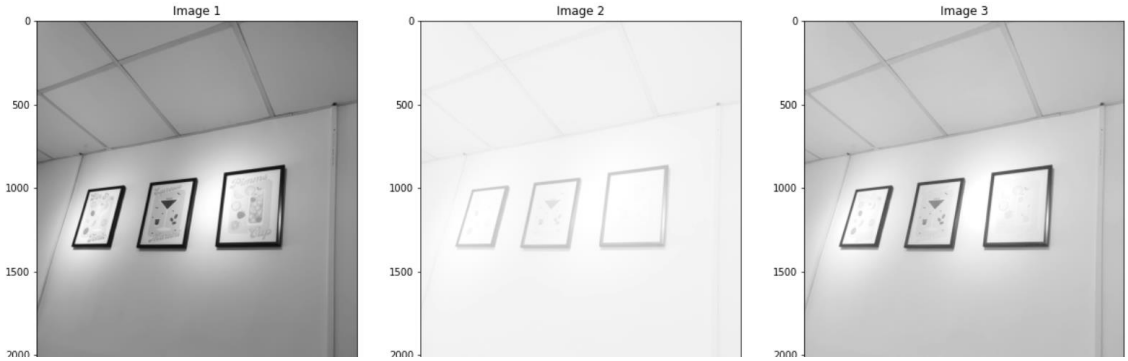
```python
# Read Image
image_color = imread("Sample03.jpg")
# Convert Image into Gray
image_gray = cv2.cvtColor(image_color, cv2.COLOR_RGB2GRAY)
# Display Image
ShowTwoImages(image_color, image_gray)
```

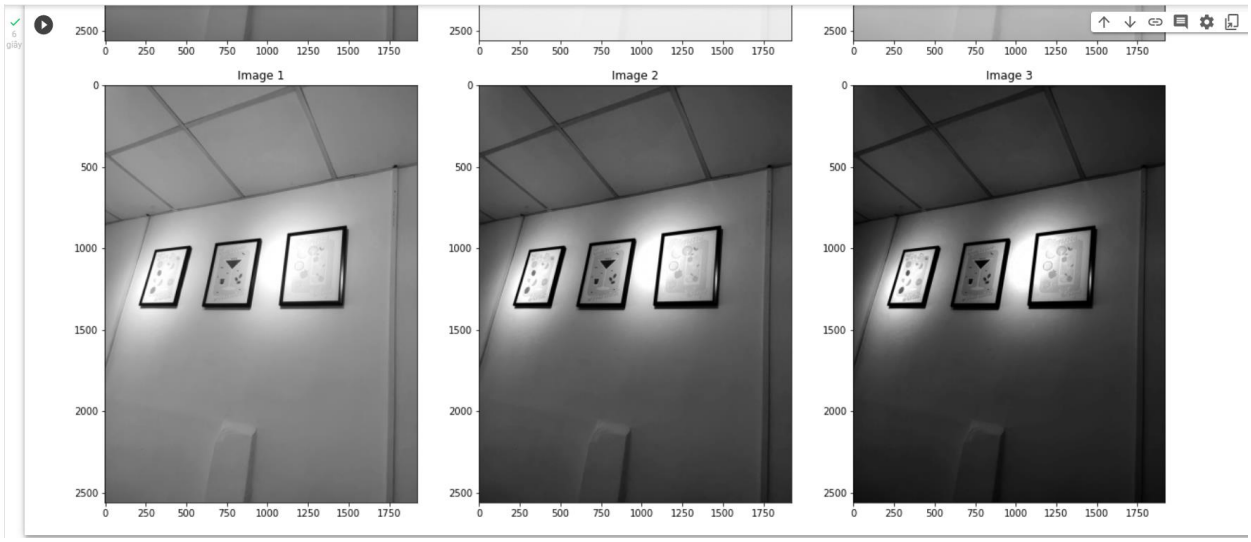


```
# Convert Image into HSV color spaces
image_hsv = cv2.cvtColor(image_color, cv2.COLOR_RGB2HSV)
# Apply histogram equalization
channel = 1
image_hsv[:, :, channel] = cv2.equalizeHist(image_hsv[:, :, channel])
channel = 2
image_hsv[:, :, channel] = cv2.equalizeHist(image_hsv[:, :, channel])
# Convert to RGB
image_enhanced = cv2.cvtColor(image_hsv, cv2.COLOR_HSV2RGB)
ShowTwoImages(image_color, image_enhanced)
```

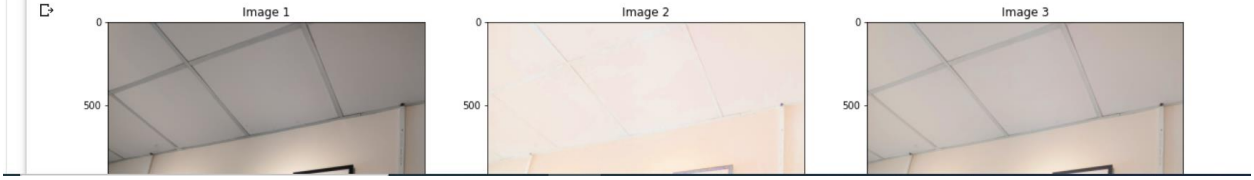


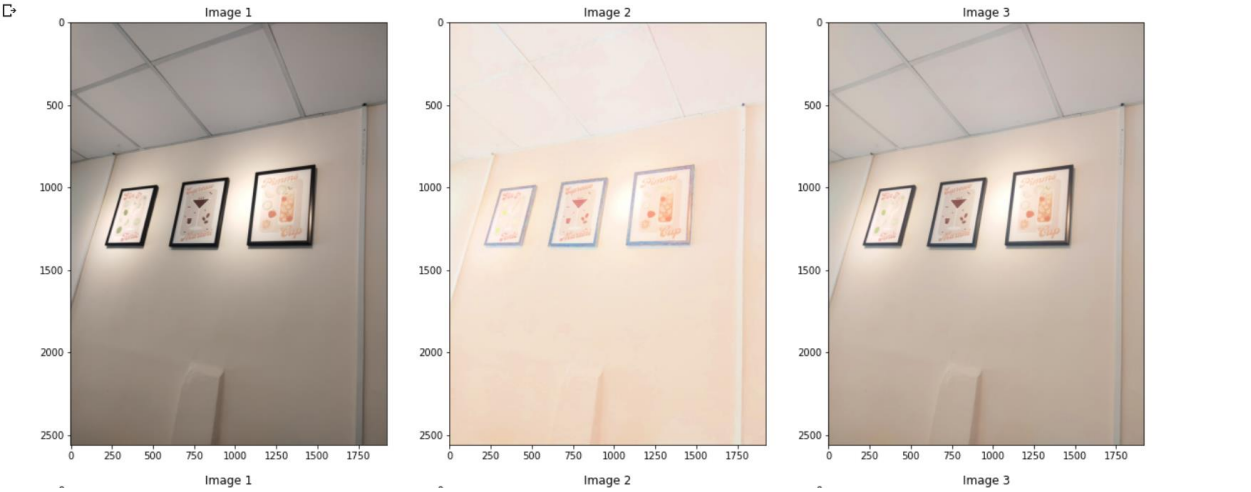

```
image_hsv = cv2.cvtColor(image_color, cv2.COLOR_RGB2HSV)
