

# Python + Arduino 應用

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# 個人簡介

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  - 國立台北商業大學 兼任教師
  - 東吳大學 兼任教師
  - 崇友實業 行銷企劃專員
  - 國航船務代理股份有限公司 海運市場運籌管理員
- 國內外各大專院校、資策會、工業技術研究院、國家發展委員會、中央氣象局、公平交易委員會、各縣市政府與日本名古屋產業大學等公營單位，演講達280多場，2480小時以上。
- 連絡資訊：
  - RWEPA網站：<http://rwepa.blogspot.com/>
  - E-MAIL: alan9956@gmail.com

R JULIA SQL PYTHON

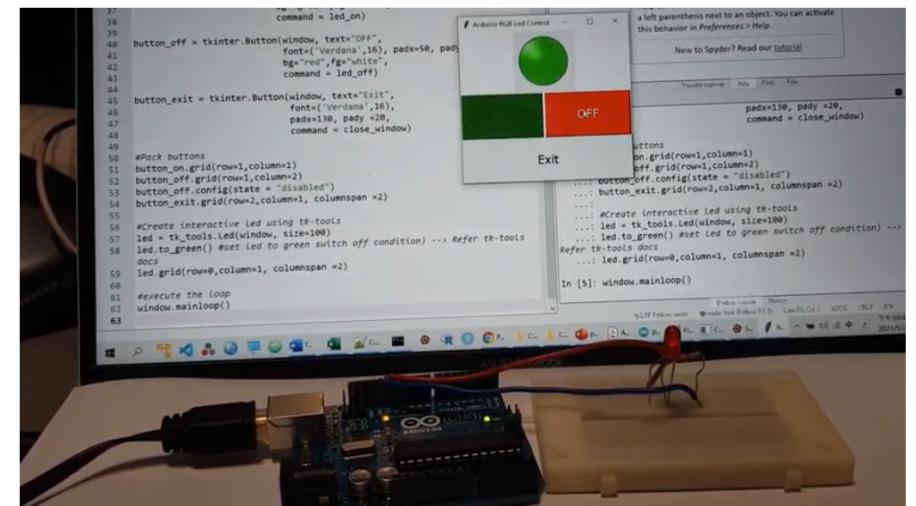


# 大綱

1. Python 簡介
2. 視窗設計 - tkinter 套件
3. Arduino 簡介
4. Python + Arduino - LED 實作

# Python + Arduino - LED 實作

- 範例1 Arduino + LED
- 範例2 Arduino – Firmata
- 範例3 Arduino + Python- pyfirmata 套件
- 範例4 Arduino + Python- pySerial 套件
- 範例5 Arduino + Python - tkinter - 套件



# 1. Python 簡介

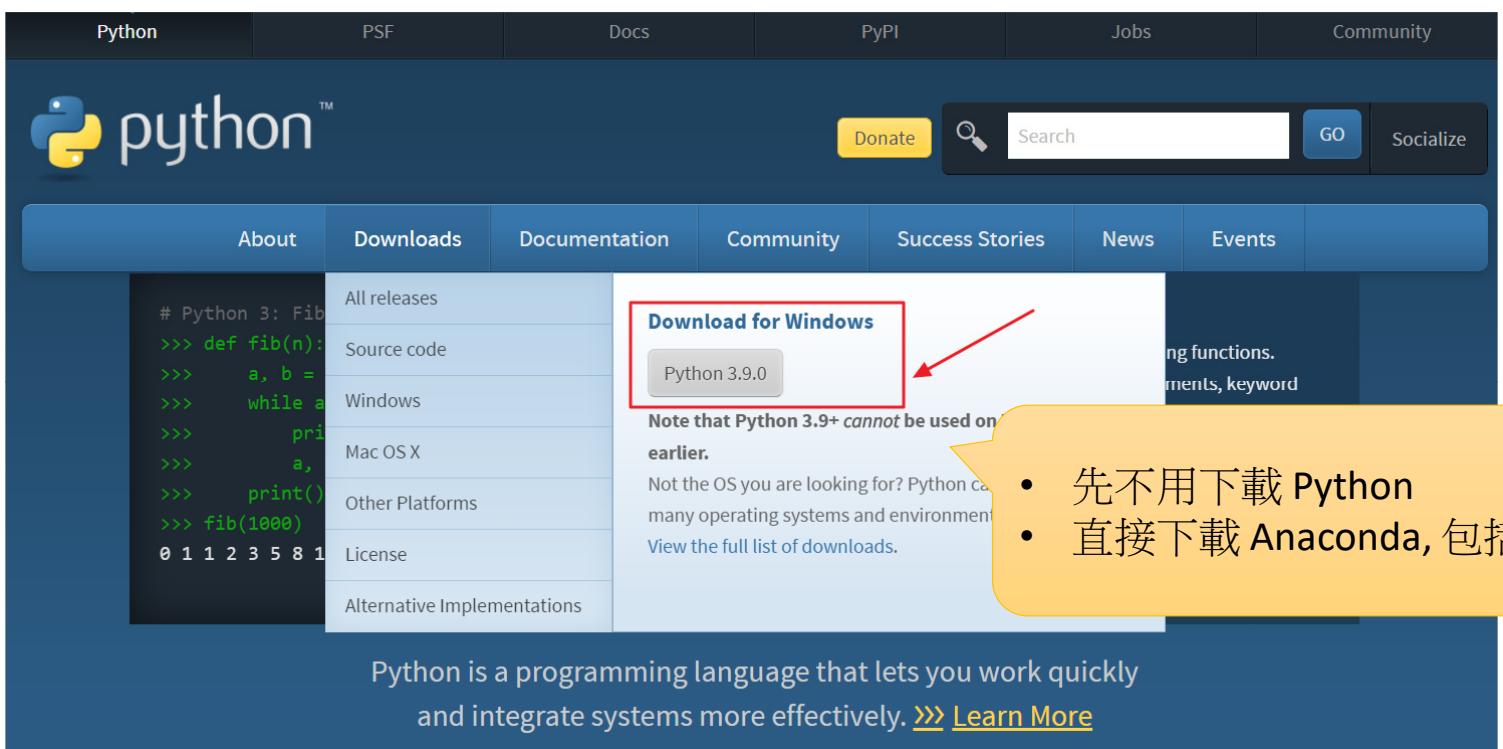
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# Python 簡介

- 吉多·范羅蘇姆 (Guido van Rossum) 在1989年的聖誕節期間研發 Python 語言。
  - Python 3.9.5 – 2021年5月28日
- 特性：
  - 跨平台
  - 開放性
  - 易讀性
  - 豐富套件(模組)
  - 其他語言結合, 例: Cython 編譯成二進位執行檔

# Python 下載

- <https://www.python.org/>



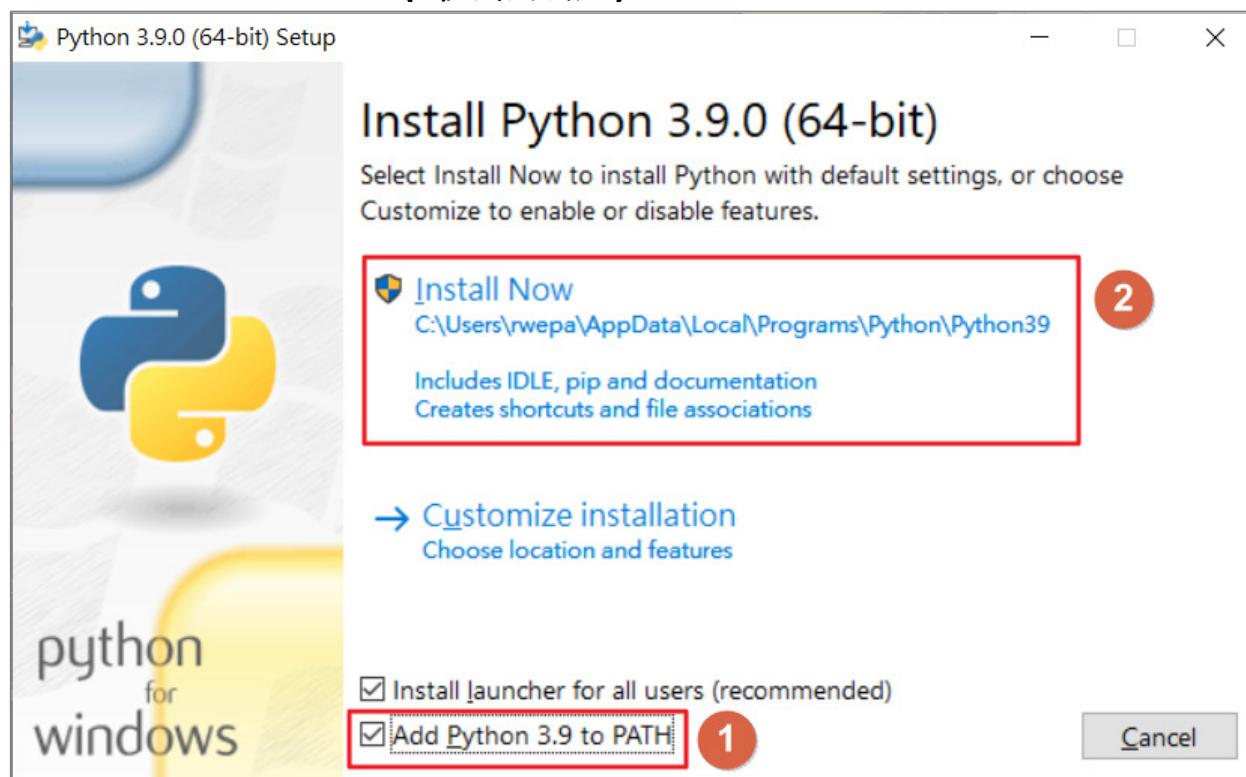
The screenshot shows the Python.org homepage. The navigation bar includes links for Python, PSF, Docs, PyPI, Jobs, and Community. The main content area features the Python logo and a search bar. A red box highlights the "Download for Windows" button, which is labeled "Python 3.9.0". A yellow callout bubble contains the following text:

- 先不用下載 Python
- 直接下載 Anaconda, 包括Python主程式

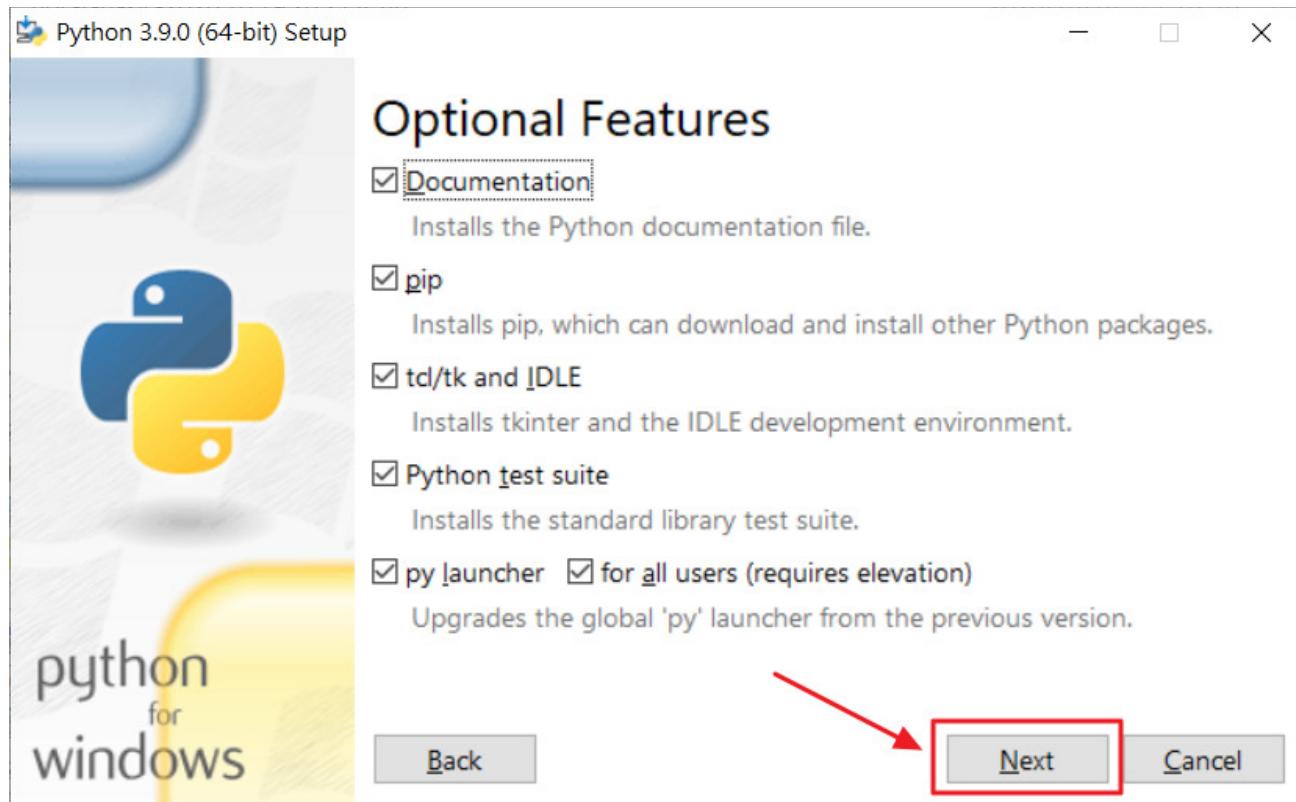
Below the download section, there is a note: "Note that Python 3.9+ cannot be used on earlier versions of Windows." At the bottom of the page, a banner states: "Python is a programming language that lets you work quickly and integrate systems more effectively. [» Learn More](#)".

