國立高雄科技大學
National Kaohsiung University of Science and Technology

Basic Image Processing Using OpenCV on Google Colab

Speaker: Shih-Shinh Huang

Version: v011

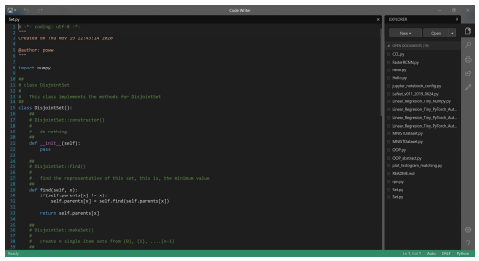
Date: August 15, 2021

Outline

- Google **Colab**oartory
  - Why Colab
  - Colab Startup
  - "Hello, Colab!" Program
- Basic Image Processing
  - About OpenCV
  - Image Loading
  - Image Accessing

Google Colaboartory

- Why Colab
  - What you have to do when you are interested in exploring machine learning (ML)



programming IDE

✚

ML library
(TensorFlow, Pytorch)

hardware accelerator
(GPU/TPU)

✚

hardware driver (cuda)

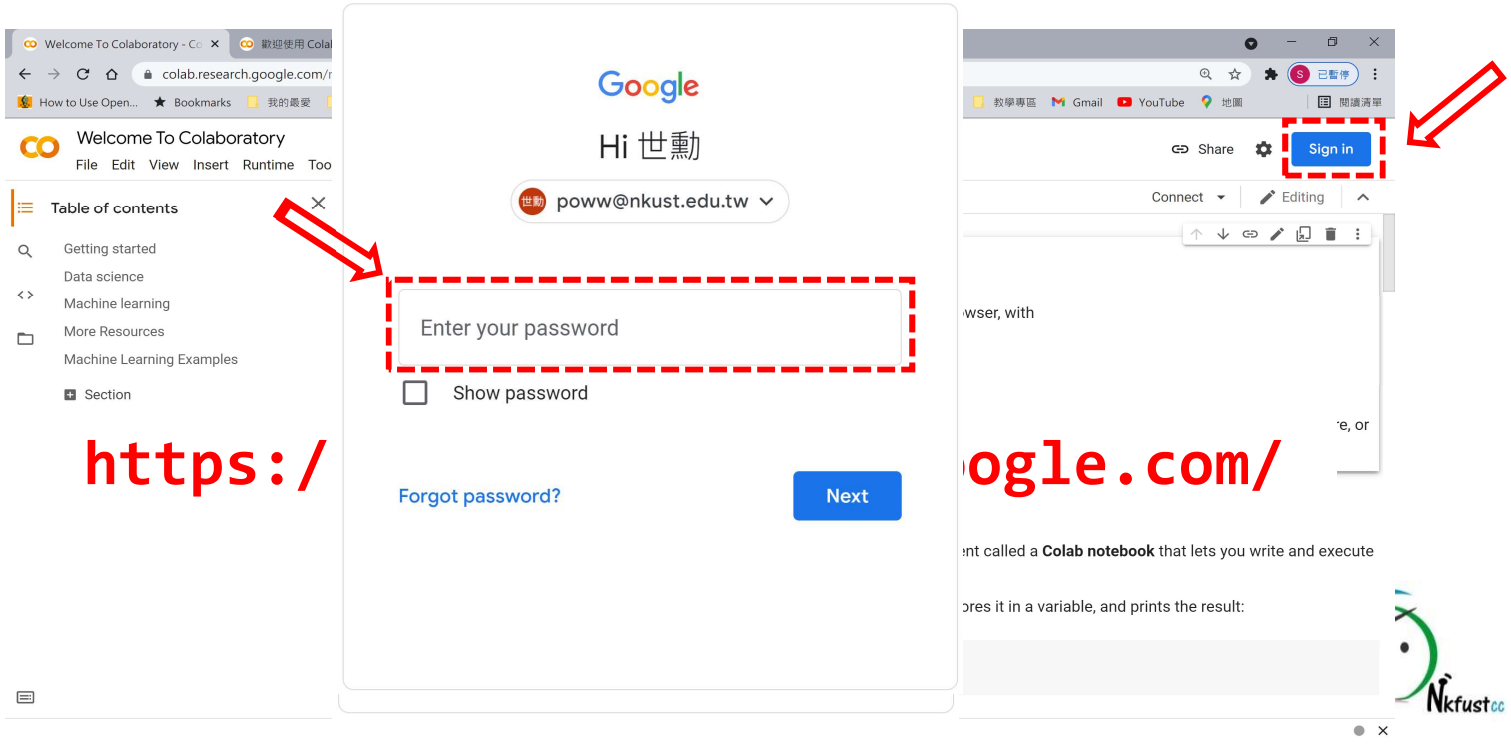
IDE: integrated development environment

Google Colaboartory

- Why Colab
  - Colab is a free cloud services to encourage machine learning research.
    - free GPU/TPU accelerator
    - Jupyter Notebook for Python programming
    - pre-installed ML libraries: Tensorflow, Pytorch,..

