Day 01

深度學習與電腦視覺
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OpenCV 簡介

OpenCV 影像處理

重要知識點

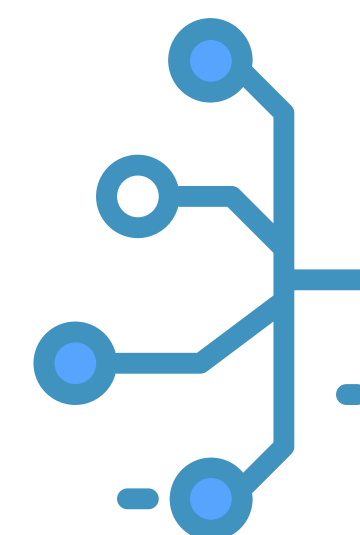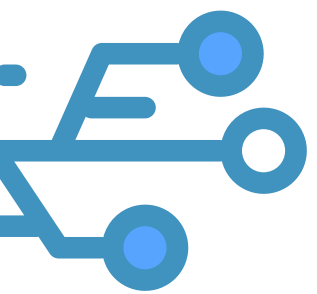- 了解如何開始使用 OpenCV

- 了解如何透過 OpenCV 讀取圖片

OpenCV 簡介

OpenCV (Open source computer Vision) 是電腦視覺領域非常知名的套件，由 Intel 發起從 1999 年開始主要透過 C++ 程式語言開發的跨平台套件。

如今也有跟包含 Python 以外諸多語言做榜定
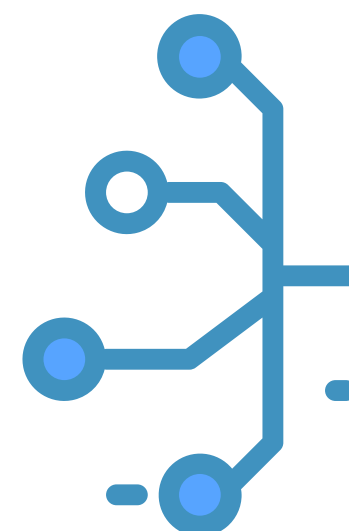讓非 C++ 開發者也能夠很輕易的使用該套件

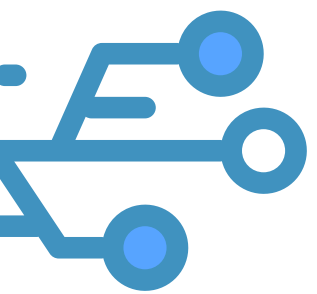Wikipedia 上面有更詳細的介紹，歡迎有興趣的各位查閱

OpenCV 安裝

由於這個開源專案也有提供 Python 版本，我們可以像是安裝一般 Python 套件一樣的透過 pip 指令下載

```
pip install --user opencv-python
```

加上 user 的參數項代表我們希望把 OpenCV 安裝在 local 環境
這樣可以避免管理者權限的相關問題
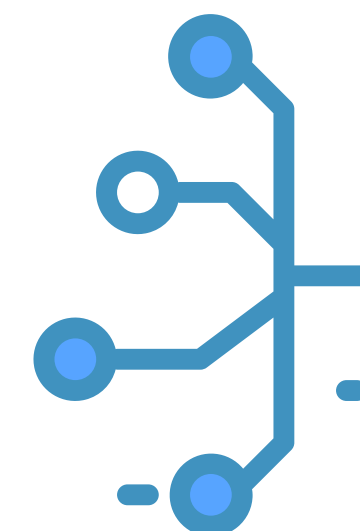
OpenCV 安裝 (optional)

因為主要是 C++ 開發的套件，所以也可以從原始碼編譯安裝套件
這種作法可以依照開發需求決定要開啟 / 關閉某些功能
例如：CUDA 相關功能，機器學習相關功能等
他們將這些額外選項獨立另外開了一個專案 opencv_contrib

因為這個課程只會將 OpenCV 拿來做簡單的處理
所以這邊就不特別介紹如何編譯，有興趣的可以參考官方流程

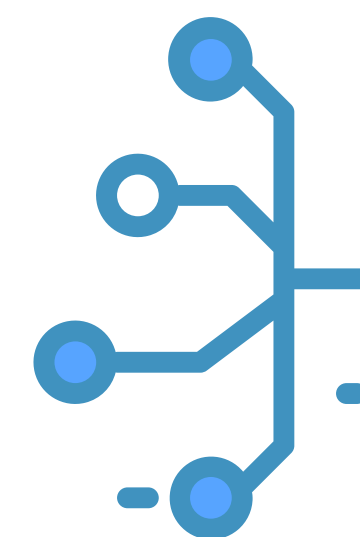reference: stackoverflow - pip 安裝的版本與編譯的版本哪裡不同

