

19110315\_TinhNgocHien.ipynb X Google Dịch X +

localhost:8888/notebooks/TNHien/Phân%20tích%20%26%20Xử%20lý%20ảnh/Lab02/19110315\_TinhNgocHien\_DIP%20Lab02.ipynb#Xuất-ảnh-xoay-các-góc-30,45,60-độ

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In [2]:

```
1 import numpy as np
2 import pandas as pd
3 import cv2
4 from matplotlib import pyplot as plt
5 from pylab import imread
6 from skimage.color import rgb2gray
```

Câu 1:

Viết thành 1 function cho biết thông tin của bức ảnh:

Ảnh màu hay ảnh xám và giá trị min max tương ứng với từng kênh màu

In [3]:

```
1 def imshows(ImageData, LabelData, rows, cols, gridType = False):
2     # Convert ImageData and LabelData to List
3     from matplotlib import pyplot as plt
4     ImageArray = list(ImageData)
5     LabelArray = list(LabelData)
6     if(rows == 1 & cols == 1):
7         fig = plt.figure(figsize=(20,20))
8     else:
9         fig = plt.figure(figsize=(cols*8,rows*5))
10
11    for i in range(1, cols * rows + 1):
12        fig.add_subplot(rows, cols, i)
13        image = ImageArray[i - 1]
14        # If the channel number is less than 3, we display as grayscale image
15        # otherwise, we display as color image
16        if (len(image.shape) < 3):
17            plt.imshow(image, plt.cm.gray)
```

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In [3]:

```
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)
            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)
```

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In [4]:

```
1 # Read Image
2 image_color = imread("kitty.jpg")
3 # Convert Image into Gray
4 image_gray = cv2.cvtColor(image_color, cv2.COLOR_RGB2GRAY)
5
6 # Display Image
7 ShowTwoImages(image_color, image_gray)
```

Image 1

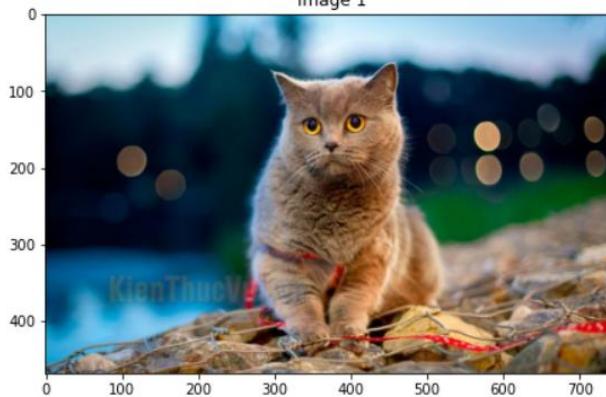
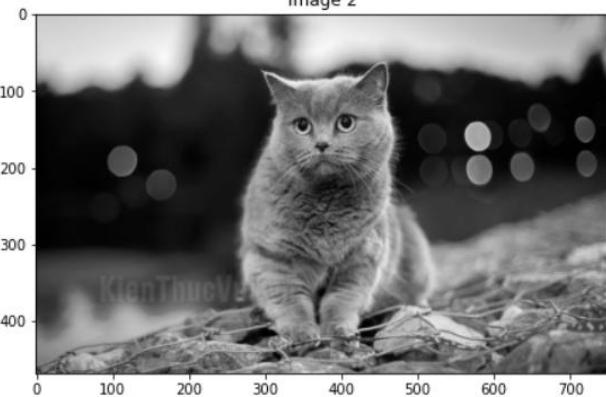


Image 2



In [5]:

```
1 # Show Information of Color Image
2 Image = image_color.copy()
3 Width = Image.shape[1]
4 Height = Image.shape[0]
5 Channel = len(Image.shape)
6 print("Width : ", Width, " Height : ", Height, " Channel : ", Channel)
7
8 IM = image_color.copy
```

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The screenshot shows a Jupyter Notebook interface running on a Windows operating system. The browser tab is titled "19110315\_TrinhNgocHien.ipynb" and the page URL is "localhost:8888/notebooks/TNhien/Phan%20tich%20%26%20Xử%20lý%20anh/Lab02/19110315\_TrinhNgocHien\_DIP%20Lab02.ipynb#Xuất-ảnh-xoay-các-góc-30,45,60-degree". The notebook title is "jupyter 19110315\_TrinhNgocHien\_DIP Lab02" and it indicates "Last Checkpoint: 2 minutes ago (autosaved)".

The interface includes a sidebar with various icons (File, Edit, View, Insert, Cell, Kernel, Widgets, Help, Trusted, Python 3) and a toolbar with buttons for file operations like Open, Save, Run, etc.

