

第二章

NumPy for images

1

影像處理

搭配Numpy

2

認識

Flip技術

3

熟悉

Histogram

同學，歡迎你參加本課程

- ☑ 請關閉你的FB、Line等溝通工具，以免影響你上課。
- ☑ 考量頻寬，請預設關閉麥克風、攝影機，若有需要再打開。
- ☑ 隨時準備好，老師會呼叫你的名字進行互動。
- ☑ 如果有緊急事情，你必需離開線上教室，請用聊天室私訊給老師，以免老師癡癡呼喚你的名字。
- ☑ 先倒好水、上個洗手間，準備上課囉^^

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那是因為
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(線上老師 **LIVE** 直播教學 · 搶先看)

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IT真人課程劃位

電腦分校課程劃位

外語真人課程劃位

美語分校課程劃位

取消劃位

課程檔案下載

上課權益查詢

教學平台測試

學習諮詢

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個資維護

忘記密碼

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ZOOM 學員操作說明

The screenshot shows the Zoom interface with several key areas highlighted for student use:

- Annotation Menu:** A dropdown menu is open, showing options like '原始大小' (Original Size), '請求遠端控制' (Request Remote Control), '共同註記' (Annotate), and '退出全螢幕' (Exit Full Screen). The '共同註記' option is highlighted with an orange box and labeled with a circled '5'.
- Toolbar:** The bottom toolbar contains icons for '游鼠' (Cursor), '文字' (Text), '筆' (Pen), '橡皮' (Eraser), '格式' (Format), '撤銷' (Undo), '重做' (Redo), and '清除' (Clear). The '筆' icon is highlighted with an orange box and labeled with a circled '5'.
- Participants Window:** A window titled '與會者 (15)' (Participants (15)) is open, showing a list of participants. The '舉手' (Raise Hand) button is highlighted with an orange box and labeled with a circled '3'.
- Bottom Bar:** The bottom bar contains icons for '解除靜音' (Unmute), '啟動視訊' (Start Video), '邀請' (Invite), '與會者' (Participants), '共享螢幕' (Share Screen), '聊天' (Chat), and '錄影' (Record). The '聊天' icon is highlighted with an orange box and labeled with a circled '1'.
- Annotations:**
 - A circled '2' points to the '共享螢幕' (Share Screen) icon, with the text: '共享螢幕 (指導演練；點評作品) 老師須先停止共享螢幕 才能請學生共享螢幕'.
 - A circled '4' points to the '解除靜音' (Unmute) icon, with the text: '解除靜音'.
 - A circled '3' points to the '與會者' (Participants) icon, with the text: '與會者/舉手'.

NumPy for images

- Fundamentals of image processing techniques
 - Flipping
 - Extract and analyze features