img = image_hsv[:,:,2]
gamma = [0.1, 0.5, 1.2, 2.2, 3.2]
gamma_corrected_01 = np.array(255*(img / 255) ** gamma[0], dtype = 'uint8')
gamma_corrected_02 = np.array(255*(img / 255) ** gamma[1], dtype = 'uint8')
gamma_corrected_03 = np.array(255*(img / 255) ** gamma[2], dtype = 'uint8')
gamma_corrected_04 = np.array(255*(img / 255) ** gamma[3], dtype = 'uint8')
gamma_corrected_05 = np.array(255*(img / 255) ** gamma[4], dtype = 'uint8')
ShowThreeImages(image_gray, gamma_corrected_01, gamma_corrected_02)
ShowThreeImages(gamma_corrected_03, gamma_corrected_04, gamma_corrected_05)
```

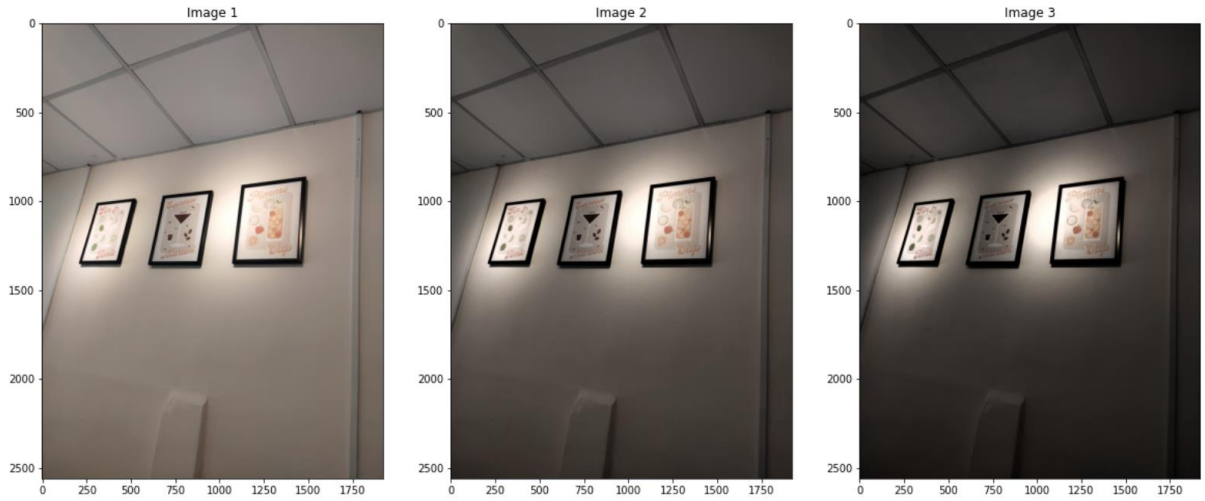





```
channel = 2
image_hsv_01 = image_hsv.copy()
image_hsv_01[:,:,2] = gamma_corrected_01
image_enhanced_01 = cv2.cvtColor(image_hsv_01, cv2.COLOR_HSV2RGB)
image_hsv_02 = image_hsv.copy()