**In [5]:**

```
1 # Show Information of Color Image
2 Image = image_color.copy()
3 Width = Image.shape[1]
4 Height = Image.shape[0]
5 Channel = len(Image.shape)
6 print("Width : ", Width, " Height : ", Height, " Channel : ", Channel)
7
8 IM = image_color.copy
9 if(Channel == 2):
10     print("Min Intensity: ", Image.min(), " Max Intensity: ", Image.max())
11 else:
12     print("Red - Min Intensity: ", Image[:, :, 0].min(), " Max Intensity: ", Image[:, :, 0].max())
13     print("Green - Min Intensity: ", Image[:, :, 1].min(), " Max Intensity: ", Image[:, :, 1].max())
14     print("Blue - Min Intensity: ", Image[:, :, 2].min(), " Max Intensity: ", Image[:, :, 2].max())
```

Output:

```
Width : 750 Height : 469 Channel : 3
Red - Min Intensity: 0 Max Intensity: 255
Green - Min Intensity: 0 Max Intensity: 248
Blue - Min Intensity: 0 Max Intensity: 255
```

**In [6]:**

```
1 # Show Information of Gray Image
2 Image = image_gray.copy()
3 Width = Image.shape[1]
4 Height = Image.shape[0]
5 Channel = len(Image.shape)
6 print("Width : ", Width, " Height : ", Height, " Channel : ", Channel)
7
8 IM = image_color.copy
9 if(Channel == 2):
10     print("Min Intensity: ", Image.min(), " Max Intensity: ", Image.max())
11 else:
12     print("Red - Min Intensity: ", Image[:, :, 0].min(), " Max Intensity: ", Image[:, :, 0].max())
13     print("Green - Min Intensity: ", Image[:, :, 1].min(), " Max Intensity: ", Image[:, :, 1].max())
14     print("Blue - Min Intensity: ", Image[:, :, 2].min(), " Max Intensity: ", Image[:, :, 2].max())
```

Output:

```
Width : 750 Height : 469 Channel : 2
```

The taskbar at the bottom shows various application icons, and the system tray indicates "A/C", battery level, and network status.

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7  
8 IM = image\_color.copy  
9 if(Channel == 2):  
10 print("Min Intensity: ", Image.min(), " Max Intensity: ", Image.max())  
11 else:  
12 print("Red - Min Intensity: ", Image[:, :, 0].min(), " Max Intensity: ", Image[:, :, 0].max())  
13 print("Green - Min Intensity: ", Image[:, :, 1].min(), " Max Intensity: ", Image[:, :, 1].max())  
14 print("Blue - Min Intensity: ", Image[:, :, 2].min(), " Max Intensity: ", Image[:, :, 2].max())

Width : 750 Height : 469 Channel : 2  
Min Intensity: 0 Max Intensity: 250

In [7]:

```
1 def intToBitArray(img) :  
2     row ,col = img.shape  
3     list = []  
4     for i in range(row):  
5         for j in range(col):  
6             list.append (np.binary_repr( img[i][j] ,width=8 ) )  
7     return list #the binary_repr() function returns binary values but in  
#string  
#not integer, which has it's own perk as you will notice  
10    def bitplane(bitImgVal , img1D ):  
11        bitList = [ int( i[bitImgVal] ) for i in img1D]  
12        return bitlist  
13    def GetBitImage(index, image2D):  
14        ImageIn1D = intToBitArray(image2D)  
15        Imagebit = np.array( bitplane(index, ImageIn1D ) )  
16        Imagebit = np.reshape(Imagebit , image2D.shape )  
17        return Imagebit  
18    def GetAllBitImage(image2D):  
19        image2D_Bit = list()  
20        for i in range(8):  
21            image2D_Bit.append(GetBitImage(i, image2D))  
22        return image2D_Bit
```

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Hiển thị 24 bức ảnh theo bit của từng kênh màu R, G, B (mỗi kênh 8 ảnh x 3 kênh = 24 ảnh bit)

Kênh màu RED:

```
In [8]: 1 img_channelR = image_color[:, :, 0]
2 img_channelR_Bit = GetAllBitImage(img_channelR)
3 print("List of channel Red have ", len(img_channelR_Bit), " images")
4 ShowListImages(img_channelR_Bit, 2, 4)
```

List of channel Red have 8 images

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Code

Kênh màu GREEN:

In [9]:

```
1 img_channelG = image_color[:, :, 1]
2 img_channelG_Bit = GetAllBitImage(img_channelG)
3 print("List of channel Green have ", len(img_channelG_Bit), " images")
4 ShowListImages(img_channelG_Bit, 2, 4)
```

List of channel Green have 8 images

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Kênh màu BLUE:

```
In [10]: 1 img_channelB = image_color[:, :, 2]
2 img_channelB_Bit = GetAllBitImage(img_channelB)
3 print("List of channel Blue have ", len(img_channelB_Bit), " images")
4 ShowListImages(img_channelB_Bit, 2, 4)
```

List of channel Blue have 8 images

0 1 4 5

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Kênh màu BLUE:

```
In [10]: 1 img_channelB = image_color[:, :, 2]
2 img_channelB_Bit = GetAllBitImage(img_channelB)
3 print("List of channel Blue have ", len(img_channelB_Bit), " images")
4 ShowListImages(img_channelB_Bit, 2, 4)
```

List of channel Blue have 8 images

0 1 2 3  
4 5 6 7

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Cho biết trong 24 ảnh bit theo kênh R, G, B có ảnh nào có thể dùng để trích xuất đối tượng hay không. Nếu có thì hiển thị ảnh bit đó ra

In [11]:

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

In [12]:

```
1 # Take the highest bit image
2 KittyMask01 = img_channelR_Bit[0]
3 KittyMask02 = img_channelG_Bit[0]
4 KittyMask03 = img_channelB_Bit[0]
5
6 KittyMask01_rgb = SegmentColorImageByMask(image_color, KittyMask01)
7 KittyMask02_rgb = SegmentColorImageByMask(image_color, KittyMask02)
8 KittyMask03_rgb = SegmentColorImageByMask(image_color, KittyMask03)
9 ShowThreeImages(KittyMask01_rgb, KittyMask02_rgb, KittyMask03_rgb)
```