透過 OpenCV 載入圖片

首先要先載入圖片，之後可以再顯示圖片來檢查我們讀取的正確性

```python
import cv2
img = cv2.imread('lena.png')
```

引入 OpenCV 的套件之後透過 `imread` 載入圖片
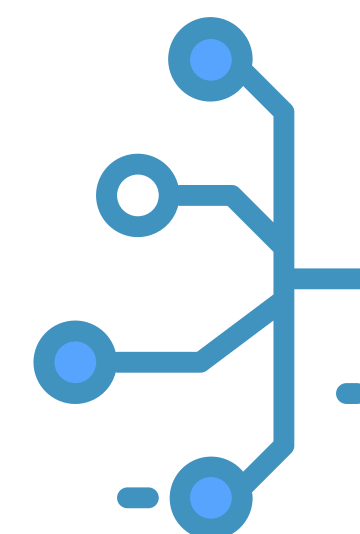
你可以透過 `type(img)` 發現 OpenCV 是用 `numpy` 表示圖片格式

圖片格式

圖片在電腦程式中是用矩陣的型式表現，每個值都代表一個 pixel

另外矩陣不一定是 2D 的，有可能包含多個 channel。

JPG 260 X 194

260 X 194 X 3

8,11,0, 55,13,25,19

15,241,2,155,13,35,65

14,211,0,255,23,45,11

05,255,1,255,10,17,23

77,167,9,112,56,16,90

45,245,0,145,22,55,48

圖片來源： **ramok.tech**
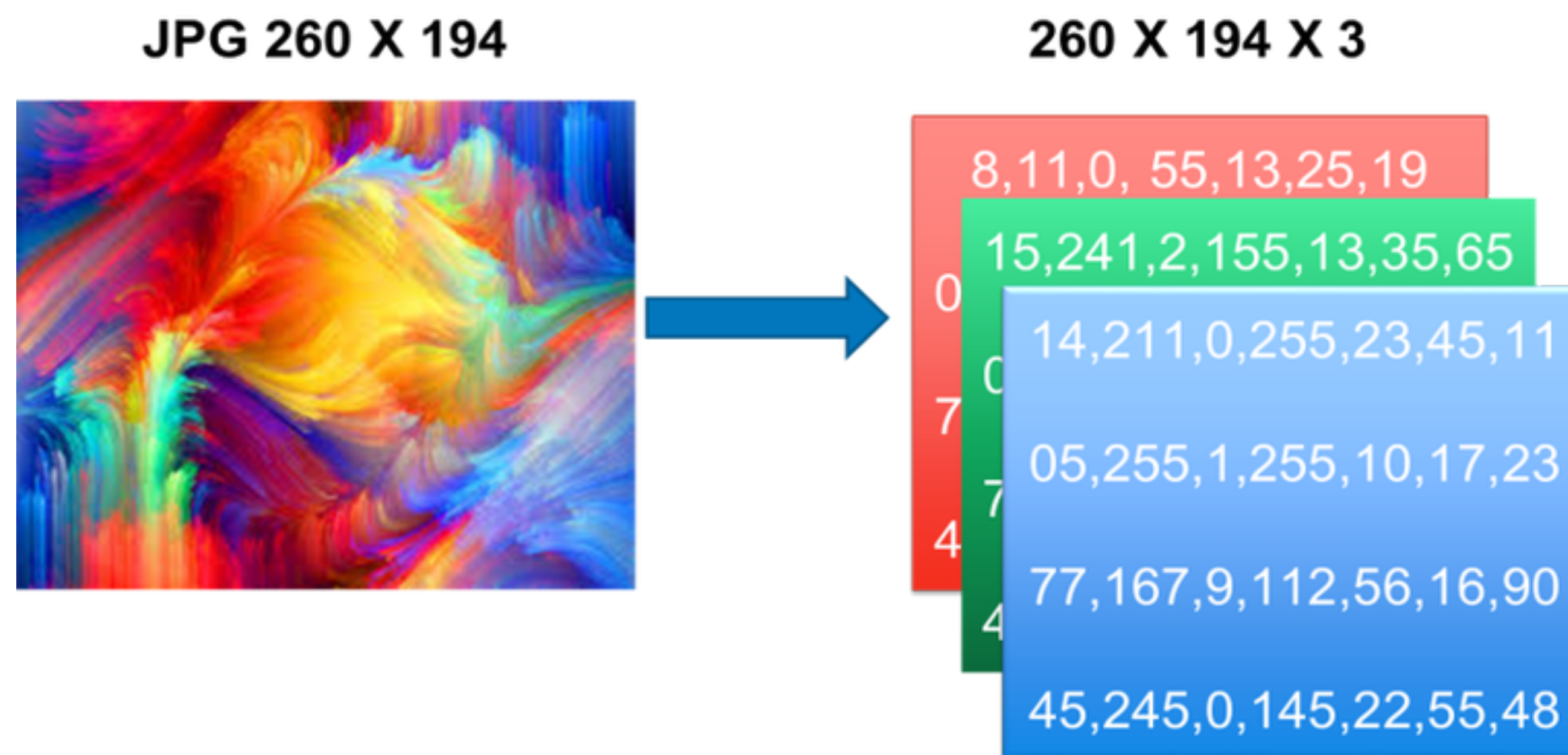
透過 **OpenCV** 載入圖片選項