# Python 安裝

- python-3.9.5-amd64.exe (最新版)

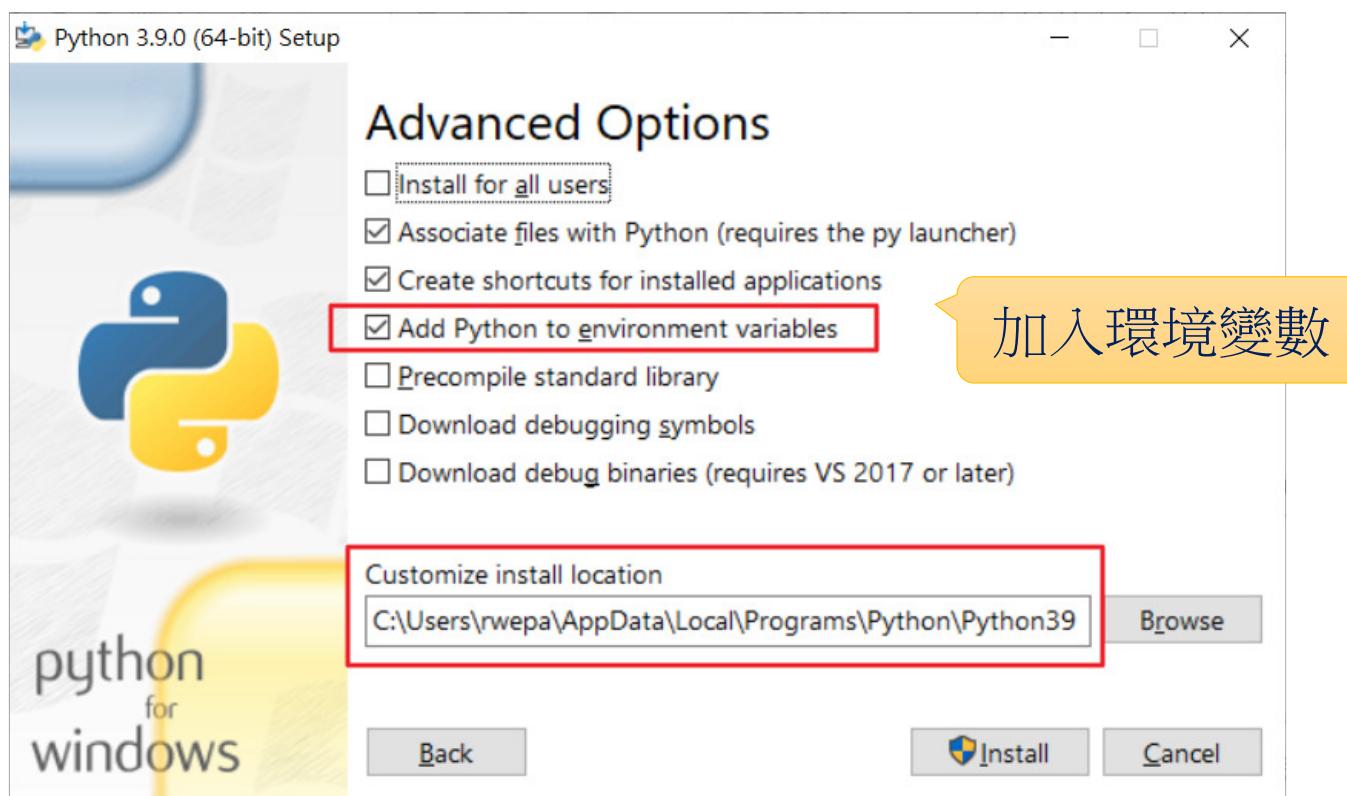


# Python 安裝(續)



# Python 安裝(續)

- 預設目錄 C:\Users\wepa9\AppData\Local\Programs\Python\Python39



# Python 安裝(續)



Disable path length limit

Changes your machine configuration to allow programs, including Python, to bypass the 260 character "MAX\_PATH" limitation.

(增加最大路徑字元數, 按此功能)



# Python – script command模式

```
Python 3.6 (64-bit)
Python 3.6.5 (v3.6.5:f59c0932b4, Mar 28 2018, 17:00:18) [MSC v.1900 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> 1+2
3
>>> help(print)
'more' 不是內部或外部命令、可執行的程式或批次檔。
>>>
>>> -
```

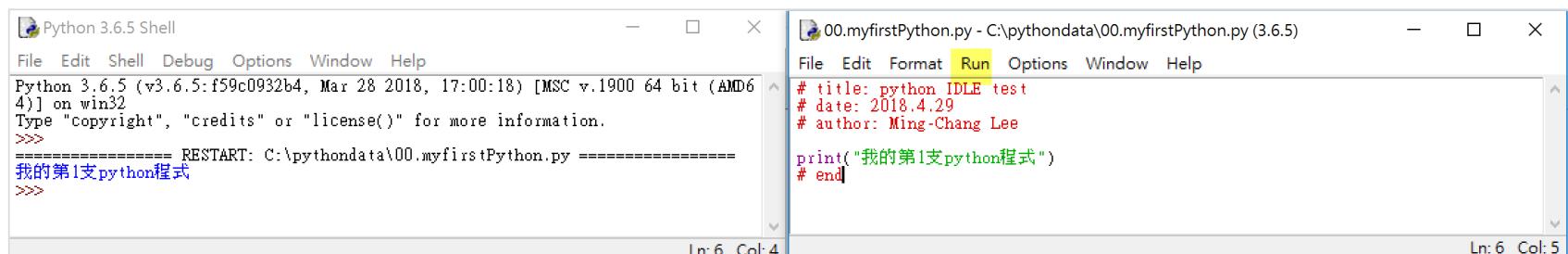
Windows 環境變數 Path: 加入  
;C:\Windows\System32

```
Python 3.6 (64-bit)
Python 3.6.5 (v3.6.5:f59c0932b4, Mar 28 2018, 17:00:18) [MSC v.1900 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> 1+2
3
>>> help(print)
Help on built-in function print in module builtins:

print(*, file=sys.stdout, flush=False)
    Prints the values to a stream, or to sys.stdout by default.
    Optional keyword arguments:
        file: a file-like object (stream); defaults to the current sys.stdout.
        sep:   string inserted between values, default a space.
        end:   string appended after the last value, default a newline.
        flush: whether to forcibly flush the stream.

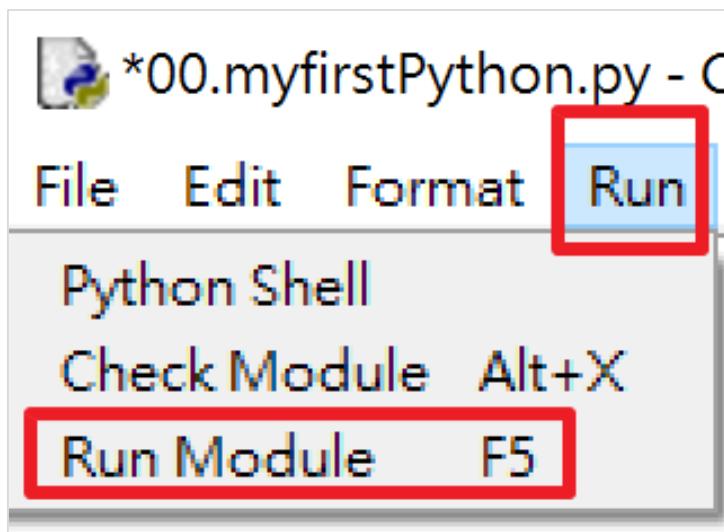
>>> quit()
```

# Python – IDLE模式



The image shows two windows from the Python 3.6.5 IDE. The left window is the Python 3.6.5 Shell, displaying the Python version information and a command prompt (">>>>). The right window is the code editor showing a script named 00.myfirstPython.py with the following content:

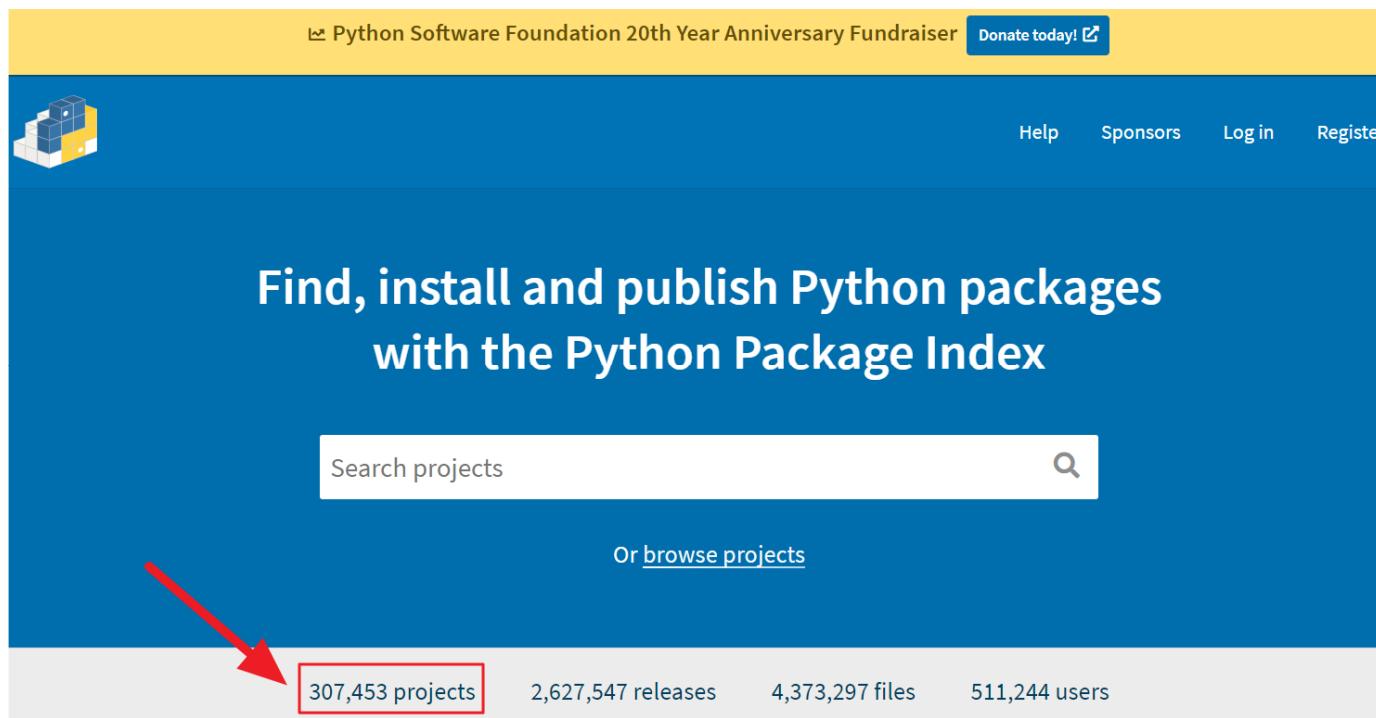
```
# title: python IDLE test
# date: 2018.4.29
# author: Ming-Chang Lee
print("我的第1支python程式")
# end
```



- File \ Save
- Run \ RunModule

# PyPI – Python 模組

- <https://pypi.org/>



# 已安裝模組(pip)

選取 命令提示字元

C:\Users\rwepa>**pip list**

Package

Version

alabaster  
anaconda-client  
anaconda-navigator  
anaconda-project

0.7.12

1.7.2

1

0

- **pip list**
- 模組說明

**python -c help('模組')**

命令提示字元 - python -c help('os')

C:\Users\rwepa>**python -c help('os')**

Help on module os:

## NAME

os - OS routines for NT or Posix depending on what system we're on.