Image 1



Image 2



Image 3



→ Có 1 ảnh trích xuất được đối tượng của ảnh. Đó chính "KittyMask01"

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In [13]:

```
1 # Convert Image into HSV color spaces
2 image_hsv = cv2.cvtColor(image_color, cv2.COLOR_BGR2HSV)
3
4 # Show each channel H , S and V
5 ShowThreeImages(image_hsv[:, :, 0], image_hsv[:, :, 1], image_hsv[:, :, 2])
```

Tạo ảnh HSV và hiển thị các kênh Hue, Saturation và Value

Image 1

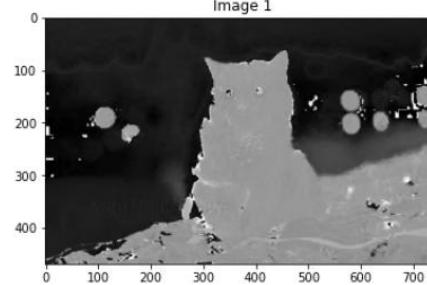


Image 2

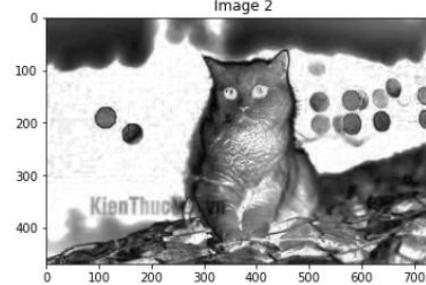
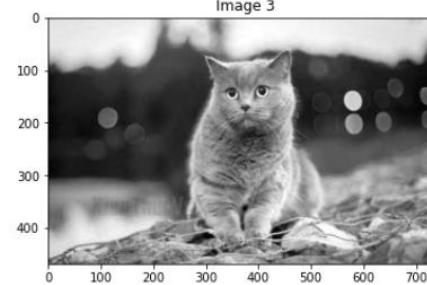


Image 3



Hiển thị 24 bức ảnh theo bit của từng kênh màu H, S, V (mỗi kênh 8 ảnh x 3 kênh = 24 ảnh bit)

Kênh màu HUE

In [15]:

```
1 img_channelH = image_hsv[:, :, 0]
2 img_channelH_Bit = GetAllBitImage(img_channelH)
3 print("List of channel Hue have ", len(img_channelH_Bit), " images")
4 ShowListImages(img_channelH_Bit, 2, 4)
```

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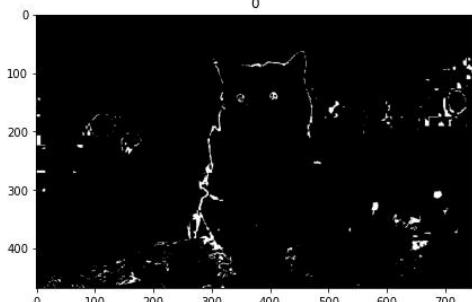
Kênh màu HUE

In [15]:

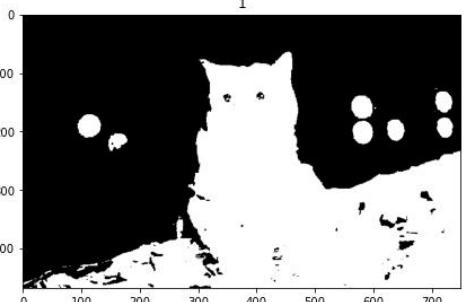
```
1 img_channelH = image_hsv[:, :, 0]
2 img_channelH_Bit = GetAllBitImage(img_channelH)
3 print("List of channel Hue have ", len(img_channelH_Bit), " images")
4 ShowListImages(img_channelH_Bit, 2, 4)
```

List of channel Hue have 8 images

0



1



4



5



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In [15]:

```
1 img_channelH = image_hsv[:, :, 0]
2 img_channelH_Bit = GetAllBitImage(img_channelH)
3 print("List of channel Hue have ", len(img_channelH_Bit), " images")
4 ShowListImages(img_channelH_Bit, 2, 4)
```

List of channel Hue have 8 images

Kênh màu HUE

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Kênh màu SATURATION

```
In [16]: 1 img_channels = image_hsv[:, :, 1]
2 img_channels_Bit = GetAllBitImage(img_channels)
3 print("List of channel Saturation have ", len(img_channels_Bit), " images")
4 ShowListImages(img_channels_Bit, 2, 4)
```

List of channel Saturation have 8 images

Kênh màu VALUE

```
In [18]: 1 img_channelV = image_hsv[:, :, 2]
2 img_channelV_Bit = GetAllBitImage(img_channelV)
```

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Kênh màu VALUE

In [18]:

```
1 img_channelV = image_hsv[:, :, 2]
2 img_channelV_Bit = GetAllBitImage(img_channelV)
3 print("List of channel Value have ", len(img_channelV_Bit), " images")
4 ShowListImages(img_channelV_Bit, 2, 4)
```