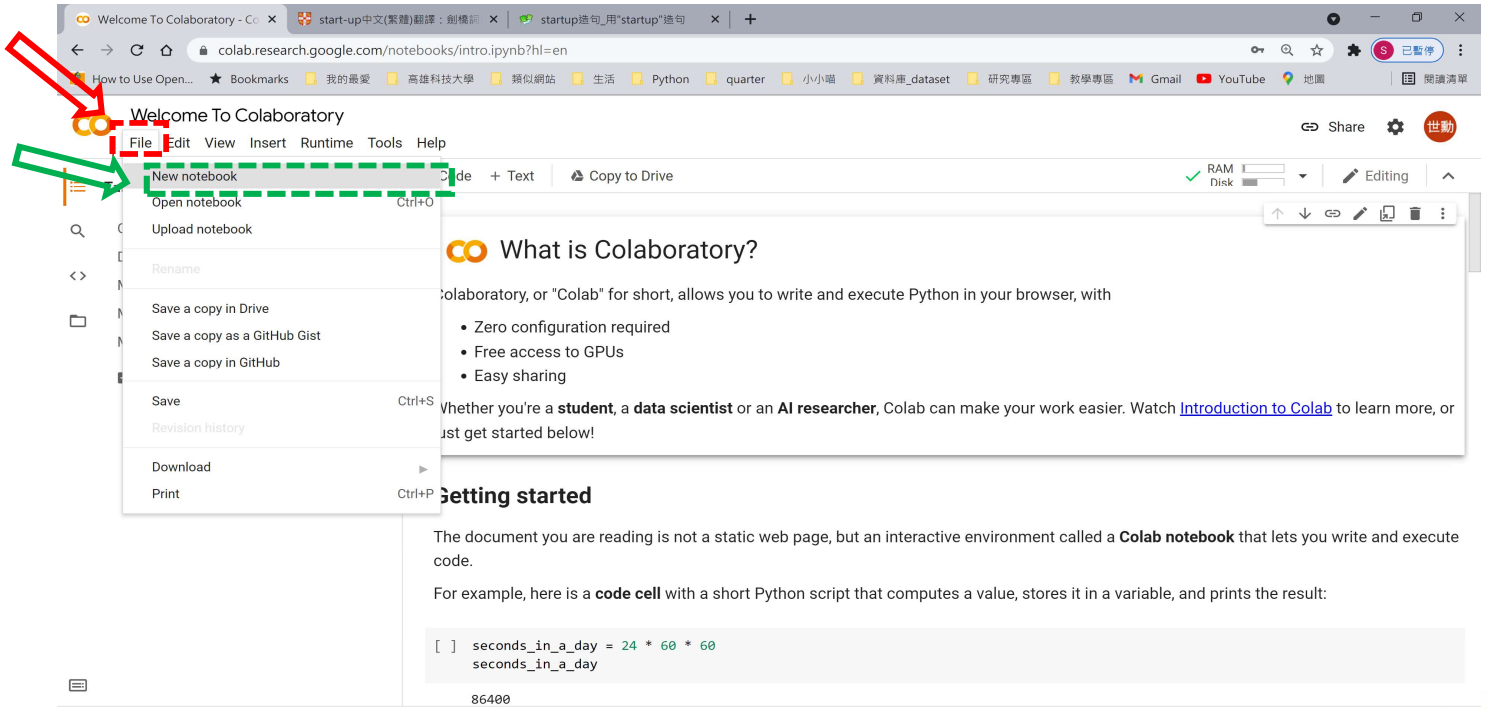
Google Colaboartory

- Colab Startup: Login
  - link to the Colab official website
  - enter your name / password