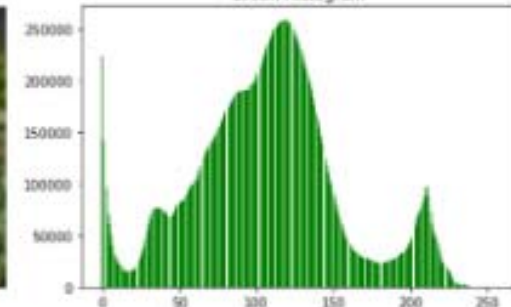
Original



Flipped



Green Histogram



Images as NdArrays

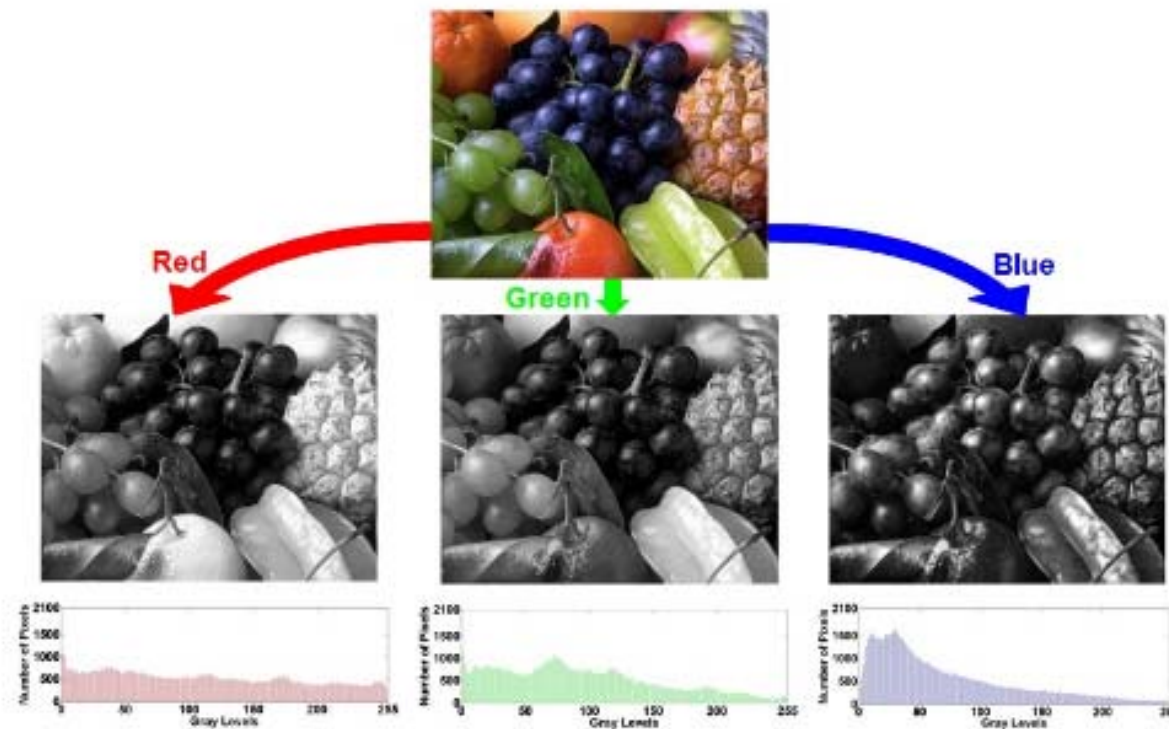


```
# Loading the image using Matplotlib
madrid_image = plt.imread('/madrid.jpeg')

type(madrid_image)
```

```
<class 'numpy.ndarray'>
```

Colors with NumPy



Colors with NumPy

```
# Obtaining the red values of the image  
red = image[:, :, 0]  
  
# Obtaining the green values of the image  
green = image[:, :, 1]  
  
# Obtaining the blue values of the image  
blue = image[:, :, 2]
```



Colors with NumPy



```
plt.imshow(red, cmap="gray")  
plt.title('Red')  
plt.axis('off')  
plt.show()
```

Shapes



```
# Accessing the shape of the image  
madrid_image.shape
```

```
(426, 640, 3)
```

Sizes



```
# Accessing the shape of the image  
madrid_image.size
```

```
817920
```

Flipping images: vertically

```
# Flip the image in up direction  
vertically_flipped = np.flipud(madrid_image)  
  
show_image(vertically_flipped, 'Vertically flipped image')
```

Vetically flipped image



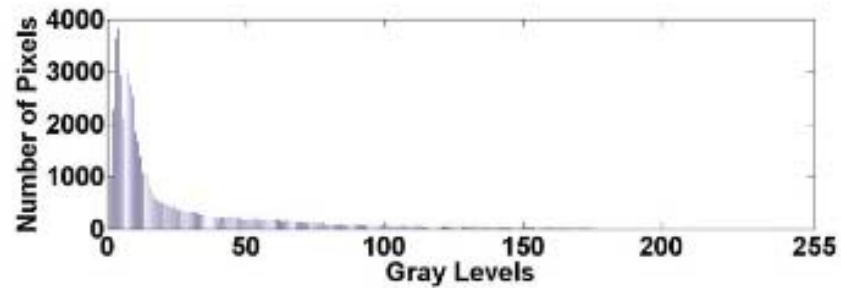
Flipping images: horizontally

```
# Flip the image in left direction  
horizontally_flipped = np.fliplr(madrid_image)  
  
show_image(horizontally_flipped, 'Horizontally flipped image')
```

Horizontally flipped image



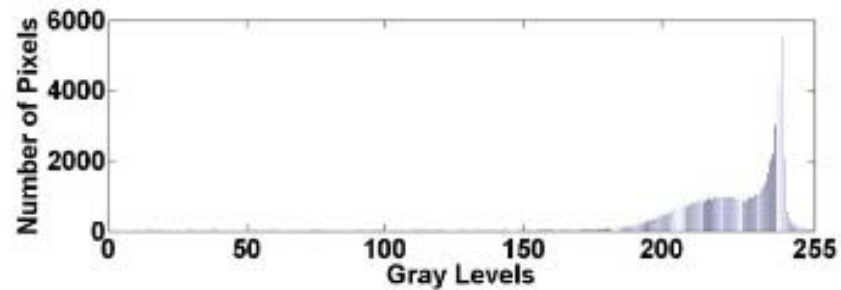
What is a histogram?