## DESCRIPTION

This exports:

- all functions from posix or nt, e.g. unlink, stat, etc.
- os.path is either posixpath or ntpath
- os.name is either 'posix' or 'nt'

# Python IDE (Integrated Development Environment)

- Anaconda, 包括 Spyder
  - <https://www.anaconda.com/>
- PyCharm
  - <https://www.jetbrains.com/pycharm/>
- Visual Studio Code
  - <https://code.visualstudio.com/>
- RStudio  
→ Terminal 視窗

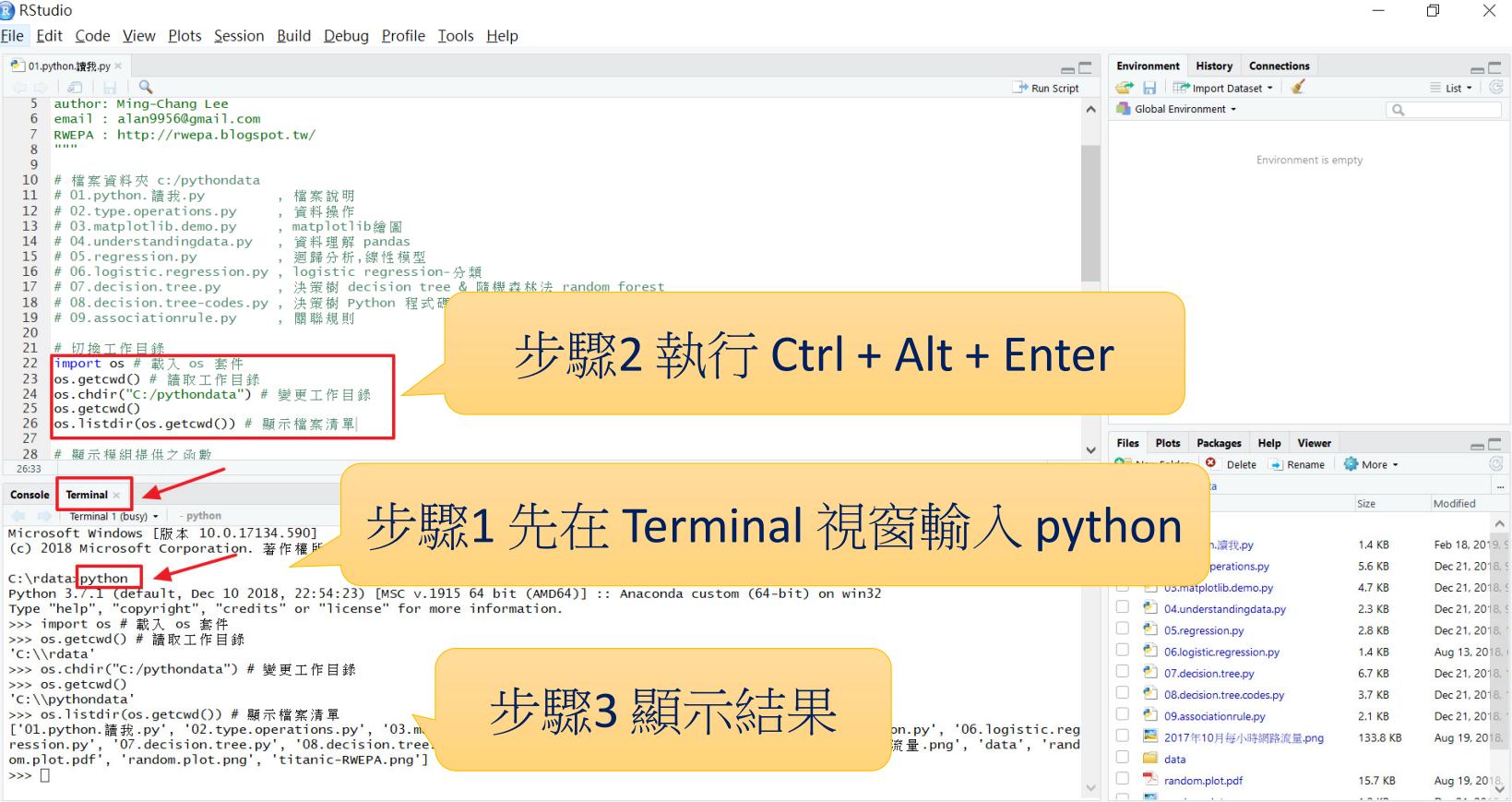
上課軟體

# RStudio - 執行 Python

**步驟1 先在 Terminal 視窗輸入 python**

步驟2 執行 **Ctrl + Alt + Enter**

步驟3 顯示結果



```

5 author: Ming-Chang Lee
6 email : alan9956@gmail.com
7 RWEPA : http://rwepa.blogspot.tw/
8 """
9
10 # 檔案資料夾 c:/pythondata
11 # 01.python.讀我.py , 檔案說明
12 # 02.type.operations.py , 資料操作
13 # 03.matplotlib.demo.py , matplotlib繪圖
14 # 04.understandingdata.py , 資料理解 pandas
15 # 05.regression.py , 迴歸分析,線性模型
16 # 06.logistic.regression.py , logistic regression-分類
17 # 07.decision.tree.py , 決策樹 decision tree & 隨機森林法 random forest
18 # 08.decision.tree.codes.py , 決策樹 Python 程式碼
19 # 09.associationrule.py , 關聯規則
20
21 # 切換工作目錄
22 import os # 載入 os 套件
23 os.getcwd() # 讀取工作目錄
24 os.chdir("c:/pythondata") # 變更工作目錄
25 os.getcwd()
26 os.listdir(os.getcwd()) # 顯示檔案清單
27
28 # 顯示模組提供之函數
2633

```

Terminal

```

C:\rdata\python
Python 3.7.1 (default, Dec 10 2018, 22:54:23) :: Anaconda custom (64-bit) on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> import os # 載入 os 套件
>>> os.getcwd() # 讀取工作目錄
'C:\rdata'
>>> os.chdir("c:/pythondata") # 變更工作目錄
>>> os.getcwd()
'C:\pythondata'
>>> os.listdir(os.getcwd()) # 顯示檔案清單
['01.python.讀我.py', '02.type.operations.py', '03.m
ression.py', '07.decision.tree.py', '08.decision.tree.
om.pdf', 'random.plot.png', 'titanic-RWEPA.png']
>>> 
```

Environment

| Variable           | Type        | Value                |
|--------------------|-------------|----------------------|
| Global Environment | Environment | Environment is empty |

Files

| Name                      | Size     | Modified        |
|---------------------------|----------|-----------------|
| 01.python.讀我.py           | 1.4 KB   | Feb 18, 2019, 5 |
| 02.type.operations.py     | 5.6 KB   | Dec 21, 2018, 5 |
| 03.matplotlib.demo.py     | 4.7 KB   | Dec 21, 2018, 5 |
| 04.understandingdata.py   | 2.3 KB   | Dec 21, 2018, 5 |
| 05.regression.py          | 2.8 KB   | Dec 21, 2018, 5 |
| 06.logistic.regression.py | 1.4 KB   | Aug 13, 2018, 1 |
| 07.decision.tree.py       | 6.7 KB   | Dec 21, 2018, 5 |
| 08.decision.tree.codes.py | 3.7 KB   | Dec 21, 2018, 5 |
| 09.associationrule.py     | 2.1 KB   | Dec 21, 2018, 5 |
| 2017年10月每小時網路流量.png       | 133.8 KB | Aug 19, 2018,   |
| data                      |          |                 |
| random.plot.pdf           | 15.7 KB  | Aug 19, 2018,   |

# Anaconda 簡介

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# Anaconda 特性

- Anaconda是一個免費、易於安裝/管理並支援Python語言
- 支援1000個以上的開源模組(套件)
- 支援 Spyder (支援 Python IDE)
- 支援 jupyter notebook
- 支援 Windows、Mac OS X和Linux