List of channel Value have 8 images

Cho biết trong 24 ảnh bit theo kênh H, S, V có ảnh nào có thể dùng để trích xuất đối tượng hay không. Nếu có thì hiển thị ảnh bit đó ra

In [19]:

```
1 # Take the highest bit image
2 KittyMask01 = img_channelH_Bit[0]
```

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In [19]:

```
1 # Take the highest bit image
2 KittyMask01 = img_channelH_Bit[0]
3 KittyMask02 = img_channels_S_Bit[0]
4 KittyMask03 = img_channelV_Bit[0]
5
6 KittyMask01_hsv = SegmentColorImageByMask(image_color, KittyMask01)
7 KittyMask02_hsv = SegmentColorImageByMask(image_color, KittyMask02)
8 KittyMask03_hsv = SegmentColorImageByMask(image_color, KittyMask03)
9 ShowThreeImages(KittyMask01_hsv, KittyMask02_hsv, KittyMask03_hsv)
```

Cho biết trong 24 ảnh bit theo kênh H, S, V có ảnh nào có thể dùng để trích xuất đối tượng hay không. Nếu có thì hiển thị ảnh bit đó ra

Image 1

Image 2

Image 3

→ Có 1 ảnh trích xuất được đối tượng của ảnh. Đó chính "KittyMask03"

In [ ]: 1

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Câu 2:

Viết 1 function input ảnh màu và xuất ảnh chân dung xám và chân dung màu của ảnh đó

In [39]:

```
1 def grayscaleImage(img):
2     img_gray = cv2.cvtColor(img, cv2.COLOR_RGB2GRAY)
3     return img_gray
```

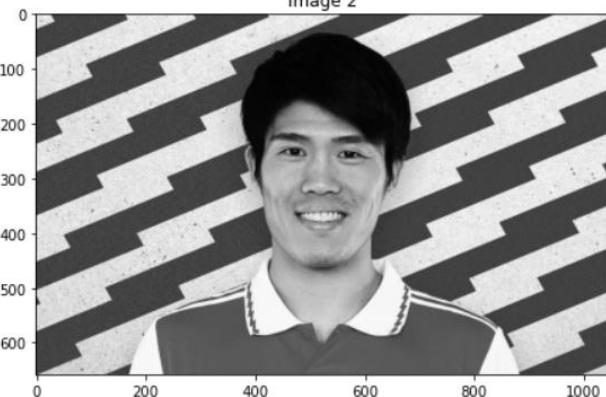
In [40]:

```
1 # Read Image
2 image_color = imread("tomiyasu.jpg")
3 # Convert Image into Gray
4 image_gray = grayscaleImage(image_color)
5
6 # Display Image
7 ShowTwoImages(image_color, image_gray)
```

Image 1



Image 2



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In [41]:

```
1 import cv2
2 from skimage import feature, filters
3
4 edges_canny = feature.canny(image_gray) # Canny
5 edges_sobel = filters.sobel(image_gray) # Sobel
6 edges_laplace = filters.laplace(image_gray) # Laplacian
7 edges_scharr = filters.scharr(image_gray) # Scharr
8 edges_prewitt = filters.prewitt(image_gray) # Prewitt
9 edges_roberts = filters.roberts(image_gray) # Roberts
10
11 ShowTwoImages(edges_canny, edges_sobel)
12 ShowTwoImages(edges_laplace, edges_scharr)
13 ShowTwoImages(edges_prewitt, edges_roberts)
```