OpenCV 在載入圖片的時候可選擇載入方式的格式

- **cv2.IMREAD_COLOR (預設值)**
  - 載入包含 Blue, Green, Red 三個 channel 的彩色圖片
- **cv2.IMREAD_GRAYSCALE**
  - 載入灰階格式的圖片
- **cv2.IMREAD_UNCHANGED**
  - 載入圖片中所有 channel

```
img = cv2.imread('lena.png', cv2.IMREAD_COLOR)
```

最後一個選項主要是針對 RGBA 等格式，這邊不會特別討論
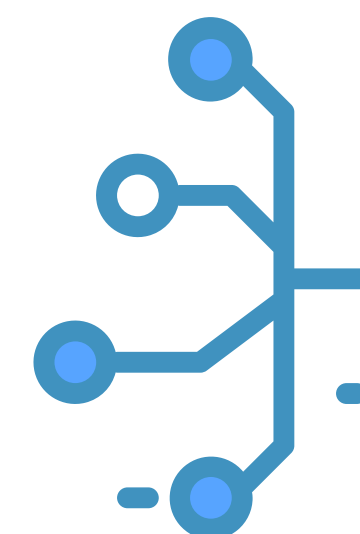
透過 OpenCV 顯示圖片

當我們載入圖片之後，接下需要決定要顯示的視窗名字

```
cv2.imshow('rgb', img)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

要顯示的圖片　　　　　我們要顯示的視窗名字

後面兩行代表顯示圖片之後，按任意鍵關閉視窗
這邊不太理解這兩行實際在做甚麼沒關係
如果有興趣了解可以看看原始碼跟官方文件

透過 OpenCV 顯示圖片

我們可以透過前面提到的載入圖片的不同方式，顯示並檢查結果
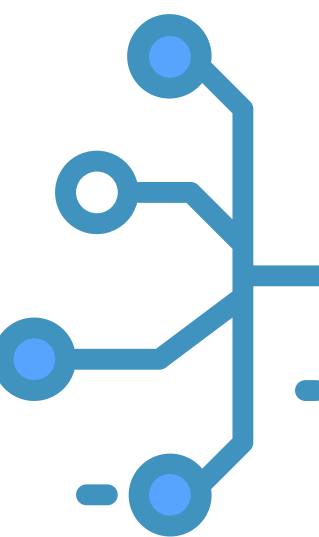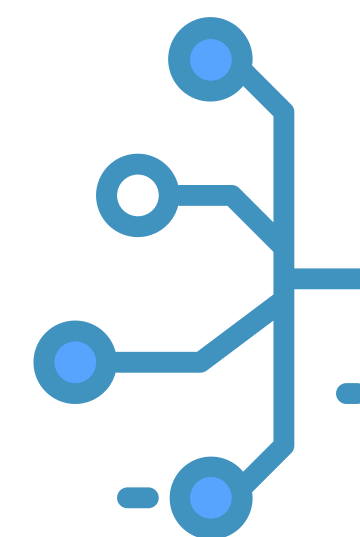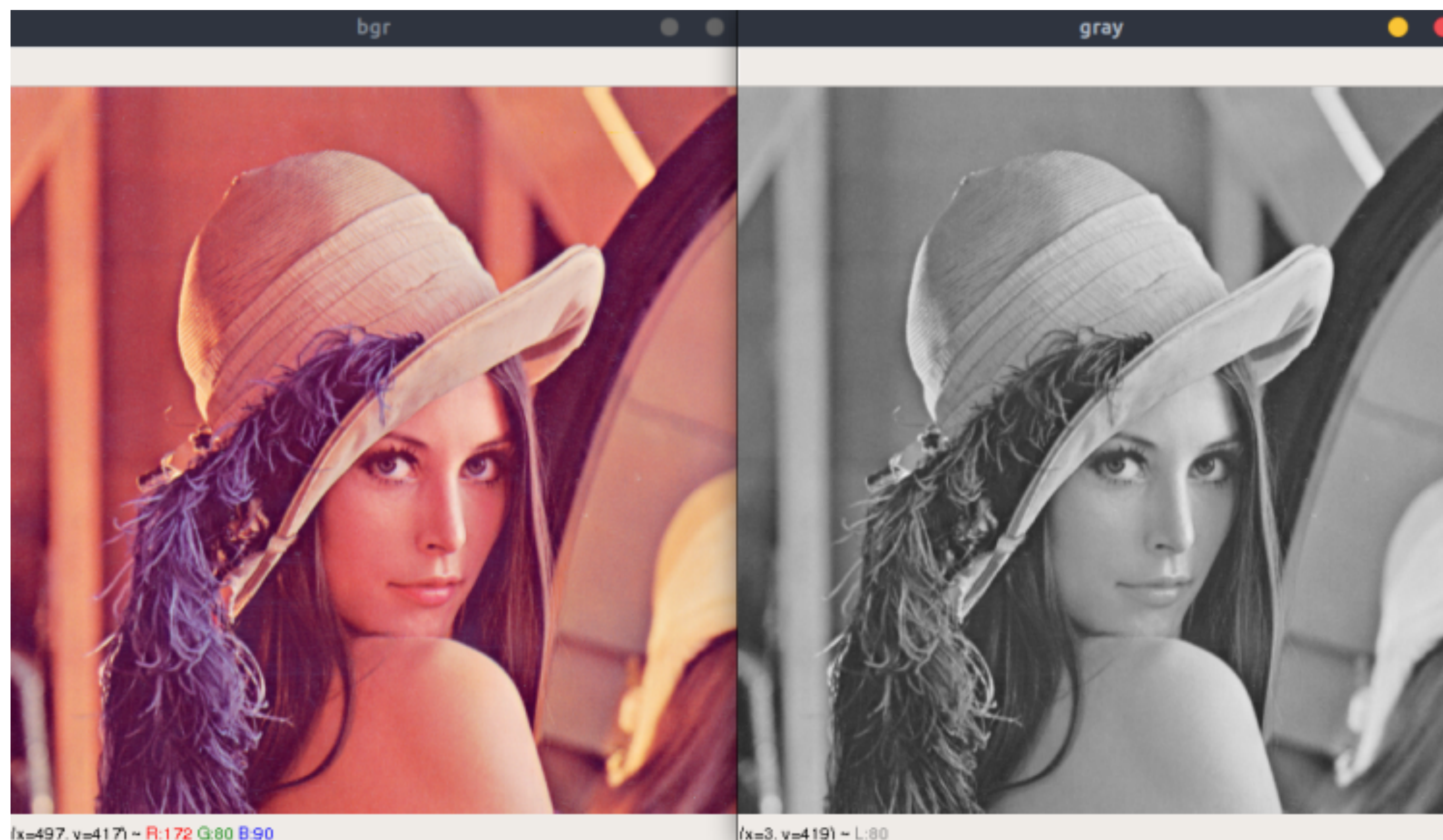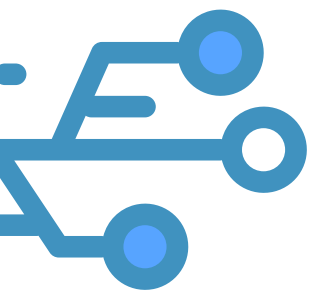
知識點回顧

- 知道如何安裝 OpenCV

  * 知道透過 pip 安裝的只有一般所需的功能

- 知道如何夠過 OpenCV 顯示圖片

  * 載入圖片，選擇載入選項（預設彩圖）

  * 決定視窗名稱並顯示圖片

推薦延伸閱讀

The Lenna Story – www.lenna.org

Imaging Experts Meet Lenna in Person

Yes, it's true! Lenna attended the 50th Anniversary IS&T conference in Boston held in May 1997.

Check out the media coverage from Playboy, Wired, and more from Playboy.

Click here for more info and pictures from the conference.

Introduction

The Lenna (or Lena) picture is one of the most widely used standard test images used for compression algorithms. The comp.compression FAQ says the following:

For the curious: 'lena' or 'lenna' is a digitized Playboy centerfold, from November 1972. (Lenna is the spelling in Playboy, Lena is the Swedish spelling of the name.) Lena Soderl last reported living in her native Sweden, happily married with three kids and a job with the state liquor monopoly. In 1988, she was interviewed by some Swedish computer rela she was pleasantly amused by what had happened to her picture. That was the first she knew of the use of that picture in the computer business.

For the full details on the history of this image check out this excellent May 2001 article in the Newsletter of the IEEE Professional Communication Society by Jamie Hutchinson. Her