# Anaconda 特性 (續)



TensorFlow

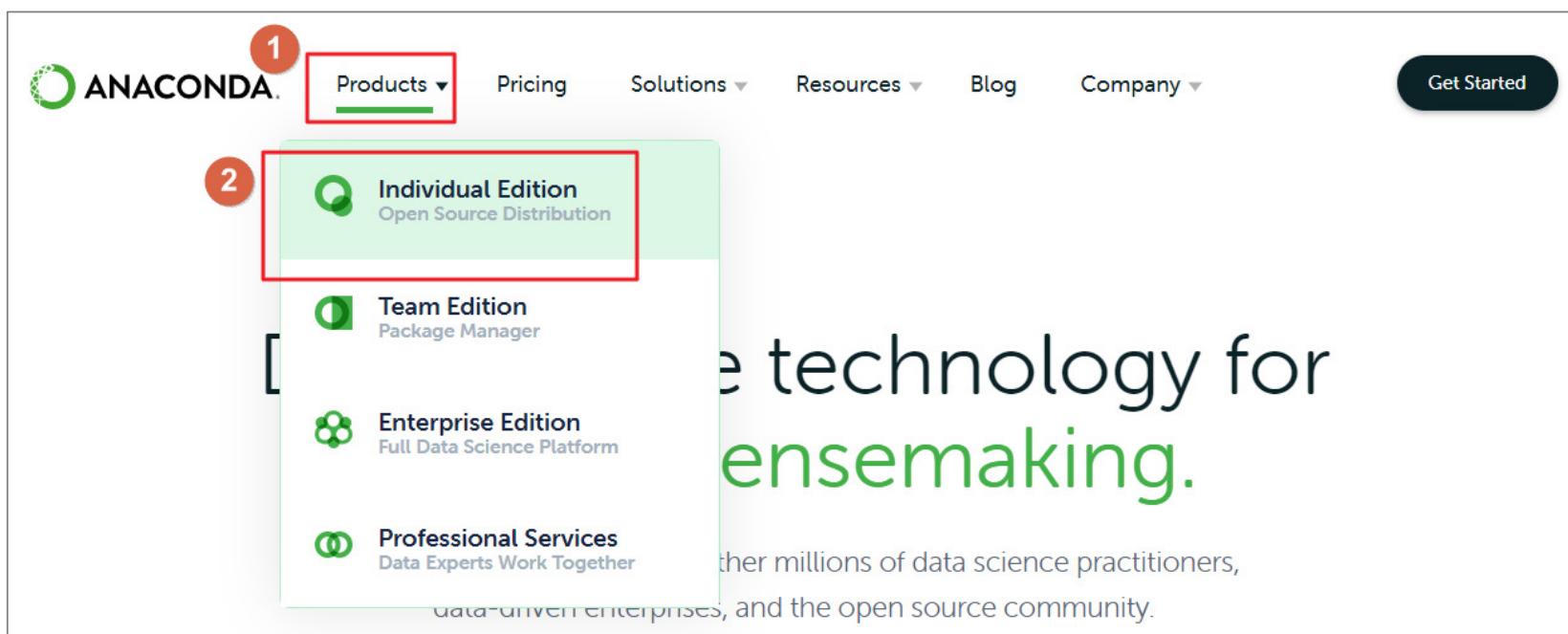


# Anaconda 下載與安裝

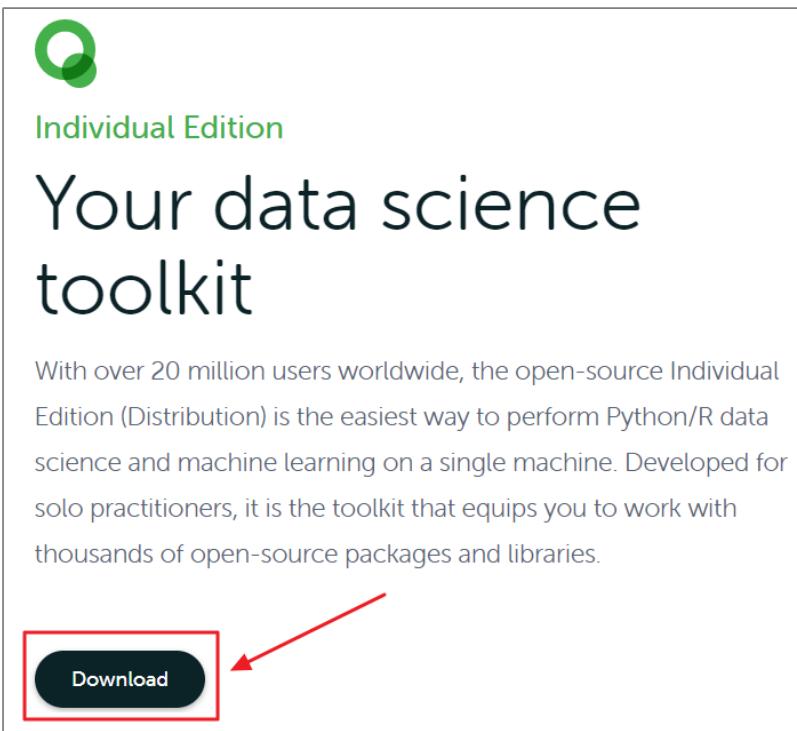
---

# Anaconda 下載

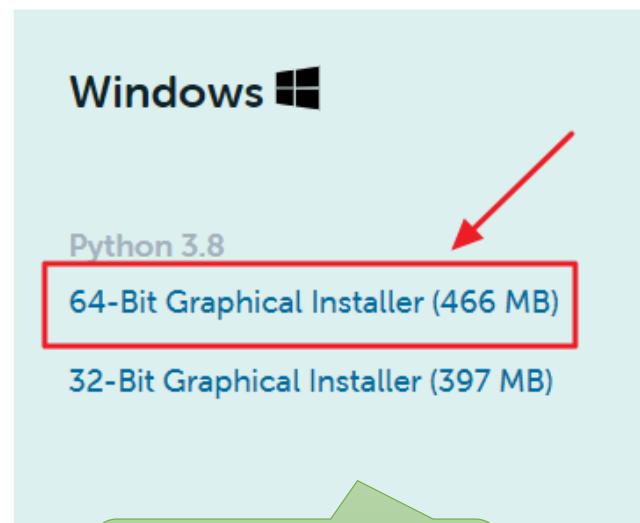
- <https://www.anaconda.com/>



# Anaconda 下載 (續)



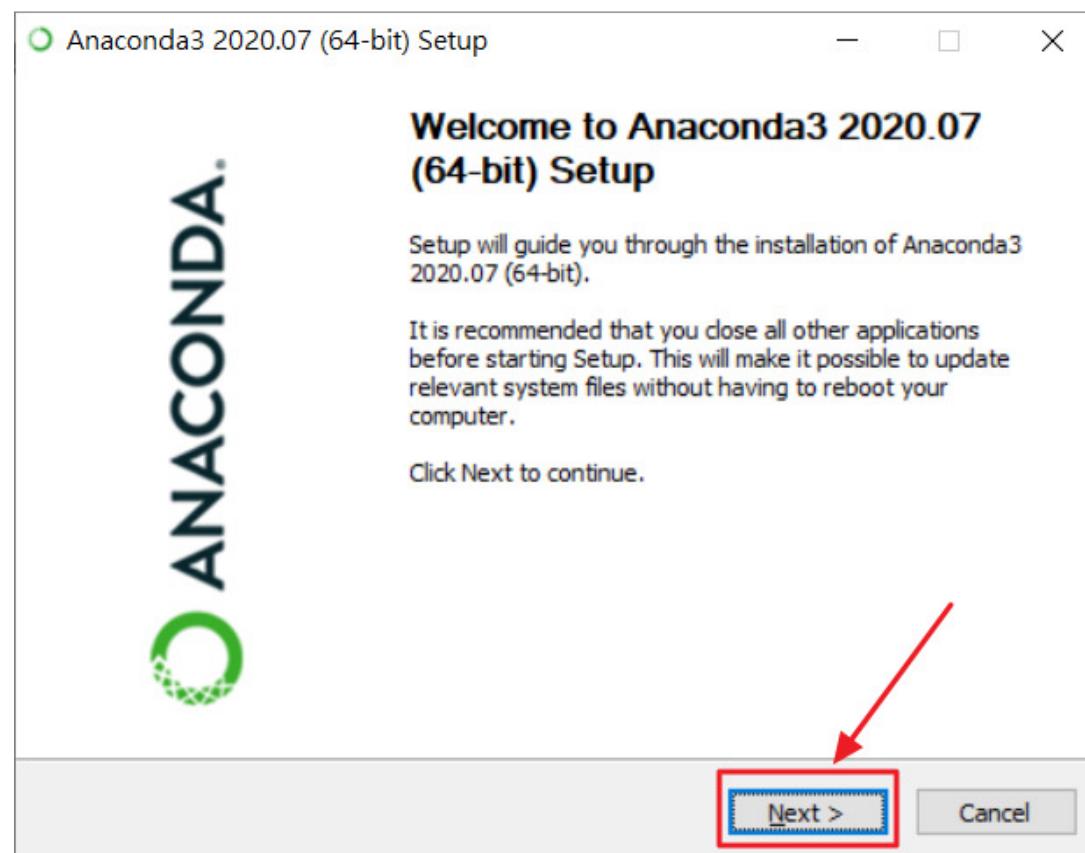
The image shows the Anaconda Individual Edition landing page. It features a large green 'Q' logo and the text 'Individual Edition'. Below this, the heading 'Your data science toolkit' is displayed in a large, bold, dark font. A descriptive paragraph follows, stating: 'With over 20 million users worldwide, the open-source Individual Edition (Distribution) is the easiest way to perform Python/R data science and machine learning on a single machine. Developed for solo practitioners, it is the toolkit that equips you to work with thousands of open-source packages and libraries.' At the bottom, there is a 'Download' button with a red border and a red arrow pointing to it from the left.



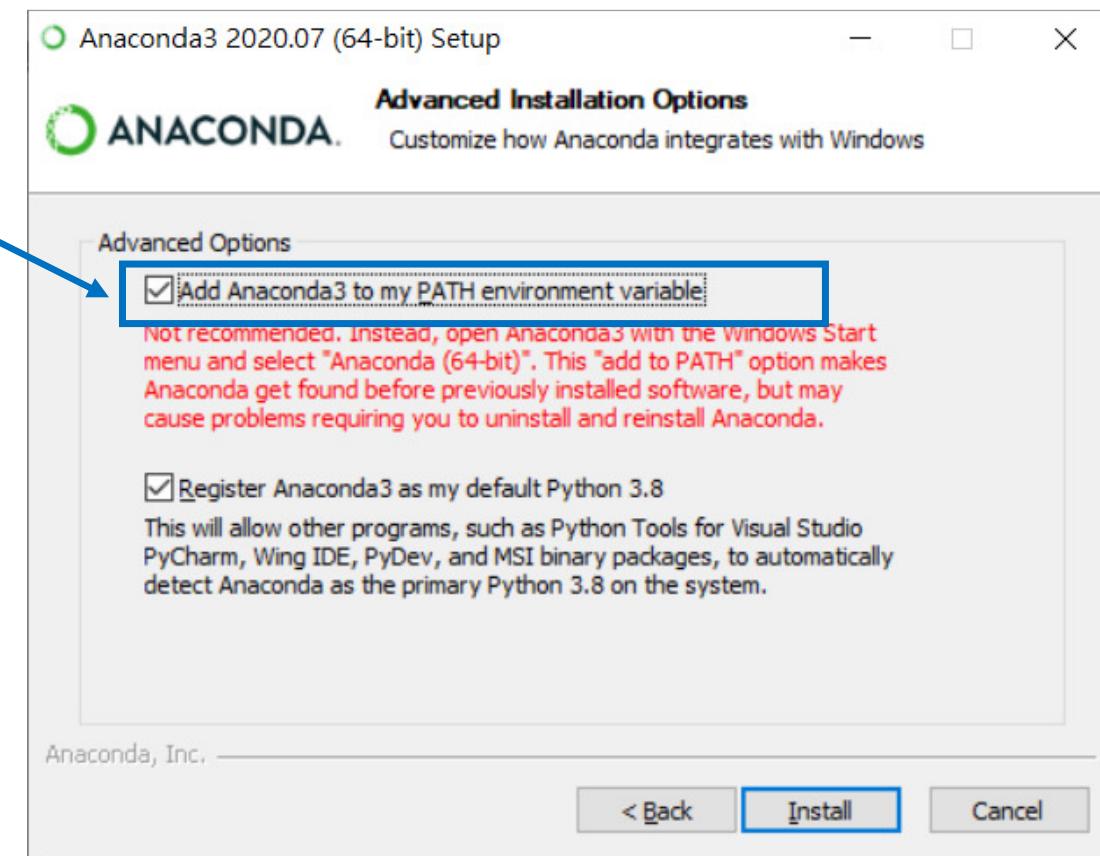
The image shows the Windows download options for Anaconda 3.8. It includes the Windows logo and the text 'Python 3.8'. Two download links are listed: '64-Bit Graphical Installer (466 MB)' and '32-Bit Graphical Installer (397 MB)'. A red arrow points from the text '下載 64位元, 466 MB' below to the '64-Bit Graphical Installer' link.