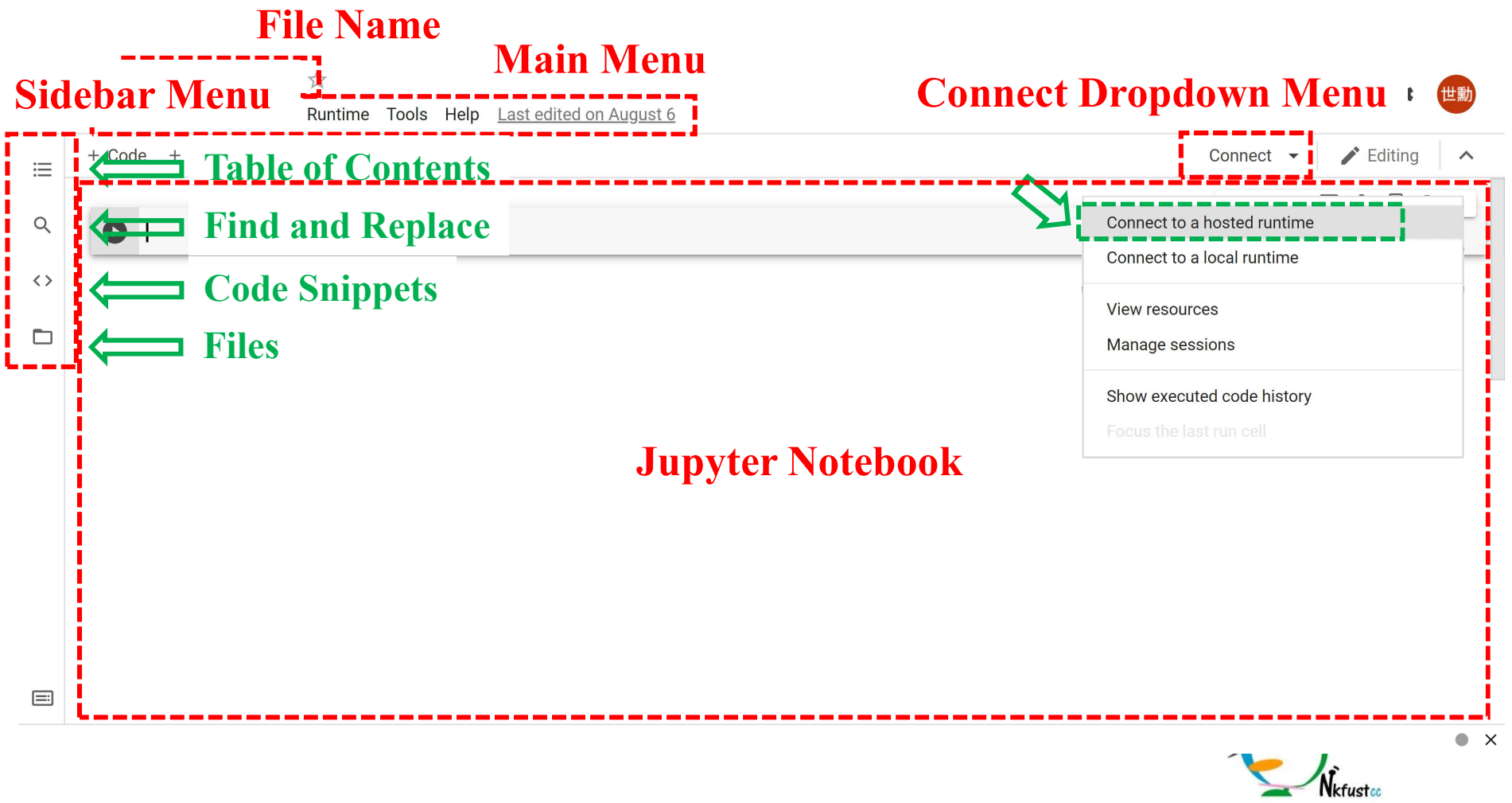


Google Colaboartory

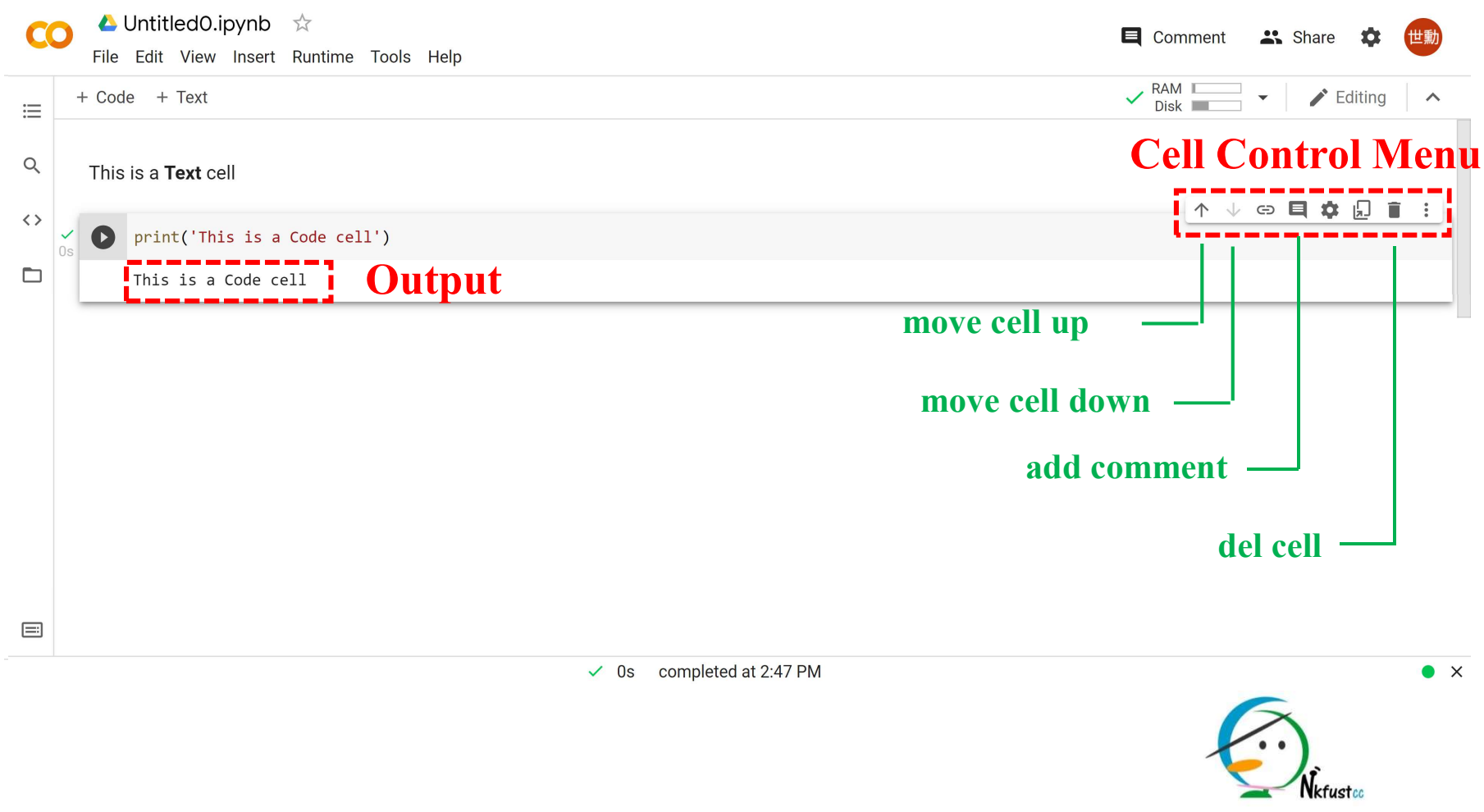
- Colab Startup: New Notebook
  - create a program file: → File → New notebook