Alexander Sawchuk estimates that it was in June or July of 1973 when he, then an assistant professor of electrical engineering at the USC Signal and Image Processing Institut graduate student and the SIPI lab manager, was hurriedly searching the lab for a good image to scan for a colleague's conference paper. They had tired of their stock of usual dating back to television standards work in the early 1960s. They wanted something glossy to ensure good output dynamic range, and they wanted a human face. Just then, so walk in with a recent issue of Playboy.

The engineers tore away the top third of the centerfold so they could wrap it around the drum of their Muirhead wirephoto scanner, which they had outfitted with analog–to–di each for the red, green, and blue channels) and a Hewlett Packard 2100 minicomputer. The Muirhead had a fixed resolution of 100 lines per inch and the engineers wanted a 51 limited the scan to the top 5.12 inches of the picture, effectively cropping it at the subject's shoulders.

The original image is still available as part of the USC SIPI Image Database in their "miscellaneous" collection.

Over the years there has been quite a bit of controversy over the use of this image. Some people proposed banning the use of this image because of its source. Also, Playboy threat

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Getting Started with Images

Goals

- Here, you will learn how to read an image, how to display it and how to save it back
- You will learn these functions : **cv2.imread()**, **cv2.imshow()** , **cv2.imwrite()**
- Optionally, you will learn how to display images with Matplotlib

Using OpenCV

Read an image

Use the function **cv2.imread()** to read an image. The image should be in the working directory or a full path of image should be given.

Second argument is a flag which specifies the way image should be read.

- cv2.IMREAD_COLOR : Loads a color image. Any transparency of image will be neglected. It is the default flag.
- cv2.IMREAD_GRAYSCALE : Loads image in grayscale mode
- cv2.IMREAD_UNCHANGED : Loads image as such including alpha channel

Note: Instead of these three flags, you can simply pass integers 1, 0 or –1 respectively.

See the code below:

```
import numpy as np
import cv2

# Load an color image in grayscale
img = cv2.imread('messi5.jpg',0)
```

Warning: Even if the image path is wrong, it won't throw any error, but print img will give you None

Display an image

Use the function **cv2.imshow()** to display an image in a window. The window automatically fits to the image size.

First argument is a window name which is a string. second argument is our image. You can create as many windows as you wish, but with different window names.

```
cv2.imshow('image',img)
```

Quick search
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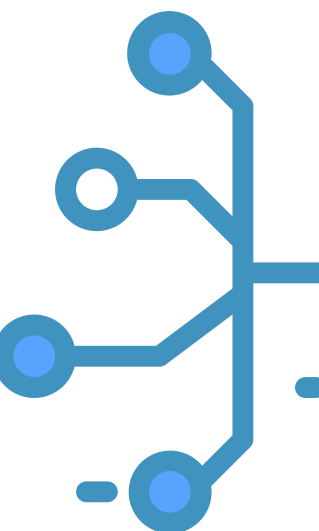» Additional Resources
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Lena 故事介紹
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OpenCV 官方介紹顯示圖片   連結
裡面包含儲存圖片，有興趣的同學可以查閱

解題時間 Let's Crack It

請跳出 PDF 至官網 Sample Code & 作業開始解題