下載 64位元,  
466 MB

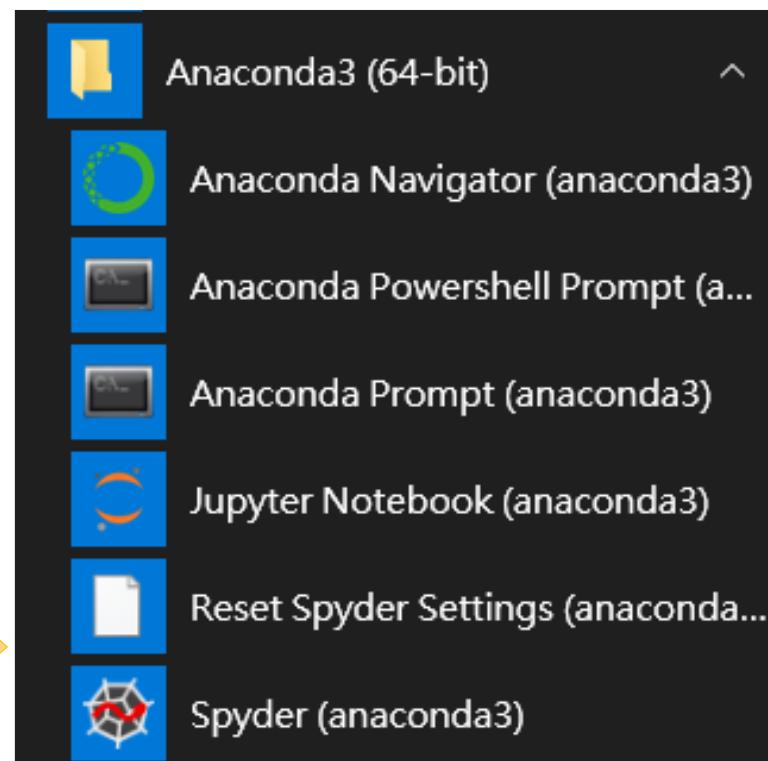
# 安裝 Anaconda



# 安裝時二個選項都打勾

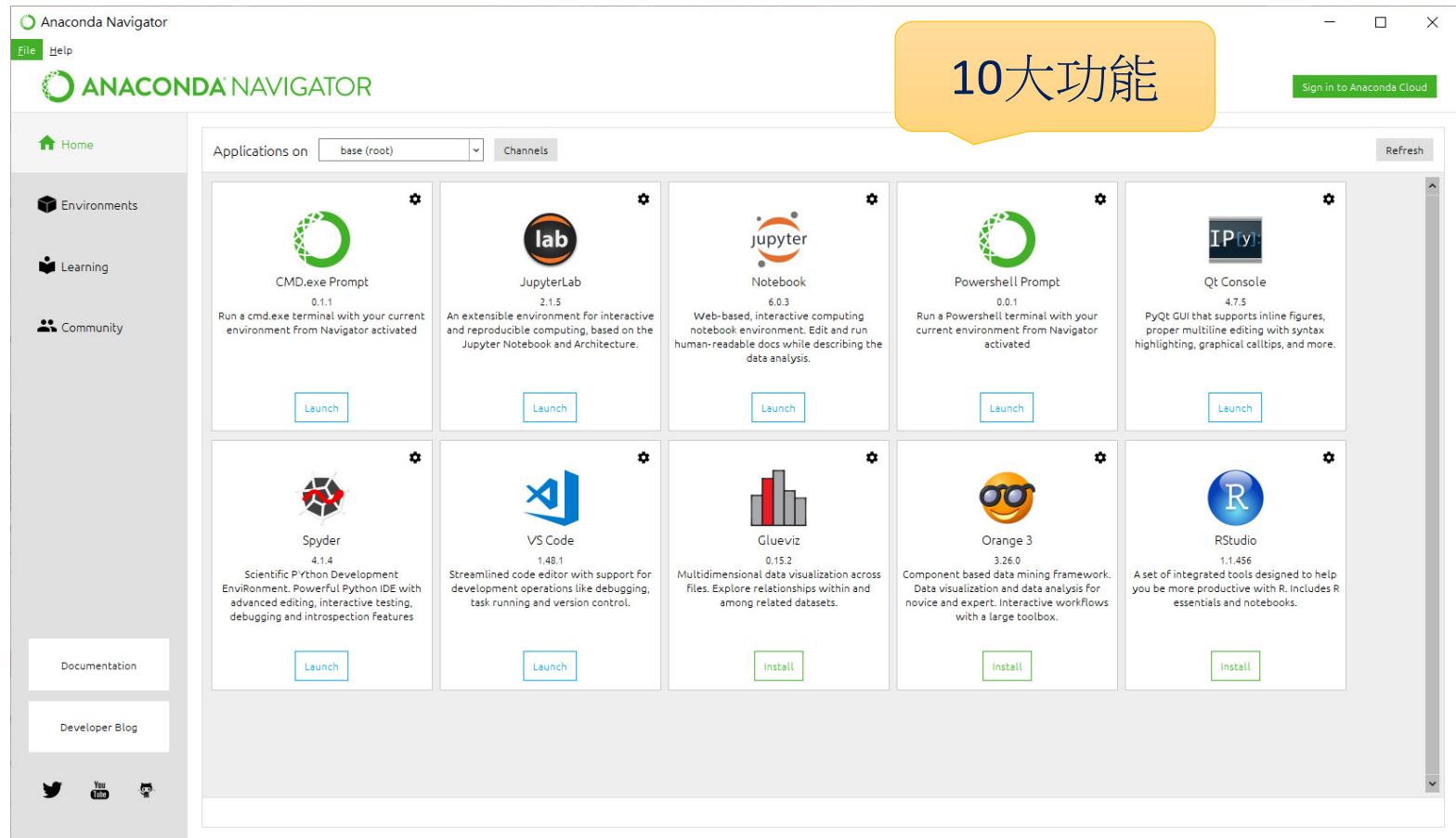


# Anaconda 安裝完成

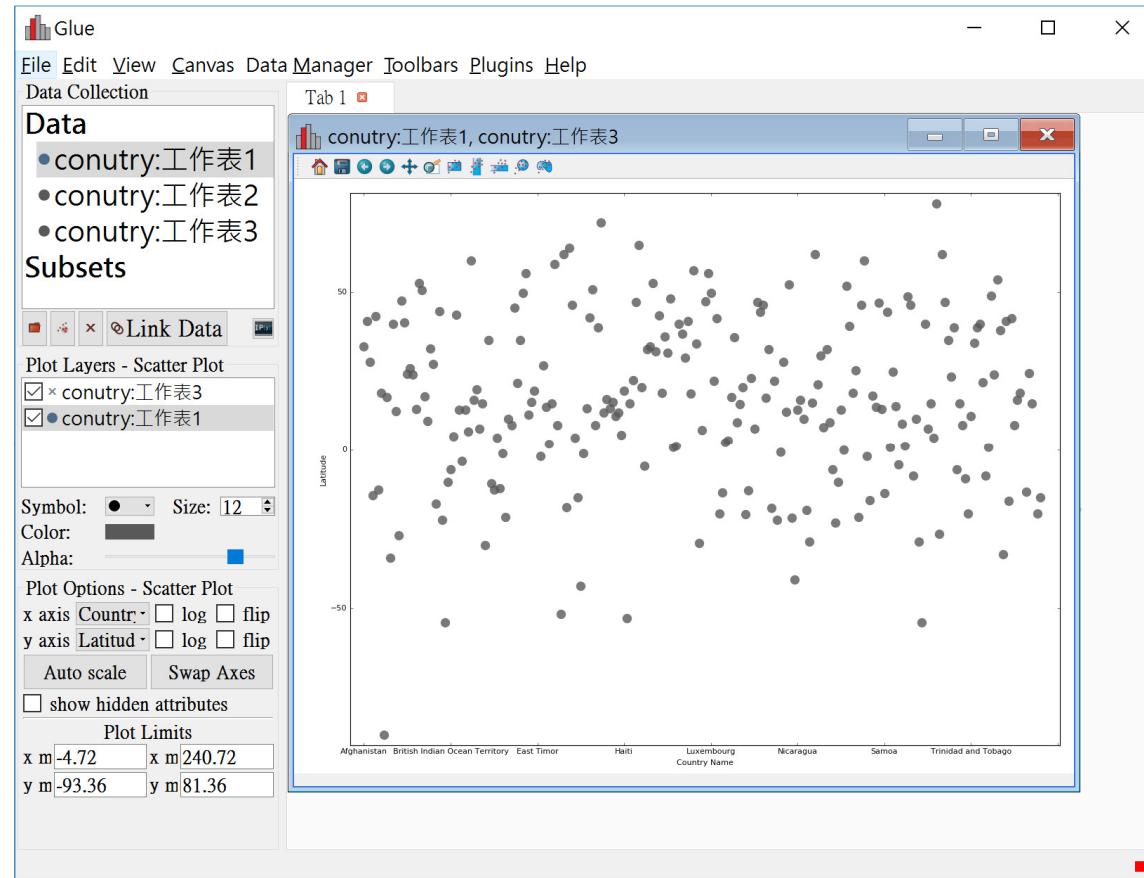


已安裝  
6個元件

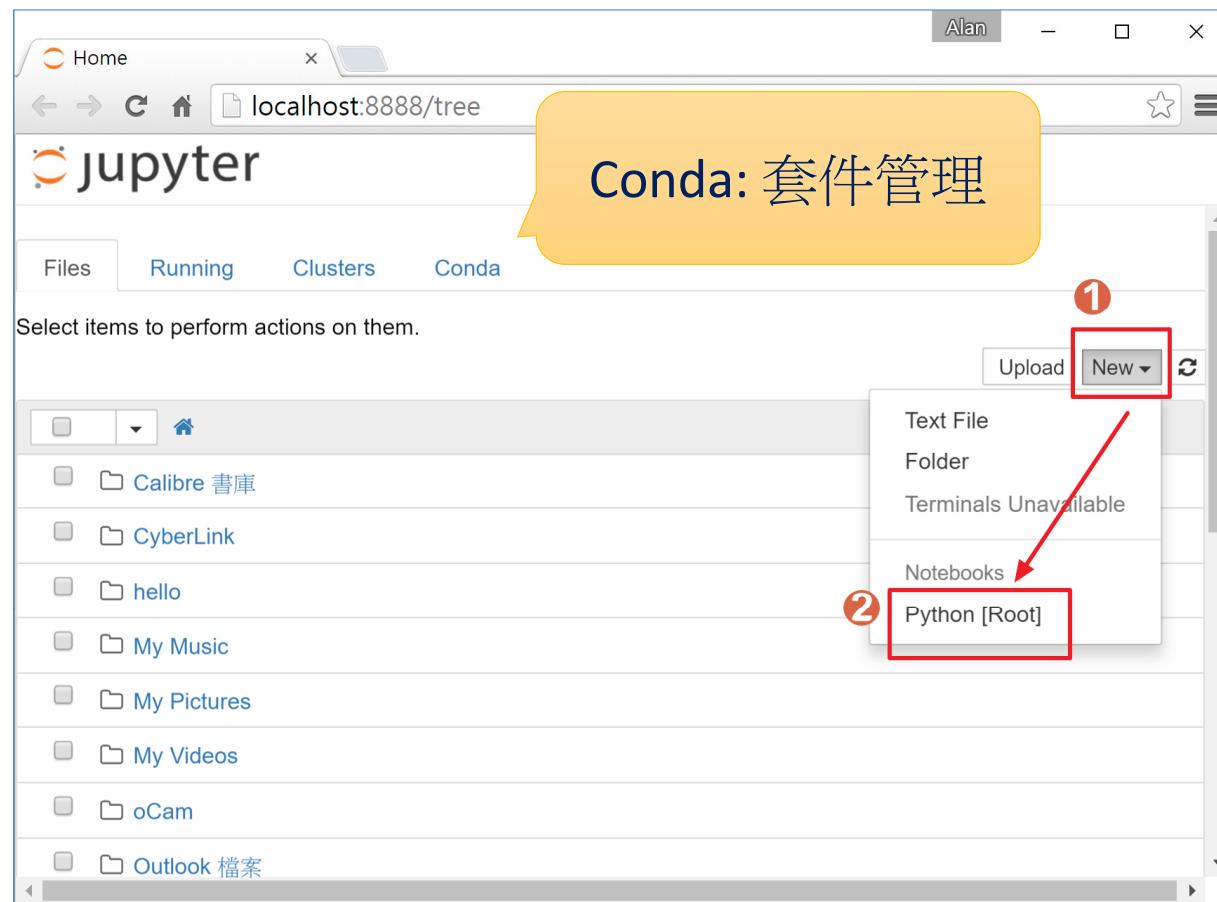
# Anaconda Navigator



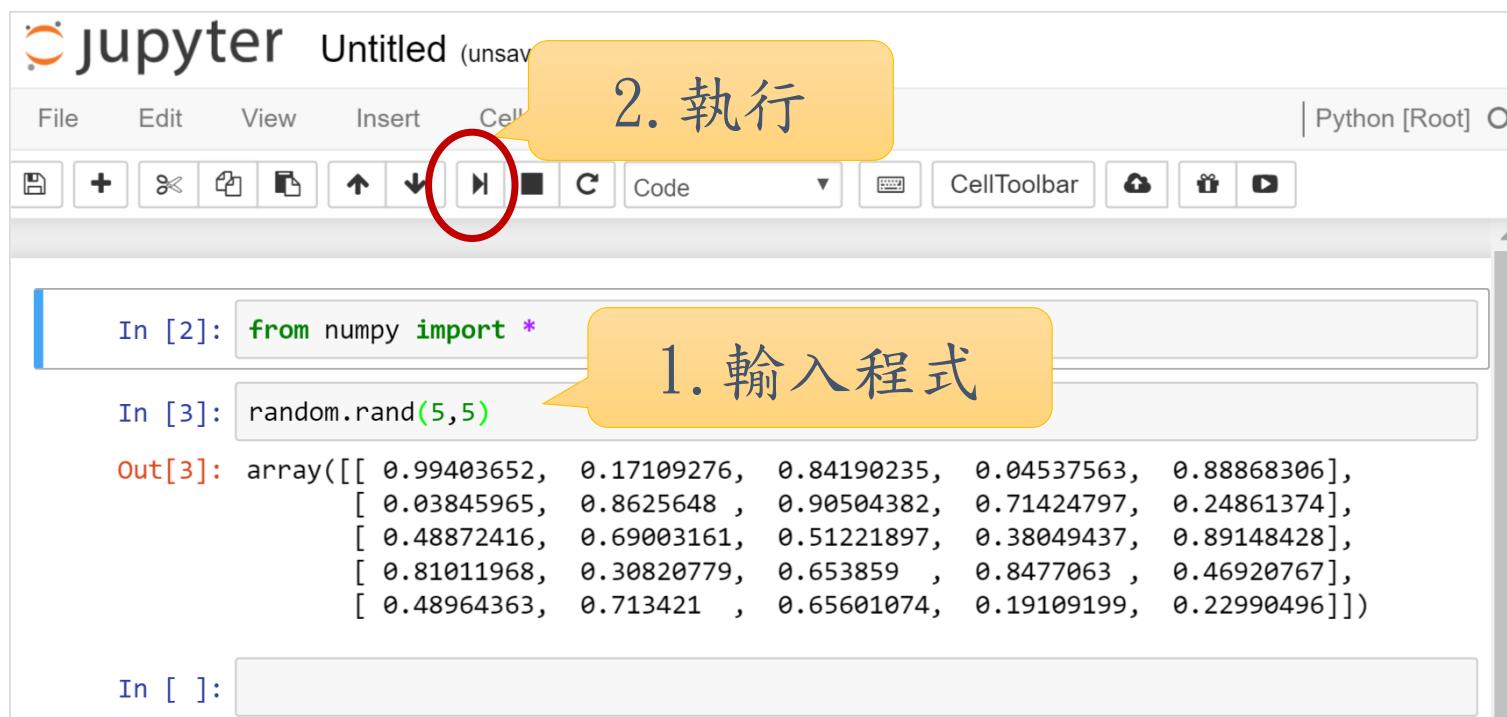
# glueviz 視覺化



# jupyter notebook



# jupyter notebook (續)

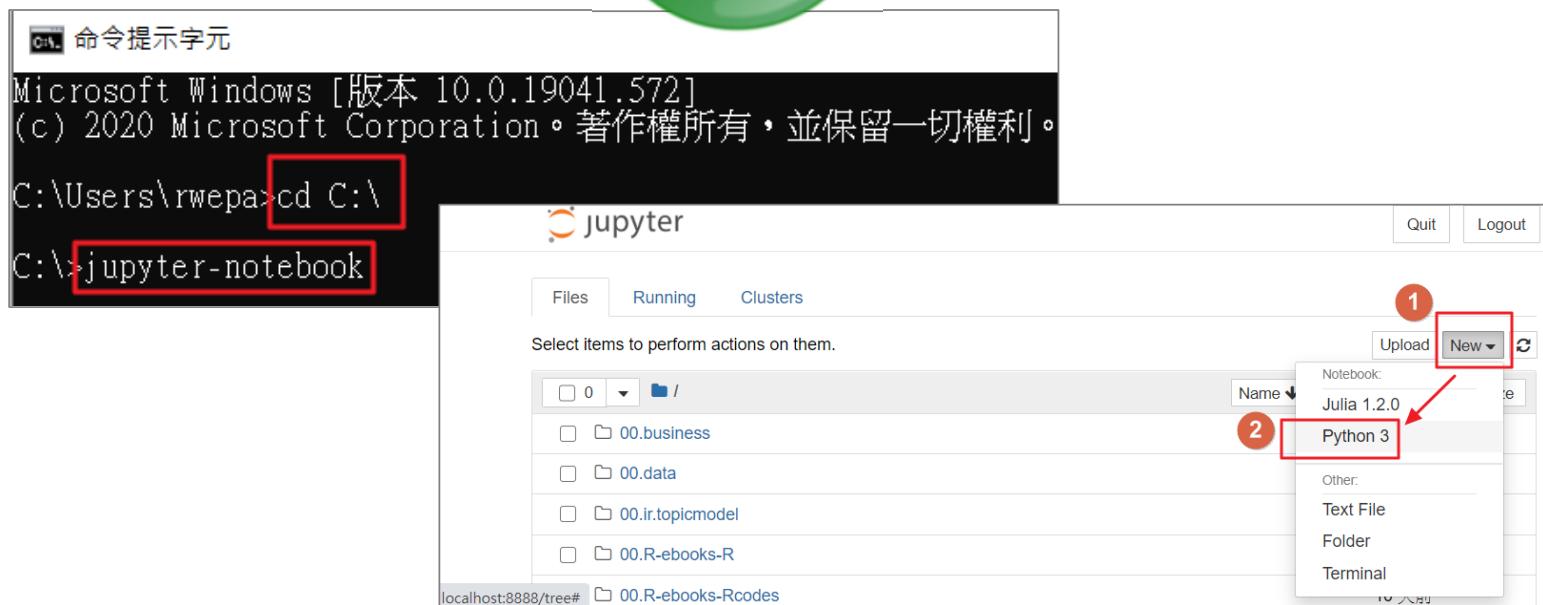


The screenshot shows a Jupyter Notebook interface with the following elements:

- Title Bar:** jupyter Untitled (unsav...). The title bar includes standard menu options: File, Edit, View, Insert, Cell, and a language selector Python [Root].
- Toolbar:** A row of icons for file operations (New, Open, Save, etc.), cell navigation (Up, Down, Previous, Next), and other functions.
- In [2]:** A code cell containing `from numpy import *`.
- In [3]:** A code cell containing `random.rand(5,5)`.
- Out[3]:** The output of the previous cell, displaying a 5x5 array of random floating-point numbers:array([[ 0.99403652, 0.17109276, 0.84190235, 0.04537563, 0.88868306],  
 [ 0.03845965, 0.8625648 , 0.90504382, 0.71424797, 0.24861374],  
 [ 0.48872416, 0.69003161, 0.51221897, 0.38049437, 0.89148428],  
 [ 0.81011968, 0.30820779, 0.653859 , 0.8477063 , 0.46920767],  
 [ 0.48964363, 0.713421 , 0.65601074, 0.19109199, 0.22990496]])
- Input Placeholder:** An empty cell labeled In [ ]: at the bottom.
- Annotations:** Two yellow callout boxes with blue text are overlaid on the interface:
  - A box labeled "1. 輸入程式" points to the In [3] cell.
  - A box labeled "2. 執行" points to the "Run" icon in the toolbar, which is highlighted with a red circle.