Image 1

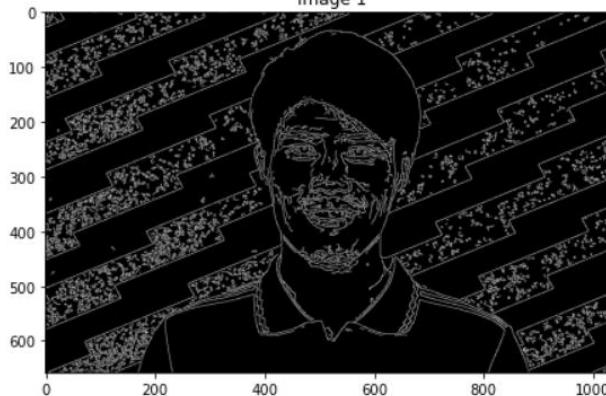


Image 2

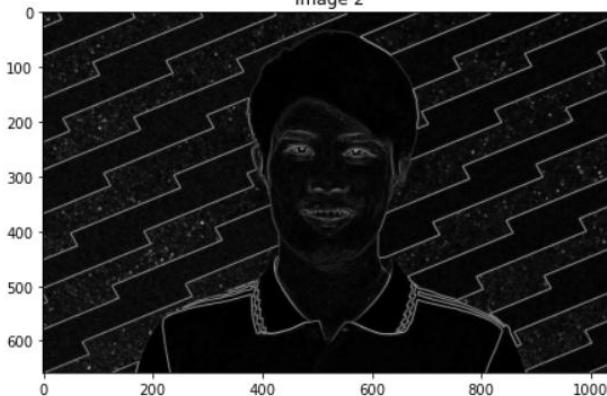


Image 1



Image 2



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Image 1

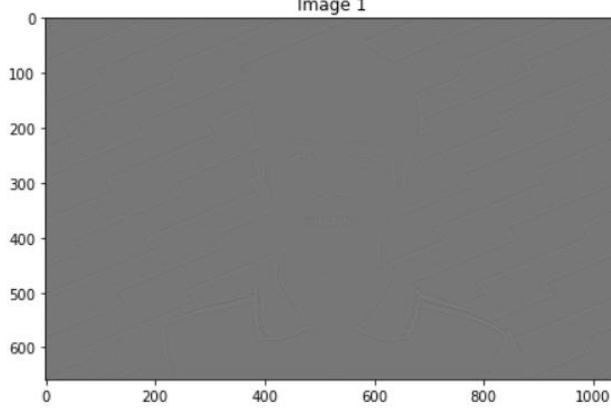


Image 2

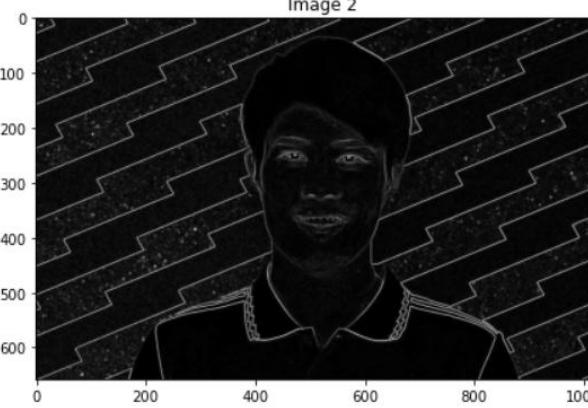


Image 1

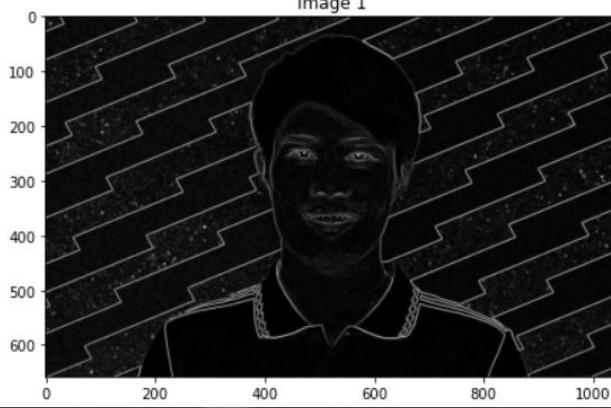
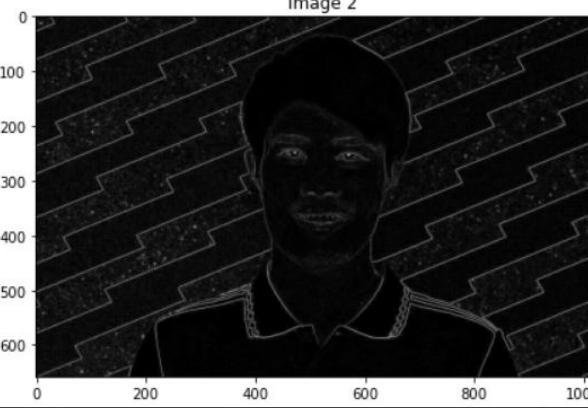


Image 2



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In [44]:

```
1 # Show Information of Gray Image
2 Image = edges_sobel.copy()
3 Width = Image.shape[1]
4 Height = Image.shape[0]
5 Channel = len(Image.shape)
6 print("Width : ", Width, " Height : ", Height, " Channel : ", Channel)
7
8 IM = image_color.copy()
9 if(Channel == 2):
10     print("Min Intensity: ", Image.min(), " Max Intensity: ", Image.max())
11 else:
12     print("Red - Min Intensity: ", Image[:, :, 0].min(), " Max Intensity: ", Image[:, :, 0].max())
13     print("Green - Min Intensity: ", Image[:, :, 1].min(), " Max Intensity: ", Image[:, :, 1].max())
14     print("Blue - Min Intensity: ", Image[:, :, 2].min(), " Max Intensity: ", Image[:, :, 2].max())
```

Width : 1045 Height : 658 Channel : 2  
Min Intensity: 0.0 Max Intensity: 0.6406163230486727

In [43]:

```
1 # Invert
2 ShowThreeImages(image_gray, 1 - edges_canny, 1 - edges_sobel)
```

Image 1

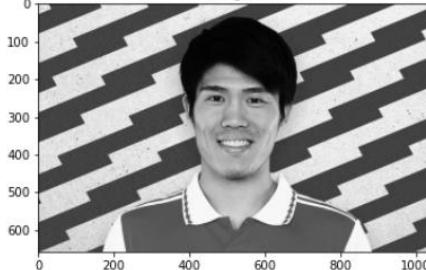


Image 2

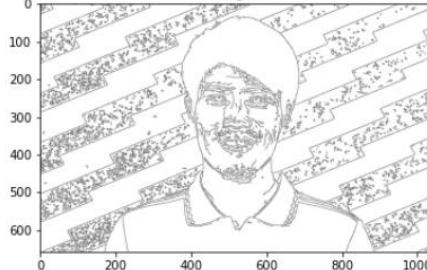
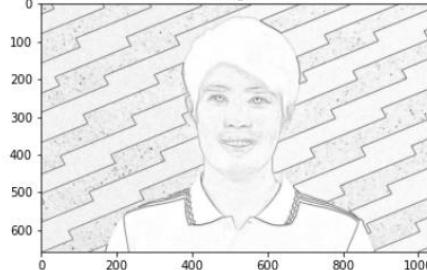