Google Colaboartory



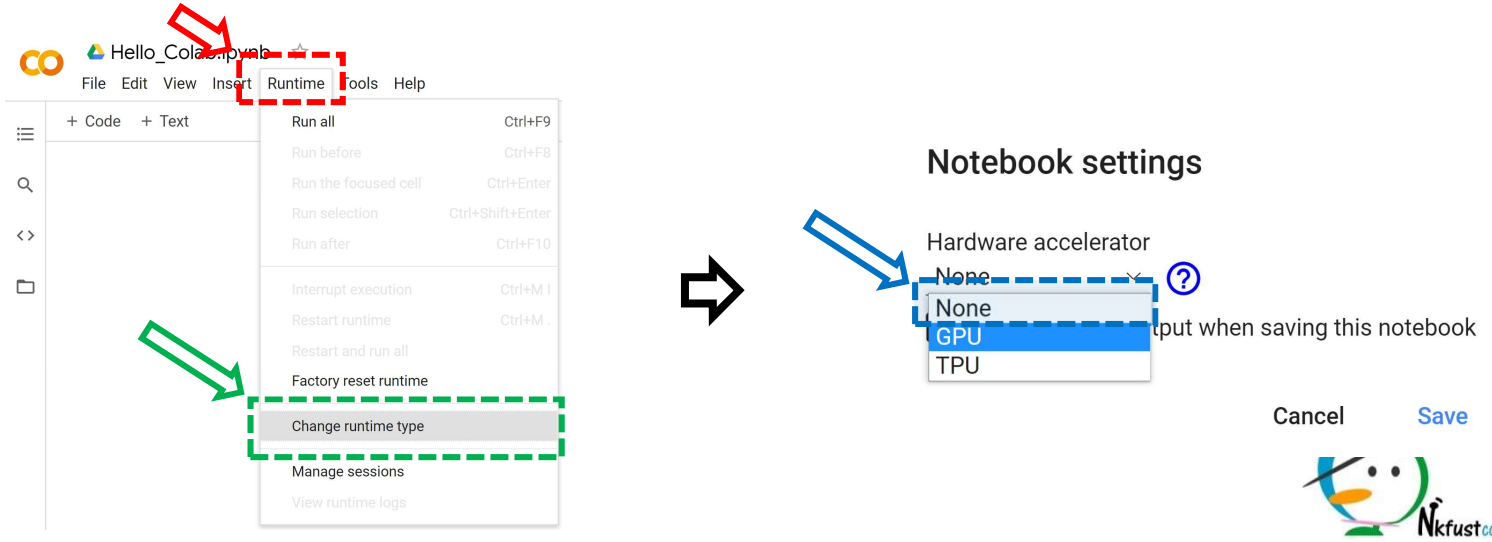
Google Colaboartory



Google Colaboartory

- "Hello, Colab!" Program
  - Step 1: rename your file as "`Hello_Colab.ipynb`"