(a)



(b)



(a)



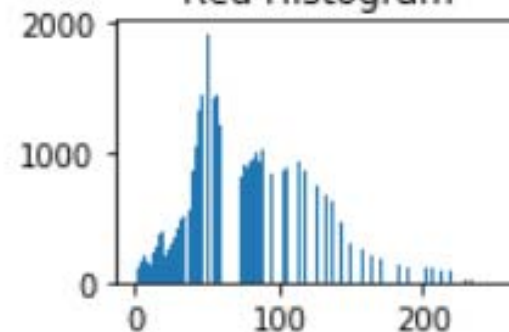
(b)

Color histograms

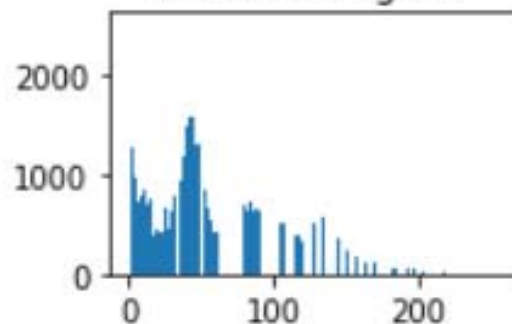
Original Image



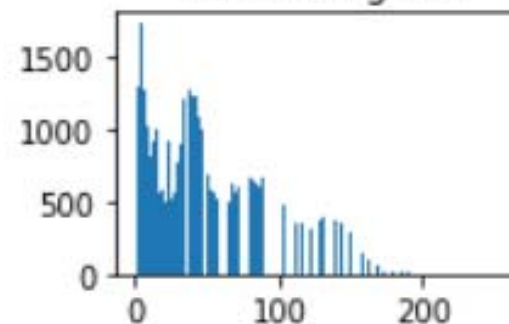
Red Histogram



Green Histogram

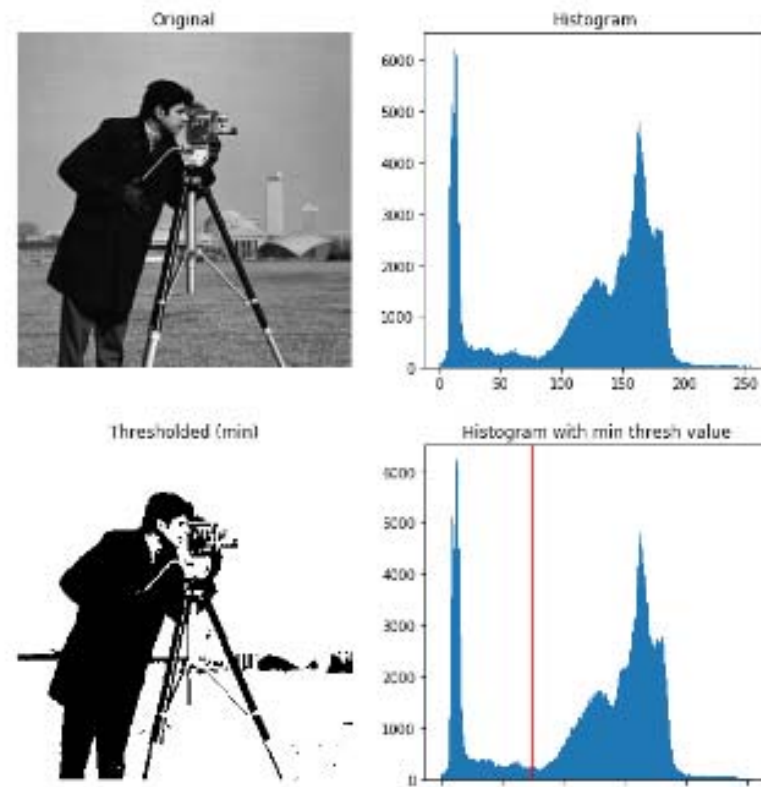


Blue Histogram

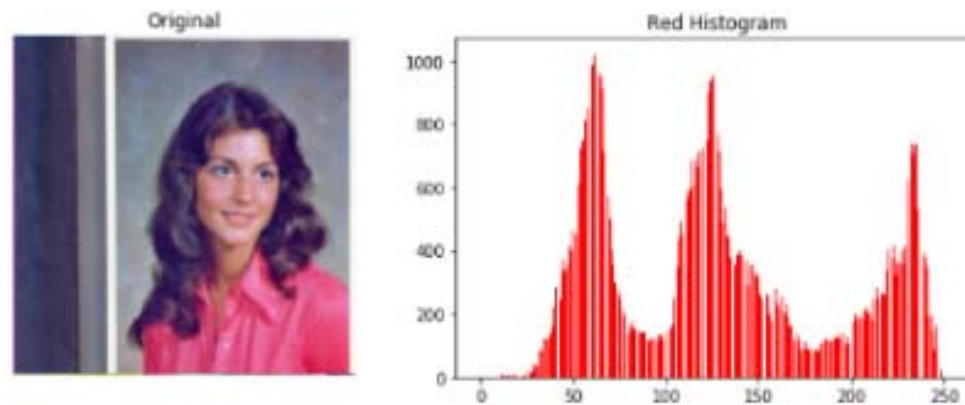


Applications of histograms

- Analysis
- Thresholding
- Brightness and contrast
- Equalize an image



Histograms in Matplotlib



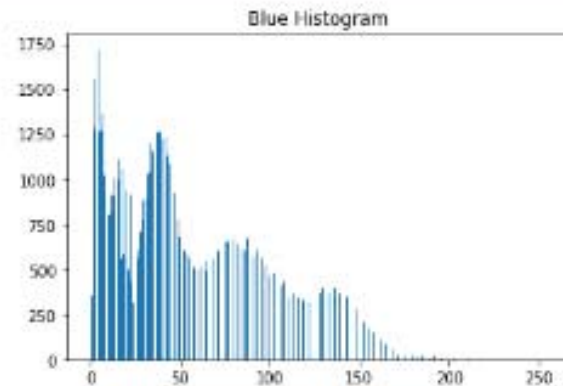
```
# Red color of the image
red = image[:, :, 0]

# Obtain the red histogram
plot.hist(red.ravel(), bins=256)
```

Visualizing histograms with Matplotlib

```
blue = image[:, :, 2]



plt.hist(blue.ravel(), bins=256)
plt.title('Blue Histogram')
plt.show()
```



練習時間












numpy with image.ipynb



 jupyter numpy with image (autosaved)  Logout

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       Run    Code 

練習

Flipping out As a prank, someone has turned an image from a photo album of a trip to Seville upside-down and back-to-front! Now, we need to straighten the image, by flipping it.

City of Seville upside-down Image loaded as `flipped_seville`. Using the NumPy methods learned in the course, flip the image horizontally and vertically. Next, compare both the original flipped image and the now corrected image, using the `show_image()` function to display them.



NumPy is already imported as `np`.



練習時間












numpy with image.ipynb



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          Code 

練習

Histograms In this exercise, you will analyze the amount of red in the image. To do this, the histogram of the red channel will be computed for the image shown below:


Woman smiling Image loaded as image. Extracting information from images is a fundamental part of image enhancement. This way you can balance the red and blue to make the image look colder or warmer.

You will use `hist()` to display the 256 different intensities of the red color. And `ravel()` to make these color values an array of one flat dimension.

Matplotlib is preloaded as `plt` and Numpy as `np`.

Remember that if we want to obtain the green color of an image we would do the following:

```
green = image[:, :, 1]
```



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1

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如無法觀看上課教材，請安裝 [PDF閱讀軟體](#)。

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2

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自107年1月1日起，課程錄影檔由180天改為365天(含)內無限次觀看 (上課隔日18:00起)。

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2017/12/27 2000 ~ 2200	線上真人-ZBrush 3D動畫造型設計	18	上課教材	錄影 3	課堂問卷
2017/12/20 2000 ~ 2200	線上真人-ZBrush 3D動畫造型設計	17	上課教材	錄影檔	
2017/12/18 2000 ~ 2200	線上真人-ZBrush 3D動畫造型設計	16	上課教材	錄影檔	



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