image_hsv_02[:,:,2] = gamma_corrected_02
image_enhanced_02 = cv2.cvtColor(image_hsv_02, cv2.COLOR_HSV2RGB)
image_hsv_03 = image_hsv.copy()
image_hsv_03[:,:,2] = gamma_corrected_03
image_enhanced_03 = cv2.cvtColor(image_hsv_03, cv2.COLOR_HSV2RGB)
image_hsv_04 = image_hsv.copy()
image_hsv_04[:,:,2] = gamma_corrected_04
image_enhanced_04 = cv2.cvtColor(image_hsv_04, cv2.COLOR_HSV2RGB)
image_hsv_05 = image_hsv.copy()
image_hsv_05[:,:,2] = gamma_corrected_05
image_enhanced_05 = cv2.cvtColor(image_hsv_05, cv2.COLOR_HSV2RGB)

ShowThreeImages(image_color, image_enhanced_01, image_enhanced_02)
ShowThreeImages(image_enhanced_03, image_enhanced_04, image_enhanced_05)
```

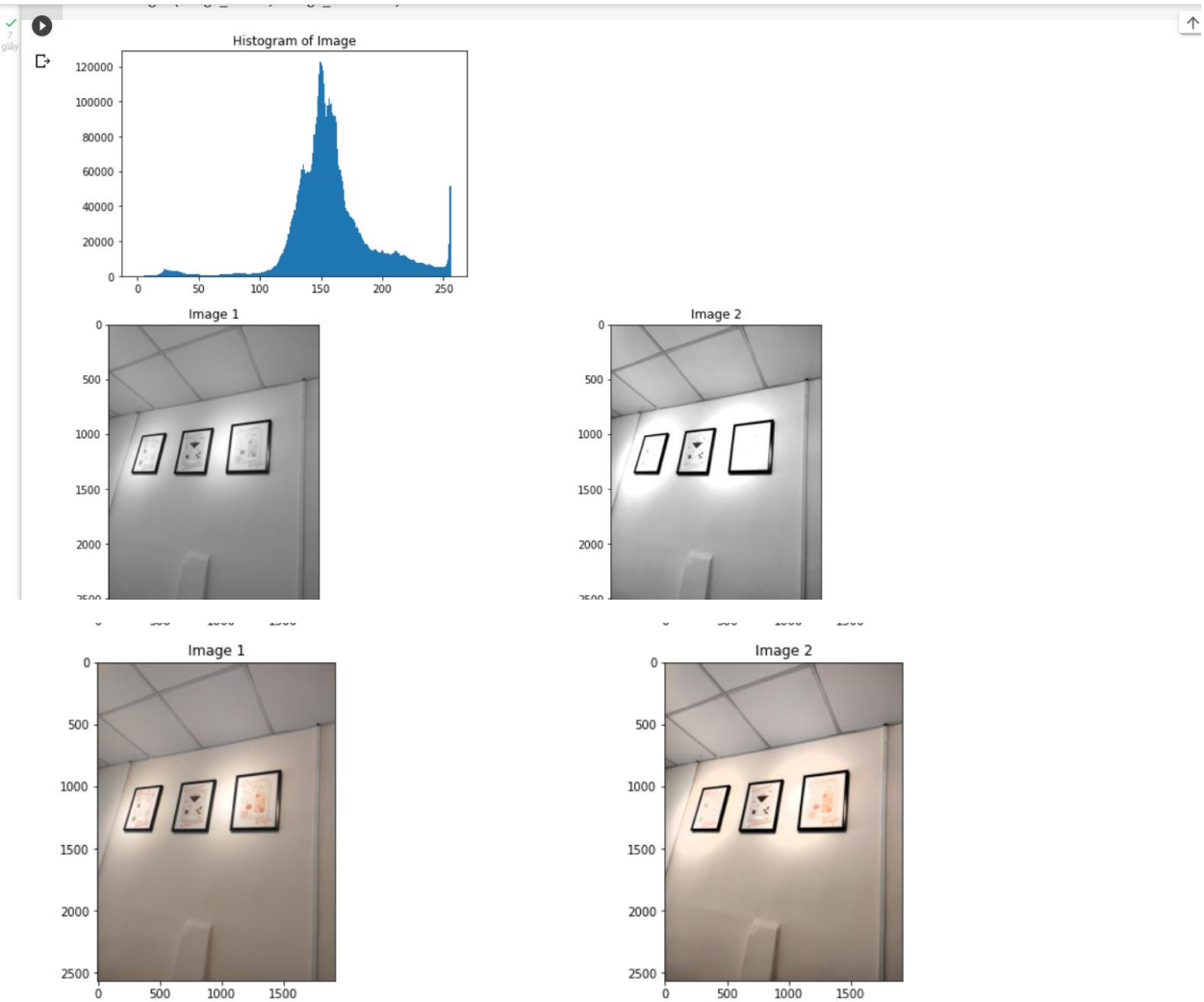




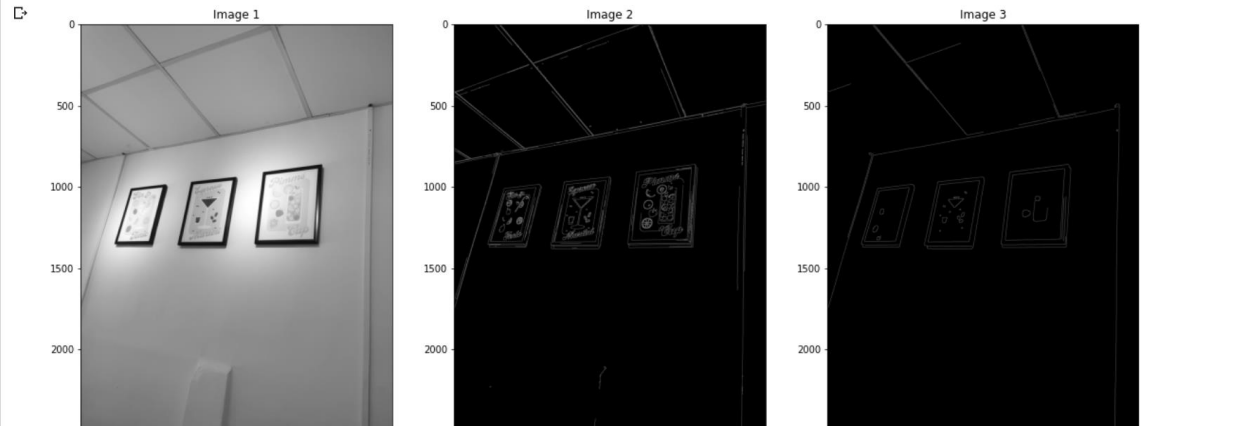



```