# jupyter notebook – 更改預設目錄

- `cd C:\`
- `jupyter-notebook`



命令提示字元

Microsoft Windows [版本 10.0.19041.572]  
(c) 2020 Microsoft Corporation。著作權所有，並保留一切權利。

C:\Users\rwepa>cd C:\  
C:\>jupyter-notebook

jupyter

Files    Running    Clusters

Select items to perform actions on them.

0 /  
00.business  
00.data  
00.ir.topicmodel  
00.R-ebooks-R

Name: Julia 1.2.0  
Notebook: Python 3

1  
Upload New  
2

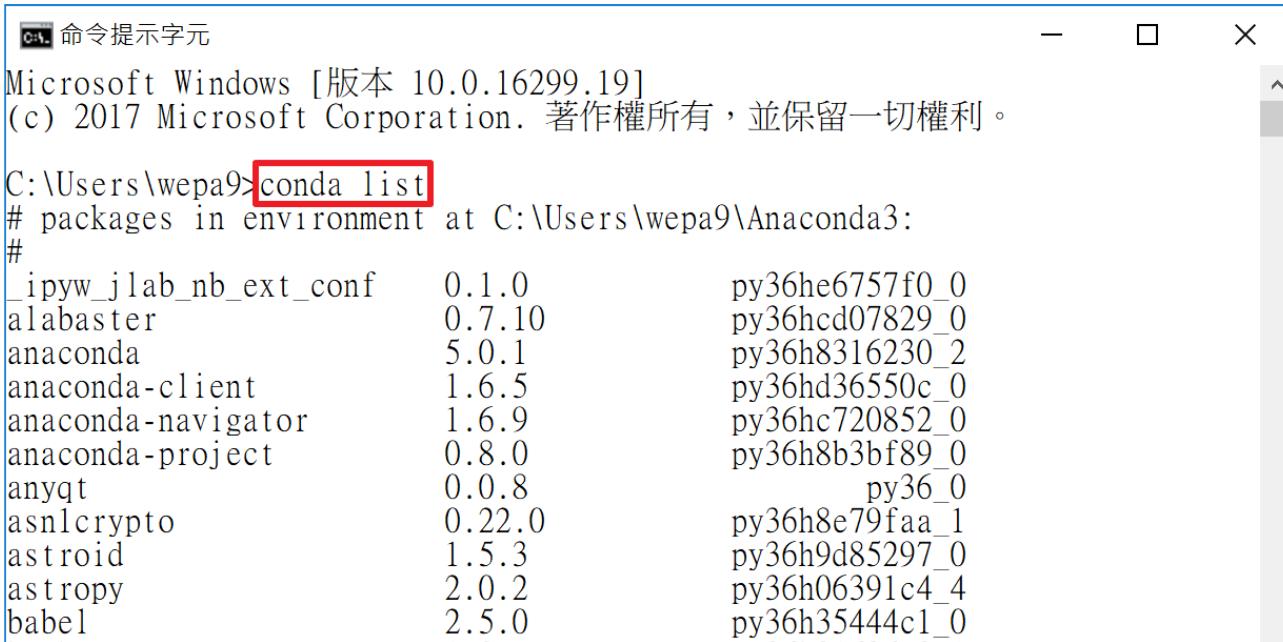
localhost:8888/tree# 00.R-ebooks-Rcodes

# Jupyter Notebook 快速鍵

- 按 [Esc] cell旁邊為藍色：
  - 按下 **x**：刪除當前選擇的cell
  - 按下 **a**：在當前選擇的上方新增一個cell
  - 按下 **b**：在當前選擇的下方新增一個cell
  - 按下 **Shift-Enter**：執行當前的cell並且選到下一個cell
  - 按下 **Ctrl-Enter**：執行當前cell
  - 按下 **M**：轉成markerdown模式，可以看到紅色框框內容從code變成markerdown

# Anaconda 套件管理

- # 顯示已安裝套件  
  conda list



```
命令提示字元
Microsoft Windows [版本 10.0.16299.19]
(c) 2017 Microsoft Corporation. 著作權所有，並保留一切權利。

C:\Users\wepa9>conda list
# packages in environment at C:\Users\wepa9\Anaconda3:
#
_ipyw_jlab_nb_ext_conf    0.1.0          py36he6757f0_0
alabaster                  0.7.10         py36hcd07829_0
anaconda                   5.0.1          py36h8316230_2
anaconda-client              1.6.5          py36hd36550c_0
anaconda-navigator           1.6.9          py36hc720852_0
anaconda-project              0.8.0          py36h8b3bf89_0
anyqt                       0.0.8          py36_0
asn1crypto                  0.22.0         py36h8e79faa_1
astroid                      1.5.3          py36h9d85297_0
astropy                     2.0.2          py36h06391c4_4
babel                       2.5.0          py36h35444c1_0
```

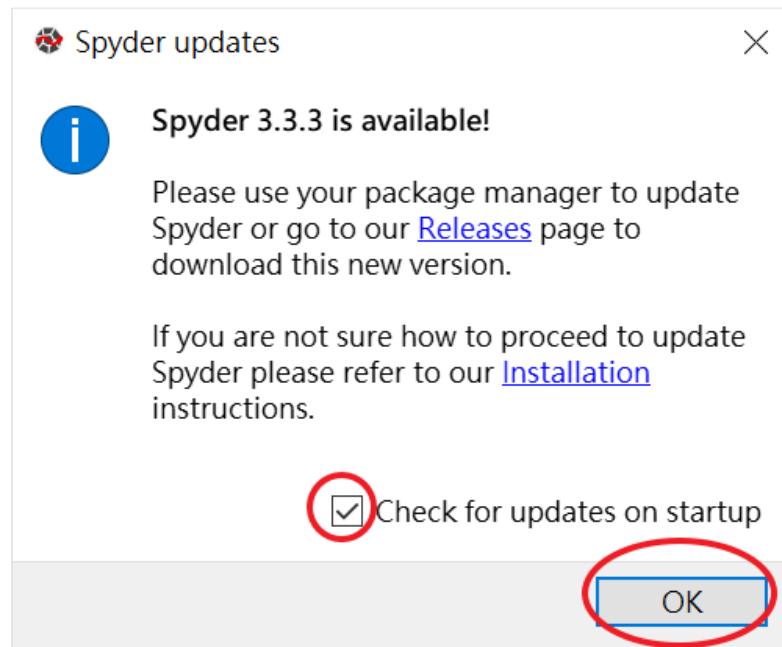
# Anaconda 套件管理(續)

- # 尋找套件  
  conda search matplotlib
- # 安裝模組  
  conda install 模組名稱
- # 更新模組  
  conda update 模組名稱