  - Step 2: select the hardware accelerator

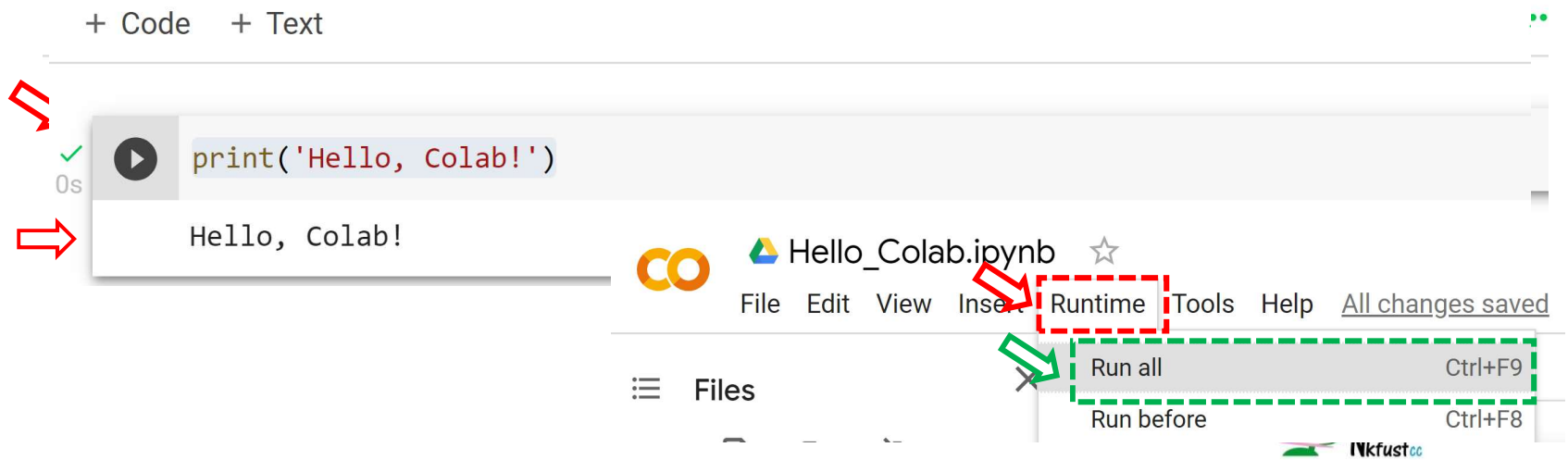


Google Colaboartory

- "Hello, Colab!" Program
  - Step 3: write the code to display “Hello, Colab!”

```
print('Hello, Colab!')
```