# With (r1, s1), (r2, s2) as parameters, the function stretches the intensity levels
# by essentially decreasing the intensity of the dark pixels and increasing the intensity
# of the light pixels. If r1 = s1 = 0 and r2 = s2 = L-1, the function becomes a straight
# dotted line in the graph (which gives no effect).
# The function is monotonically increasing so that the order of intensity levels between pixels
# is preserved.
# Function to map each intensity level to output intensity level.
def pixelValTransformation(pix, r1, s1, r2, s2):
    if (0 <= pix and pix <= r1):
        return (s1 / r1)*pix
    elif (r1 < pix and pix <= r2):
        return ((s2 - s1)/(r2 - r1)) * (pix - r1) + s1
    else:
        return ((255 - s2)/(255 - r2)) * (pix - r2) + s2
```

```
image_hsv = cv2.cvtColor(image_color, cv2.COLOR_RGB2HSV)
image_hsv_value = image_hsv[:,:,2]

hist = cv2.calcHist([image_hsv_value],[0],None,[256],[0,256])
plt.hist(image_hsv_value.ravel(),256,[0,256])
plt.title('Histogram of Image')
plt.show()

# Define parameters.
r1 = 50
s1 = 0
r2 = 200
s2 = 255

# Vectorize the function to apply it to each value in the Numpy array.
pixelVal_vec = np.vectorize(pixelValTransformation)
# Apply contrast stretching.
contrast_stretched = pixelVal_vec(image_hsv_value, r1, s1, r2, s2)

image_hsv[:,:,2] = contrast_stretched
image_enhanced = cv2.cvtColor(image_hsv, cv2.COLOR_HSV2RGB)

ShowTwoImages(image_gray, contrast_stretched)
ShowTwoImages(image_color, image_enhanced)
```




```
from skimage import feature
# sigma help to remove the noisy image in edge detection
image_edges_01 = feature.canny(image_gray)
image_edges_02 = feature.canny(image_gray, sigma=3)
ShowThreeImages(image_gray, image_edges_01, image_edges_02)
```



Hết.

Em xin chân thầy cảm ơn thầy ạ.