Image 3



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Tìm chọn range màu lower và upper để trích xuất được các khuôn mặt trong ảnh màu

In [49]:

```
1 # Read Image
2 image_color = imread("football-team.jpg")
```

In [50]:

```
1 # Edge Detection on Color Image
2 from skimage.color.adapt_rgb import adapt_rgb, each_channel, hsv_value
3 from skimage import filters
4
5 @adapt_rgb(each_channel)
6 def sobel_each(image):
7     return filters.sobel(image)
8
9 @adapt_rgb(hsv_value)
10 def sobel_hsv(image):
11     return filters.sobel(image)
```

In [51]:

```
1 from skimage.exposure import rescale_intensity
2
3 image_sobel_rgb = rescale_intensity(1 - sobel_each(image_color))
4 image_sobel_hsv = rescale_intensity(1 - sobel_hsv(image_color))
5
6 ShowThreeImages(image_color, image_sobel_rgb, image_sobel_hsv)
```

Image 1



Image 2



Image 3



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Image 1

Image 2

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In [52]:

```
1 # Read Image
2 image_color = imread("kitty-fly.jpg")
3 # Convert Image into Gray
4 image_gray = cv2.cvtColor(image_color, cv2.COLOR_RGB2GRAY)
5
6 # Display Image
7 print("Image Size:", image_color.shape)
8 ShowTwoImages(image_color, image_gray)
```

Image Size: (628, 1200, 3)

Image 1

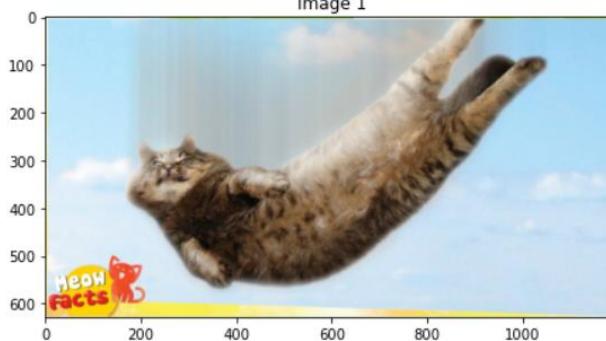
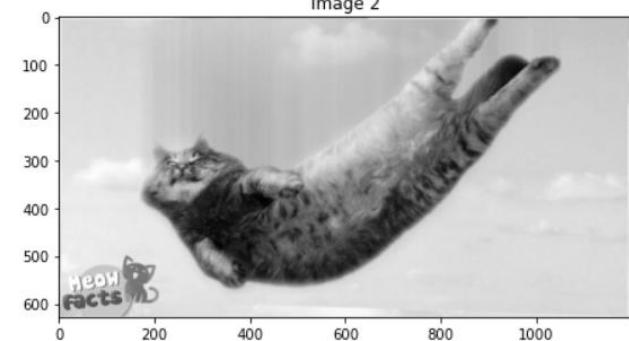


Image 2



Câu 3:

Xuất ảnh xoay các góc 30,45,60 độ

In [57]:

```
1 from skimage.transform import rotate
2 # Xoay góc 30 độ:
```

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In [57]:

```
from skimage.transform import rotate
# Xoay góc 30 độ:
image_color_rotate_30 = rotate(image_color, 30, resize=True)
ShowTwoImages(image_color, image_color_rotate_30)

# Xoay góc 45 độ:
image_color_rotate_45 = rotate(image_color, 45, resize=True)
ShowTwoImages(image_color, image_color_rotate_45)

# Xoay góc 60 độ:
image_color_rotate_60 = rotate(image_color, 60, resize=True)
ShowTwoImages(image_color, image_color_rotate_60)
```

Xuất ảnh xoay các góc 30,45,60 độ

Image 1

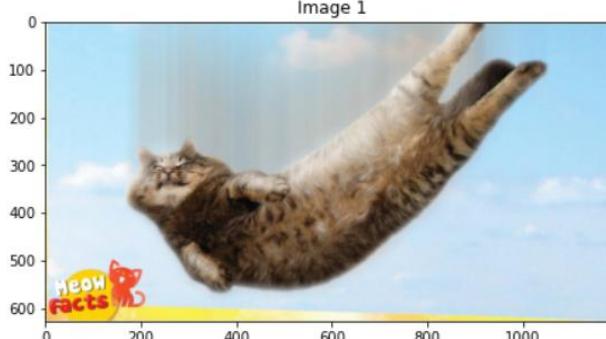
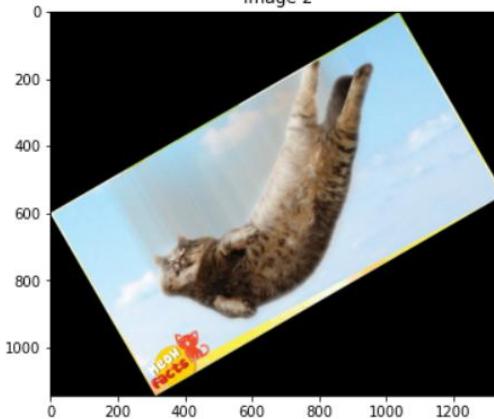