# Spyder 軟體簡介

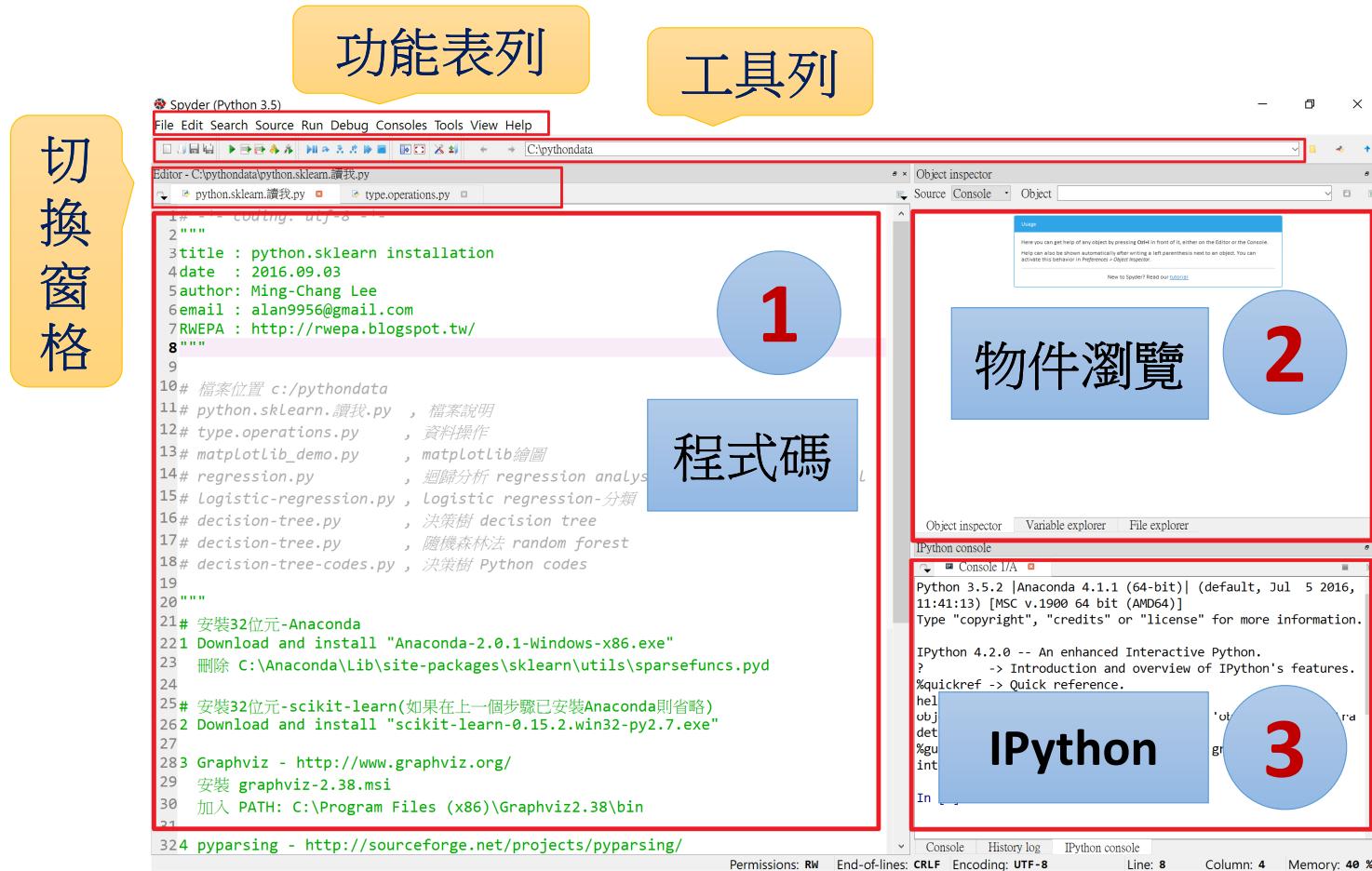


# Spyder 更新

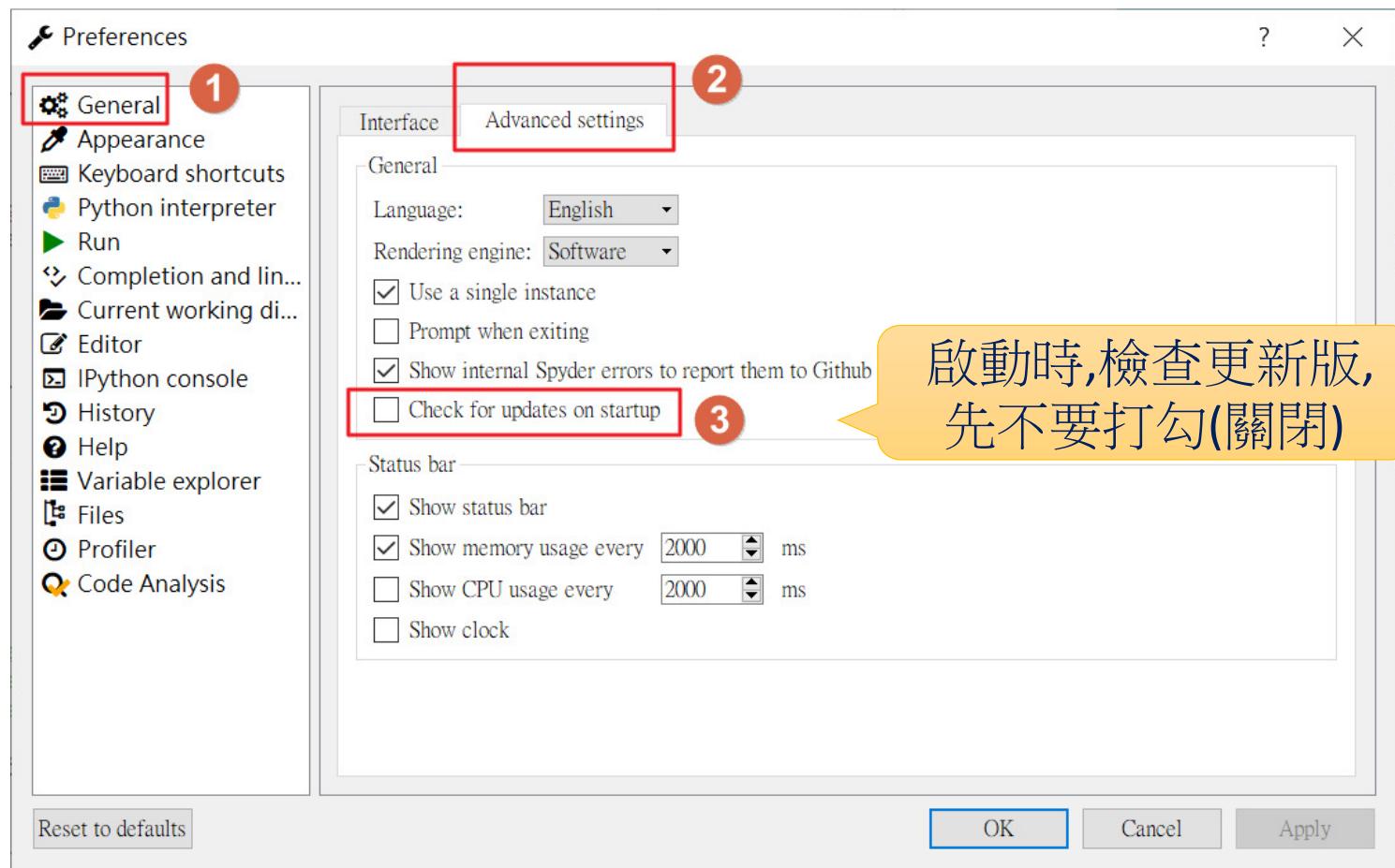


- Anaconda 整體更新 `conda update anaconda`
- Spyder 更新 `conda update spyder`

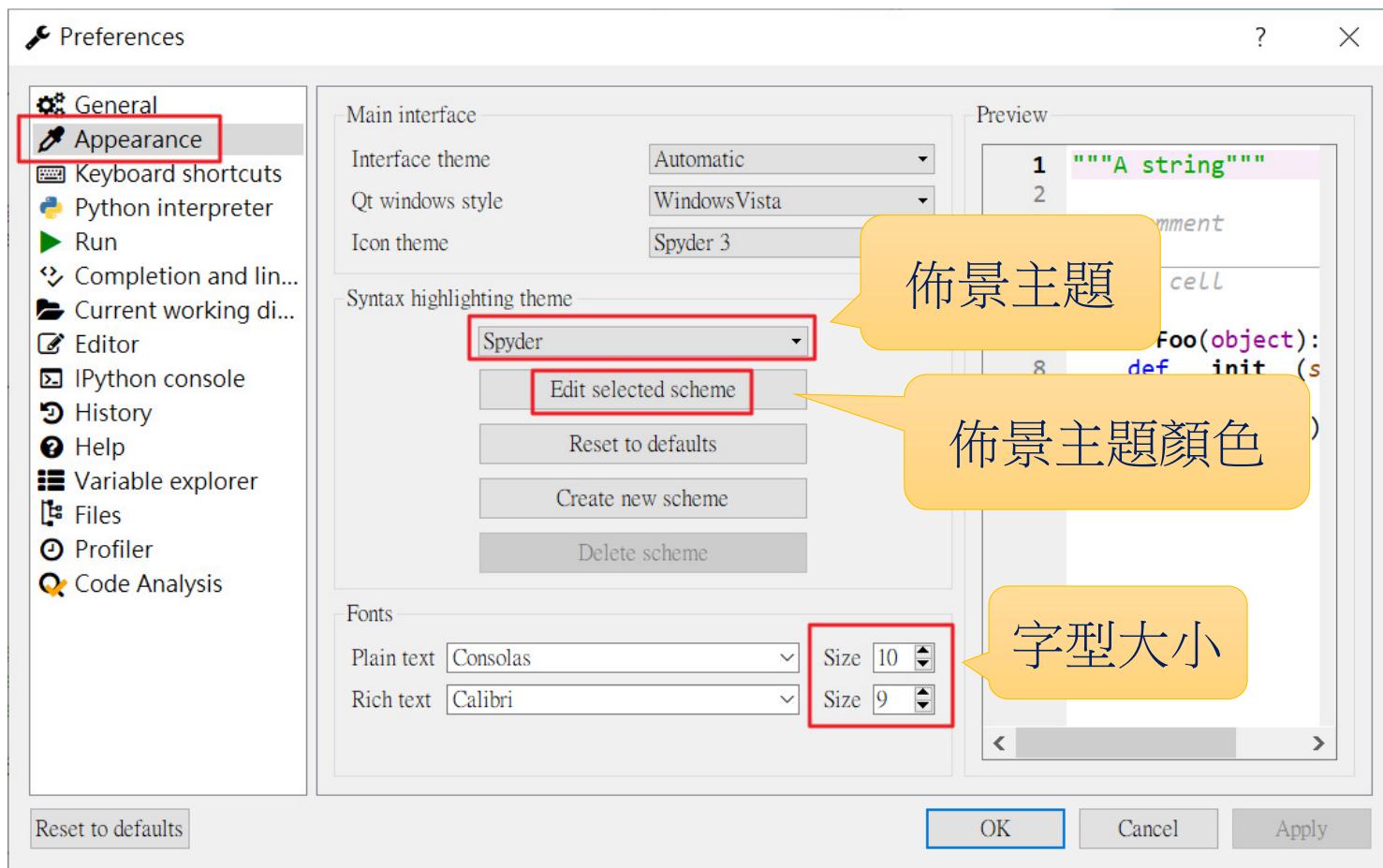
# Spyder 畫面



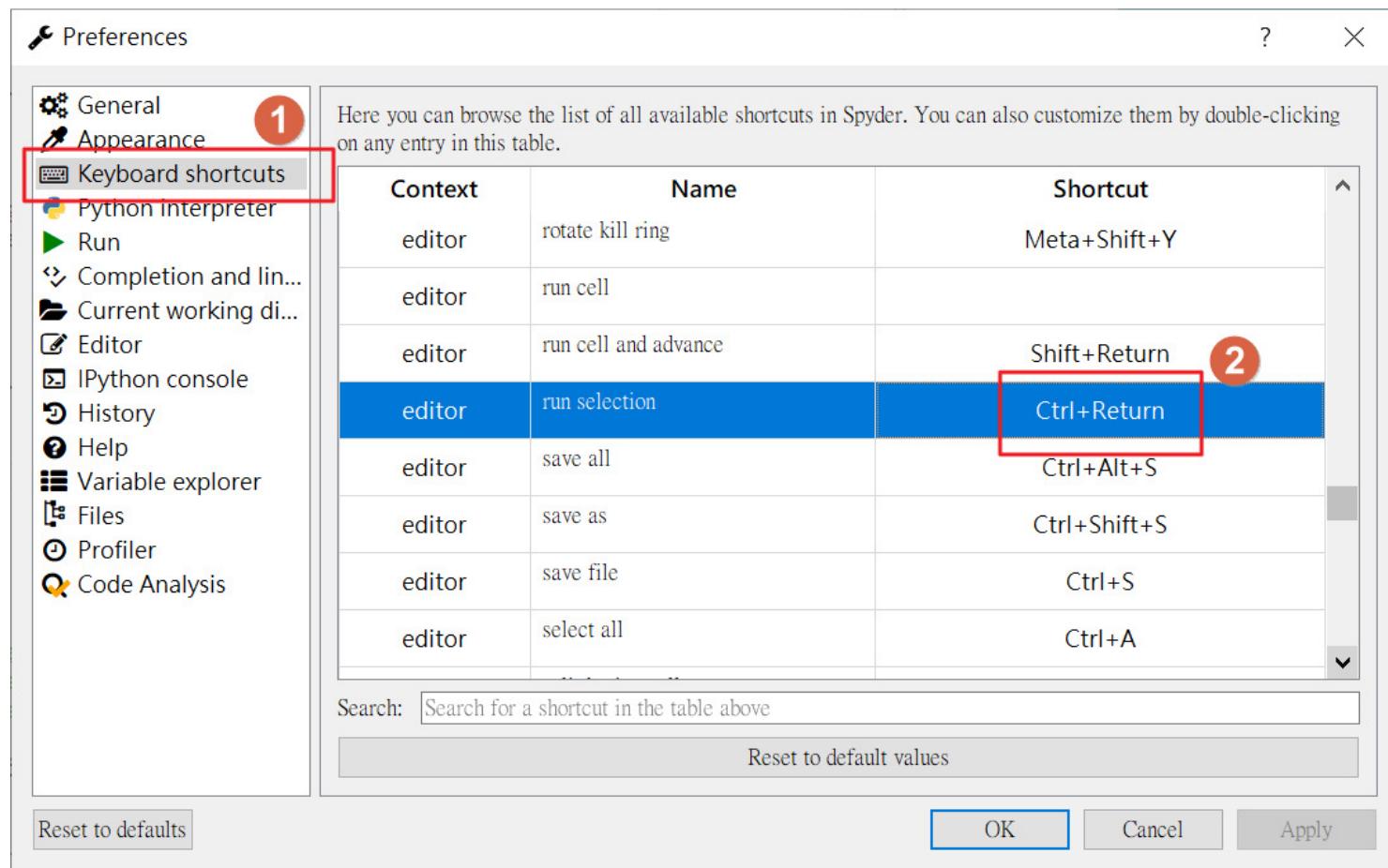
# 喜好設定 Tools \ Preferences \ General



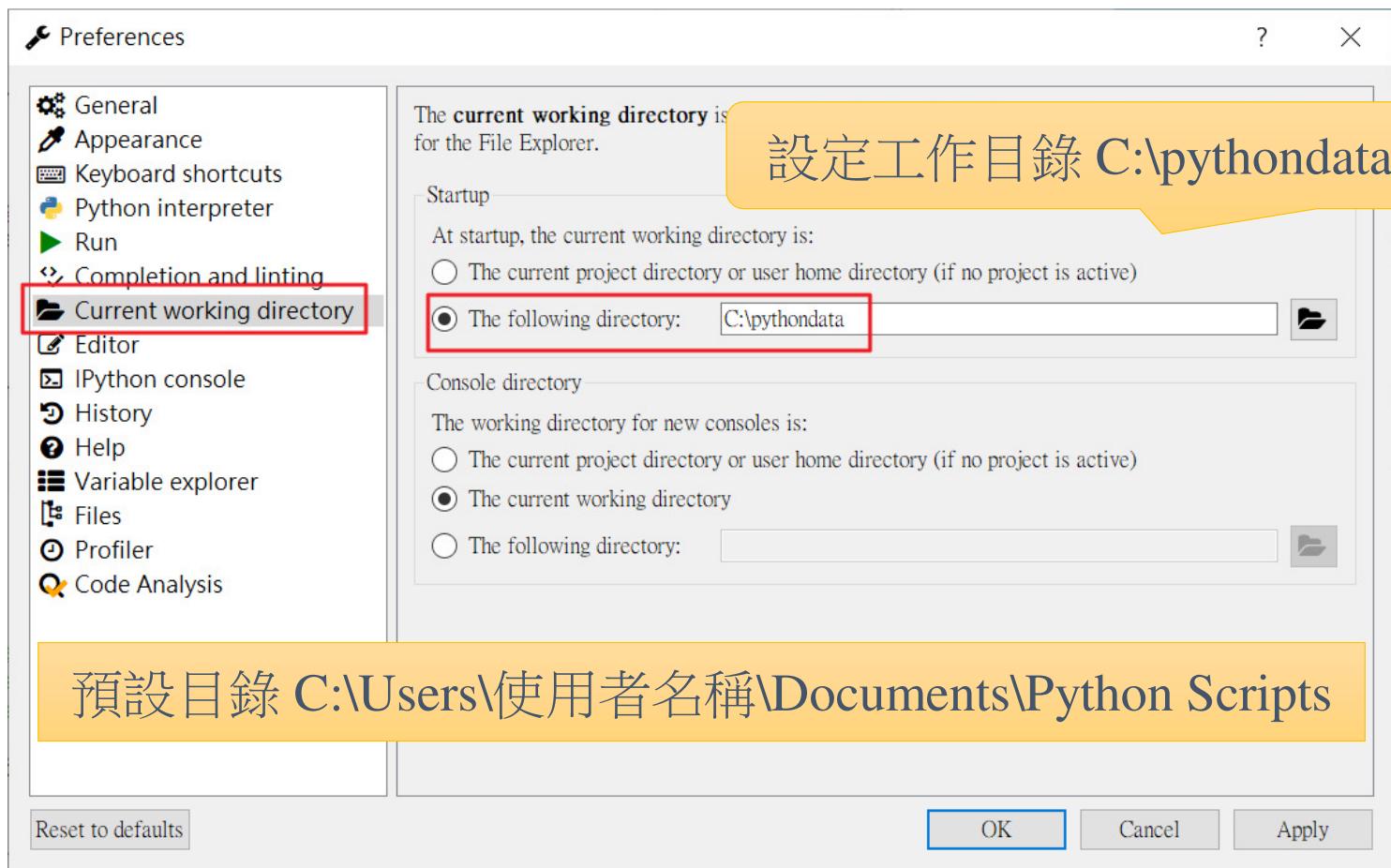
# Appearance: 佈景主題 / 字型大小



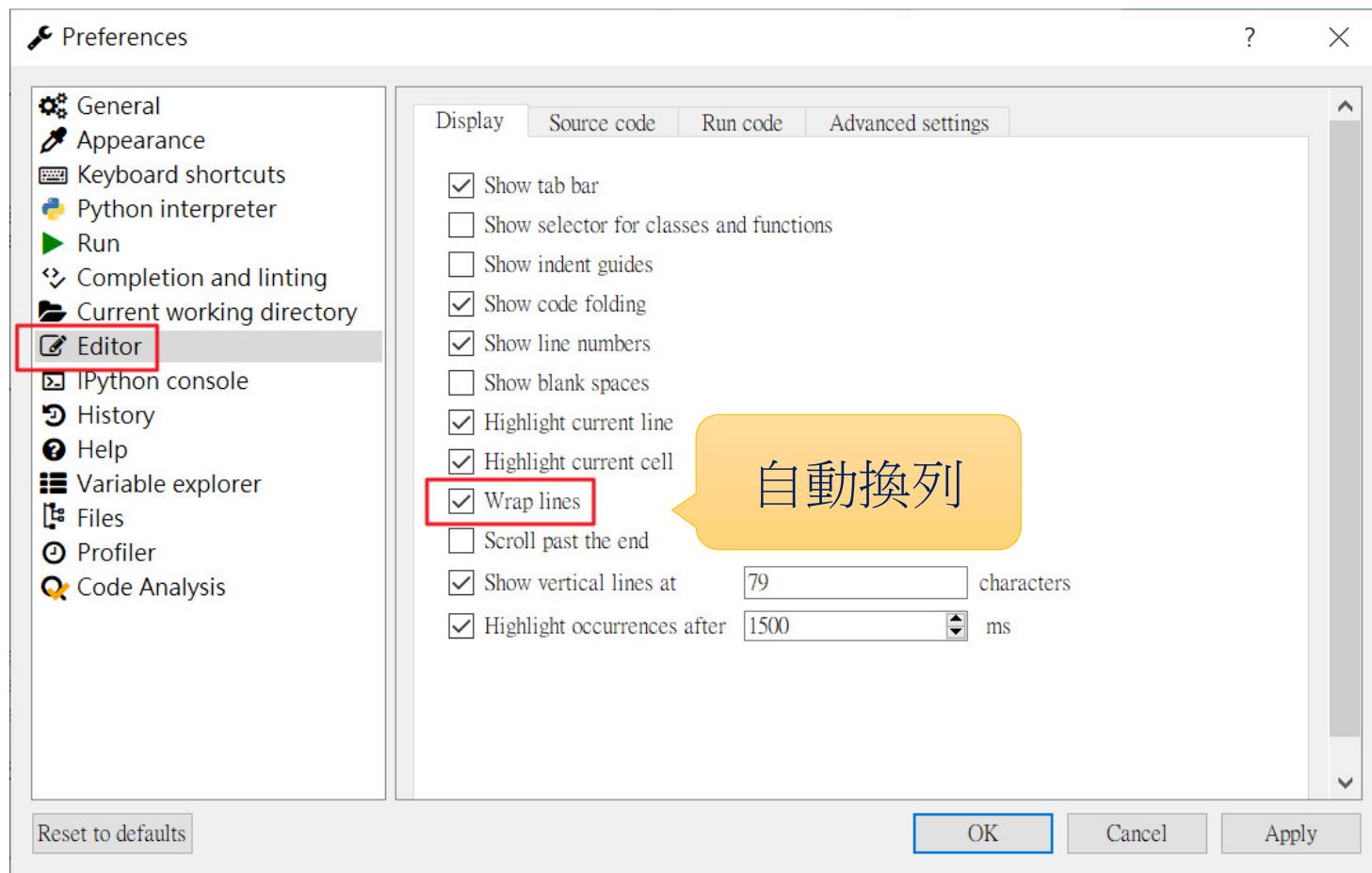
# Keyboard shortcuts 快速鍵



# Current working directory 工作目錄



# Editor: Wrap lines 自動換列



# Python 程式設計-李明昌 免費電子書 - PDF 分享, 220頁

- <http://rwepa.blogspot.com/2020/02/pythonprogramminglee.html>

Python 程式設計-李明昌 <免費電子書>

**主題:** Python 程式設計-李明昌 免費電子書 - PDF 分享,  
220頁



開啟 → Python程式設計-李明昌.ipynb

### 主題: Python 程式設計-李明昌 - ipynb

檔名: Python\_Programming\_Lee\_ipynb.zip

包括 Python 程式設計-李明昌電子書的原始 ipynb 檔案, 圖檔, 部分資料集

下載: [https://github.com/rwepa/DataDemo/blob/master/Python\\_Programming\\_Lee\\_ipynb.zip](https://github.com/rwepa/DataDemo/blob/master/Python_Programming_Lee_ipynb.zip)

| Python_Programming_Lee_ipynb.zip > python.book.lee > |          |
|--|----------|
| 名稱   | 類型       |
| .ipynb_checkpoints                                   | 檔案資料夾    |
| data   | 檔案資料夾    |
| img  | 檔案資料夾    |
| Python程式設計-李明昌.ipynb                                 | IPYNB 檔案 |