  - Step 4: run the “Hello, Colab!” program

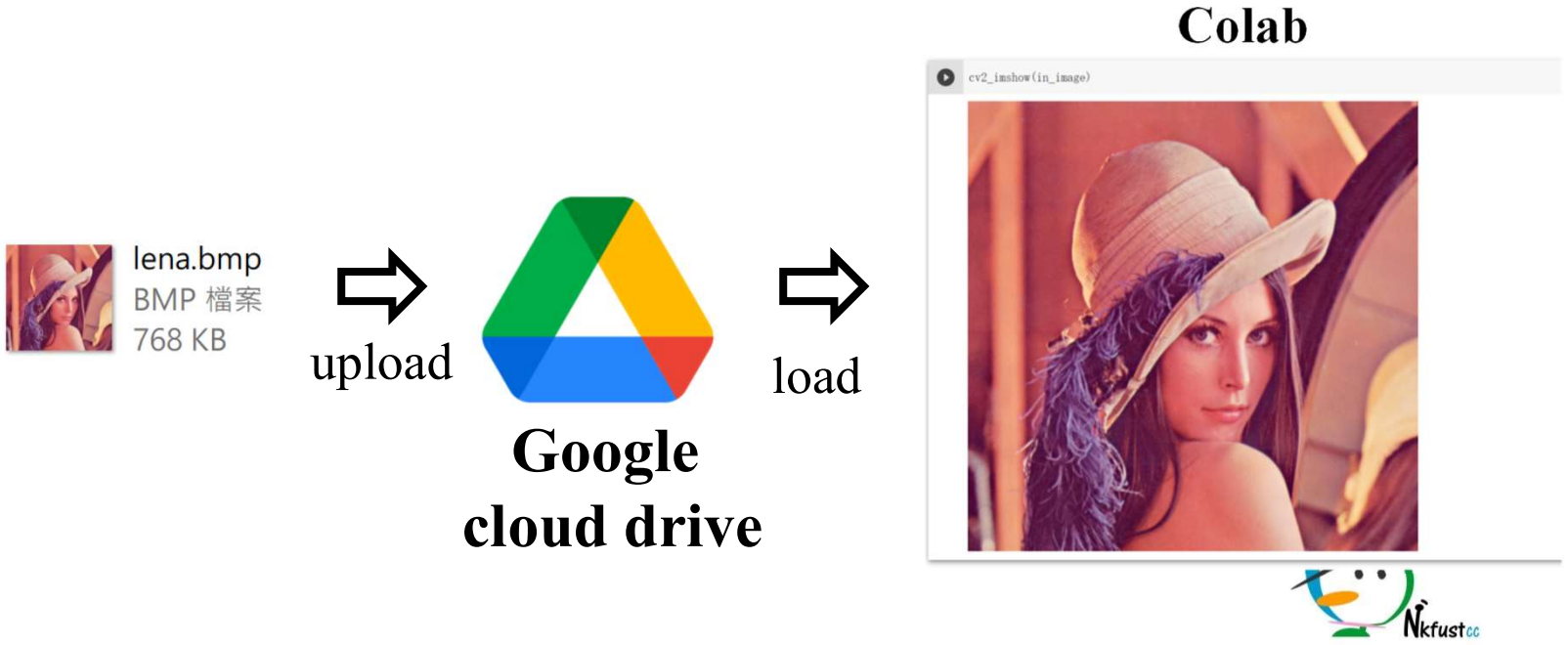


Basic Image Processing

- About OpenCV
  - OpenCV is an open source computer vision and machine learning software library.
  - OpenCV has more than 2,500 optimized algorithms
    - computer vision
    - machine learning
  - OpenCV has interfaces for C++, Python, Java and MATLAB programming languages.

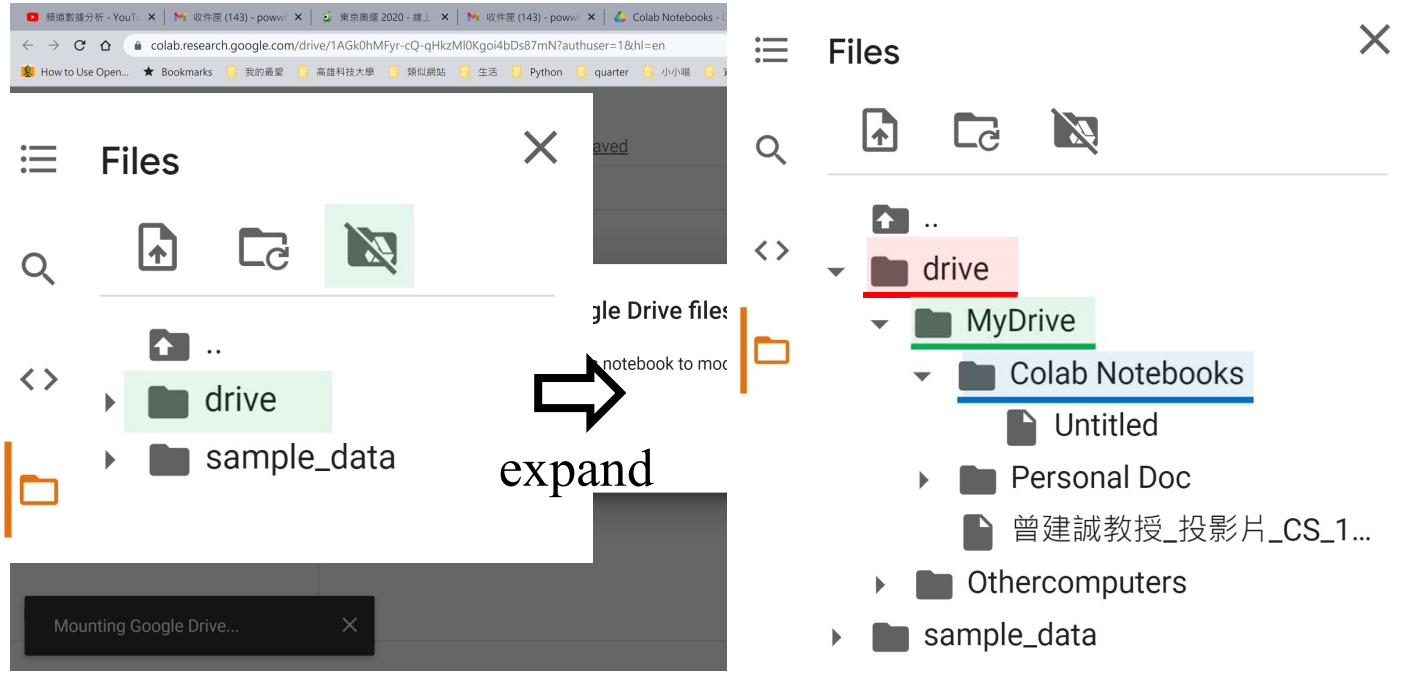
Basic Image Processing

- Image Loading
  - upload a local image file to Google cloud drive
  - read in the image file and display it