Image 2



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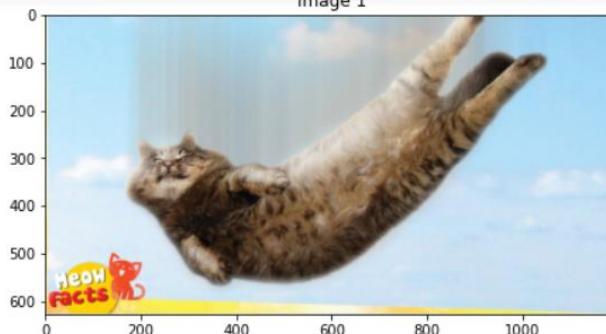
localhost:8888/notebooks/TNHien/Phân%20tích%20%26%20Xử%20lý%20anh/Lab02/19110315\_TinhNgocHien\_DIP%20Lab02.ipynb#Xuất-ảnh-xoay-các-góc-30,45,60-độ

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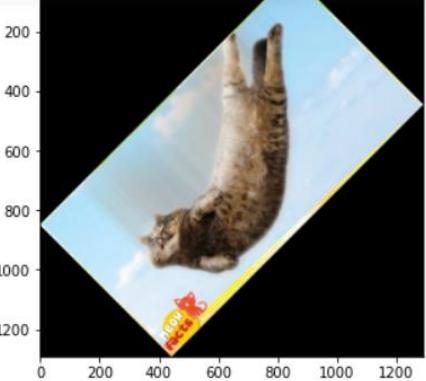
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Image 1



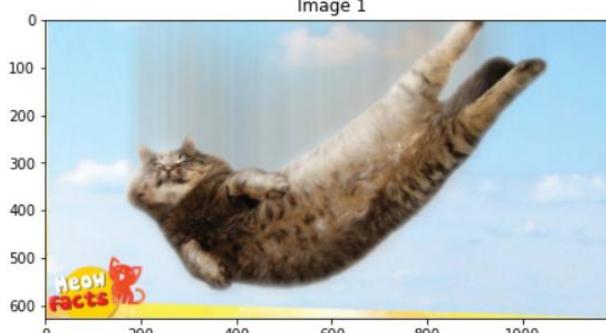
A photograph of a brown tabby cat falling through a blue sky with white clouds. The cat is positioned horizontally, facing left. A small yellow graphic in the bottom-left corner of the image contains the text "Meow Facts". The image has a coordinate system overlaid with x and y axes ranging from 0 to 1000.

Image 2



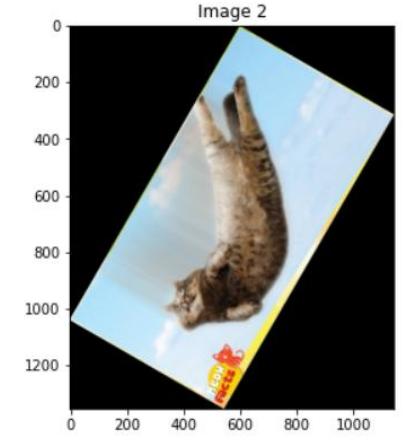
The same photograph of the cat falling, but rotated 30 degrees clockwise around its center. The yellow "Meow Facts" graphic is also rotated. The coordinate system shows the rotated axes.

Image 1



The same photograph of the cat falling, but rotated 45 degrees clockwise. The yellow "Meow Facts" graphic is also rotated. The coordinate system shows the rotated axes.

Image 2



The same photograph of the cat falling, but rotated 60 degrees clockwise. The yellow "Meow Facts" graphic is also rotated. The coordinate system shows the rotated axes.

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In [58]:

```
1 image_color_horizontal_flip = image_color[:, ::-1]
2 image_color_vertical_flip = image_color[::-1, :]
3
4 ShowThreeImages(image_color, image_color_horizontal_flip,image_color_vertical_flip)
```

Xuất ảnh đối xứng qua trực hoành và trực tung đi qua tâm ảnh

Image 1

Image 2

Image 3

In [59]:

```
1 from skimage import util
2 image_color_inversion = util.invert(image_color)
3 ShowTwoImages(image_color, image_color_inversion)
```

Xuất ảnh Inversion

Image 1

Image 2

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In [59]:

```
1 from skimage import util
2 image_color_inversion = util.invert(image_color)
3 ShowTwoImages(image_color, image_color_inversion)
```

Xuất ảnh Inversion

Image 1

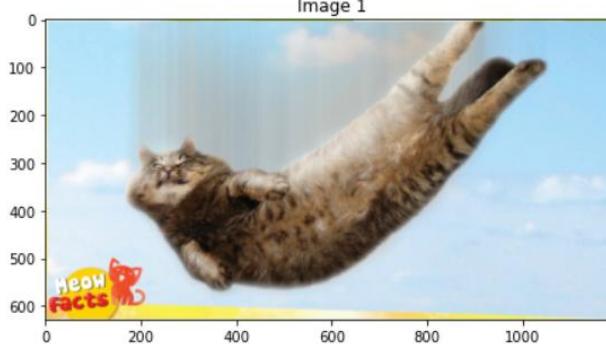
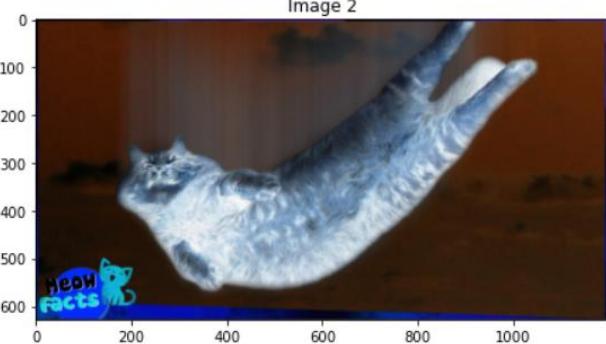