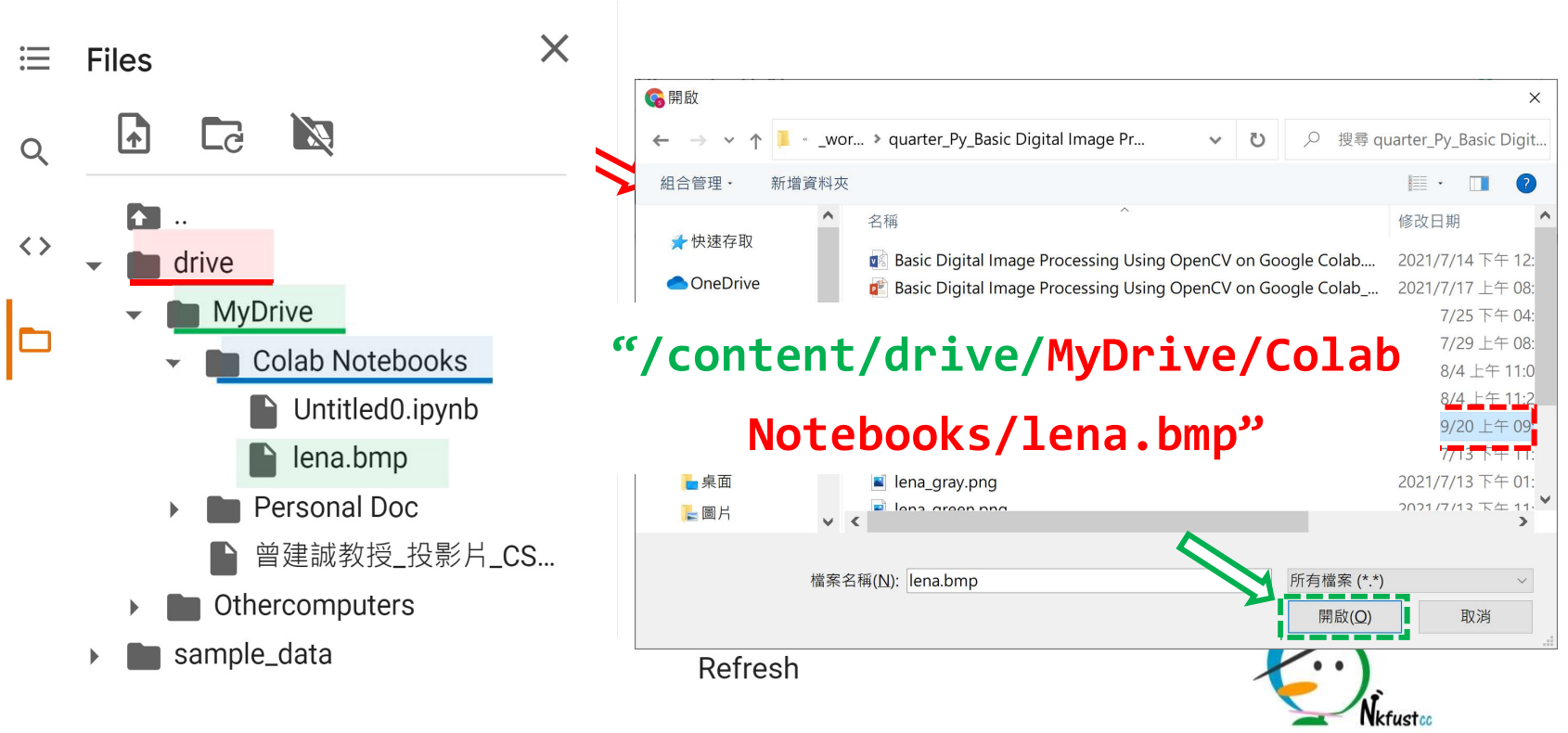
Basic Image Processing

- Image Loading: File Upload
  - mount the Google cloud drive



Basic Image Processing

- Image Loading: File Upload
  - select an image file in local disk for uploading