Image 2



In [60]:

```
1 import numpy as np
2 from skimage import exposure
3
4 # take from 10 to 90 percent of color range
5 v_min, v_max = np.percentile(image_color, (10, 90))
6 better_contrast = exposure.rescale_intensity(image_color, in_range=(v_min, v_max))
7
8 print(v_min, v_max)
9 ShowTwoImages(image_color, better_contrast)
```

Xuất ảnh enhance contrast

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In [60]:

```
1 import numpy as np
2 from skimage import exposure
3
4 # take from 10 to 90 percent of color range
5 v_min, v_max = np.percentile(image_color, (10, 90))
6 better_contrast = exposure.rescale_intensity(image_color, in_range=(v_min, v_max))
7
8 print(v_min, v_max)
9 ShowTwoImages(image_color, better_contrast)
```

73.0 245.0

Image 1

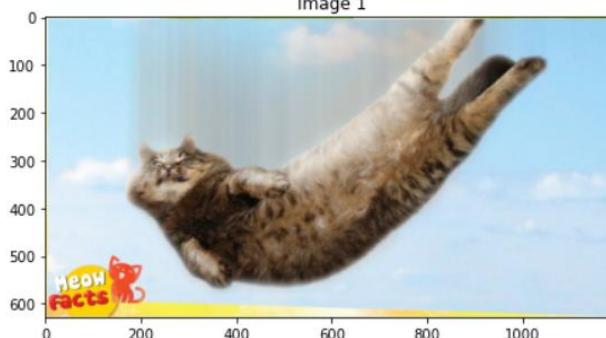
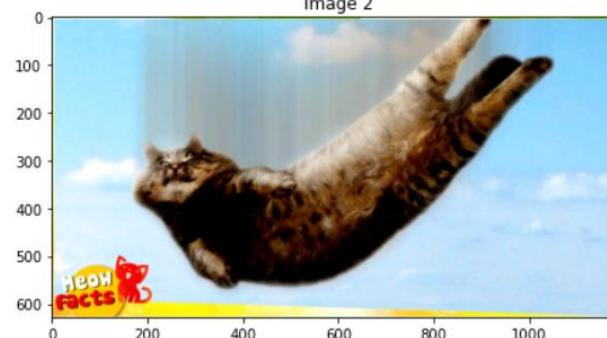


Image 2



## Xuất ảnh enhance contrast

## Xuất ảnh gamma

In [61]: 1 # gamma and gain parameters are between 0 and 1

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In [61]:

```
1 # gamma and gain parameters are between 0 and 1
2 adjusted_gamma_image = exposure.adjust_gamma(image_color, gamma=1.2, gain=0.9)
3 ShowTwoImages(image_color, adjusted_gamma_image)
```

Xuất ảnh gamma

Image 1

Image 2

In [62]:

```
1 # Logarithmic corrected
2 log_correction_image = exposure.adjust_log(image_color)
3 ShowTwoImages(image_color, log_correction_image)
```

Xuất ảnh log enhancement

Image 1

Image 2

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In [62]:

```
1 # Logarithmic corrected
2 log_correction_image = exposure.adjust_log(image_color)
3
4 ShowTwoImages(image_color, log_correction_image)
```

Xuất ảnh log enhancement

Image 1

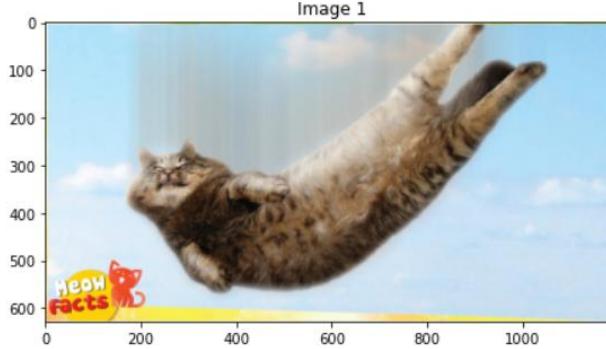
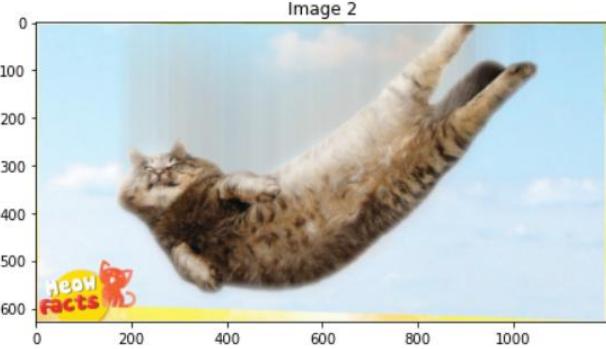


Image 2



In [ ]: 1