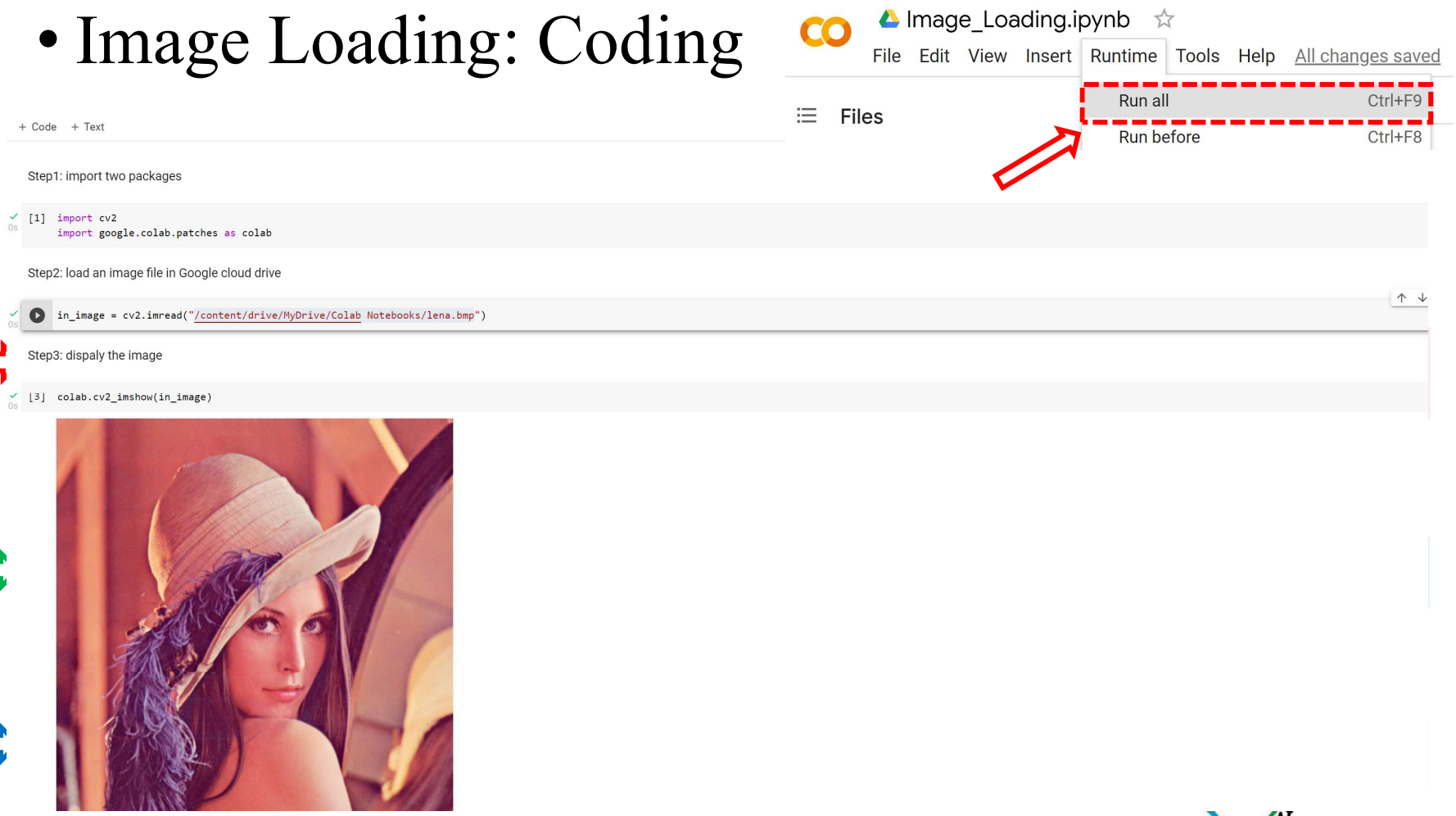


Basic Image Processing

- Image Loading: Coding
  - Step 1: import two packages including opencv and google.colab packages
  - Step 2: invoke **`imread()`** in opencv package to read an image file in Google cloud drive
  - Step 3: invoke **`cv2_imshow()`** in google.colab package to display the image

Basic Image Processing

- Image Loading: Coding



Basic Image Processing

- Image Accessing
  - opencv loads an image as a numpy array
    - gray image: 2D numpy array
    - color image: 3D numpy array


```
shape =(512, 512)
```

h:height *w*:width


```
shape =(512, 512, 3)
```

h:height *w*:width *c*: channels

Basic Image Processing

- Image Accessing
  - pixel accessing: single-element indexing

read a pixel

⇨ `p_value = in_image[20,30]`

write a pixel

⇨ `in_image[20,30] = [255, 0, 0]`

Basic Image Processing

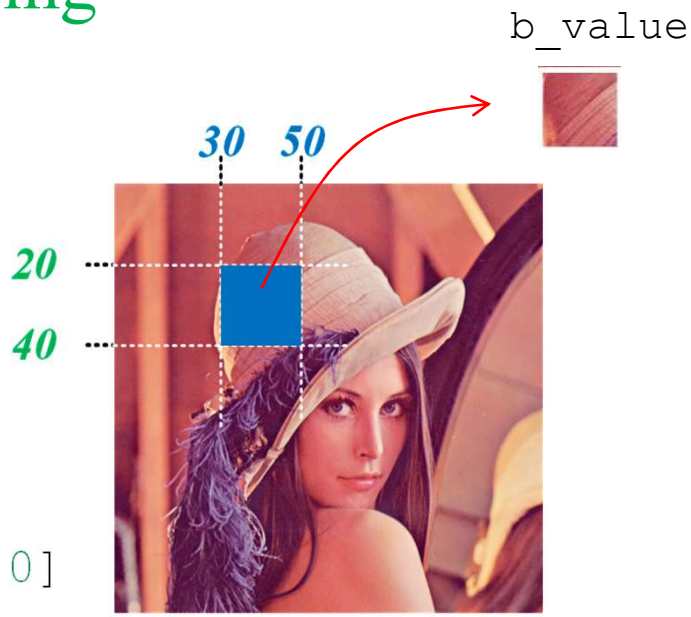
- Image Accessing
  - block accessing: array slicing

read a block

⇨
```
b_value
    = in_image[20:40,30:50]
```

write a block

⇨
```
in_image[20:40,30:50]= [255,0,0]
```




thank you
© 1996, 2002 SANRIO CO., LTD.