## 2. 視窗設計 - tkinter套件

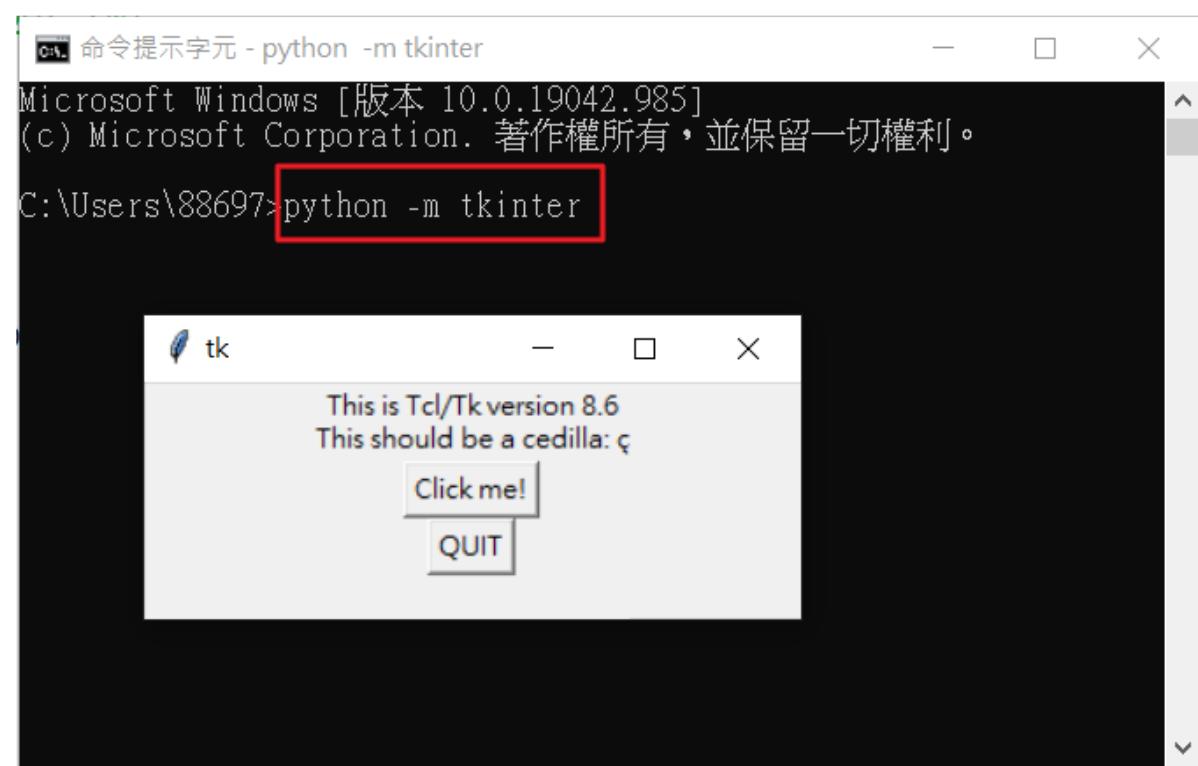
---

# 視窗設計 - tkinter 模組

- **tkinter** 套件 - Python內建的圖形使用者介面 (Graphical User Interface, GUI)，例：使用選單，滑桿，按鈕等元件（控制項），製作使用者可以互動的介面，以提供決策者進一步資料分析與提升決策品質。
- **tkinter** 表示 **Tk interface** (Tk介面) 縮寫。
- Tk是開放原始碼的圖形化使用者介面開發工具，提供許多常用的圖形介面元件，具有跨平台、輕量化等特色。
- Tk最初發展於1991年，是以Tcl 語言撰寫的擴充套件，目前 Python、R、Ruby、Perl、Common Lisp、Java、C與C++等多種版本，並可在Linux、Unix、Mac、Windows等作業系統執行。

# 開啟範例視窗

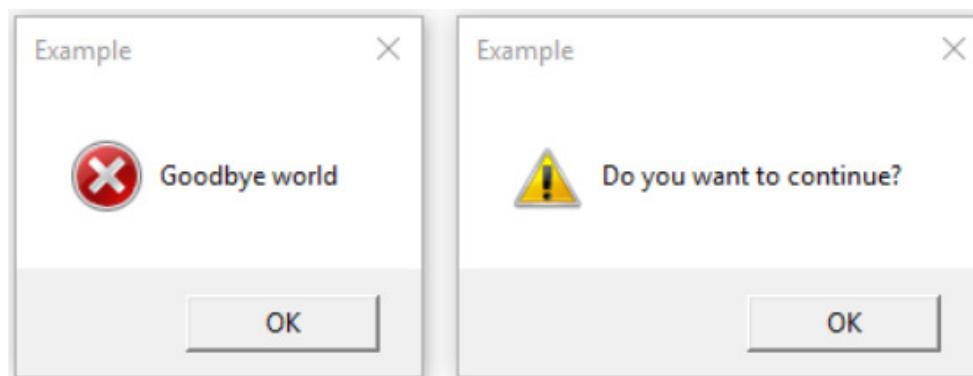
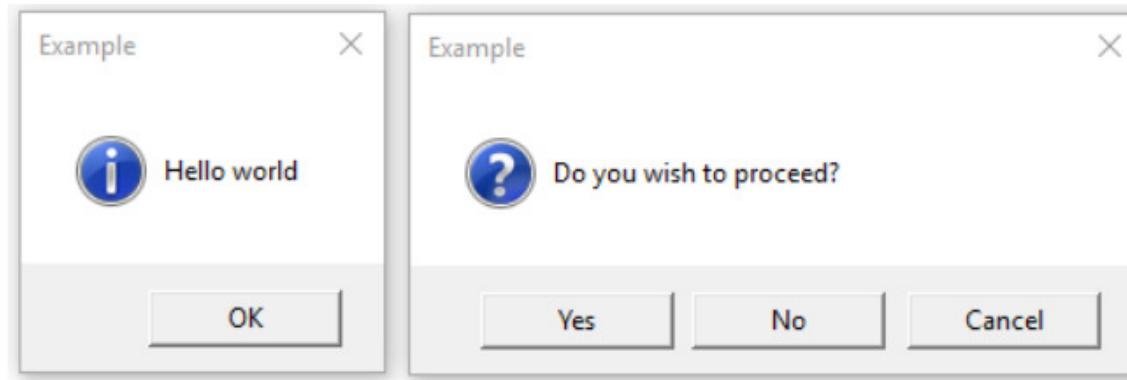
- 命令提示列  
**python -m tkinter**



# Python – tkinter 常用元件

| Tkinter 類別         | 功能              | Tkinter 類別        | 功能                  |
|--------------------|-----------------|-------------------|---------------------|
| <b>frame</b>       | 視窗              | <b>menu</b>       | 選單列的下拉式選單           |
| <b>label</b>       | 文字標籤            | <b>labelframe</b> | 文字標籤視窗              |
| <b>text</b>        | 文字方塊            | <b>menubutton</b> | 選單的選項               |
| <b>button</b>      | 按鈕              | <b>messagebox</b> | 訊息方塊，顯示通知，錯誤，警告訊息   |
| <b>canvas</b>      | 畫圖，可以用來繪圖、加入文字等 | <b>optionmenu</b> | 下拉式的選項選單            |
| <b>checkbutton</b> | 核取按鈕            | <b>panewindow</b> | 類似 Frame ，可包含其他視窗元件 |
| <b>radiobutton</b> | 單選按鈕            | <b>scale</b>      | 滑桿                  |
| <b>entry</b>       | 文字方塊            | <b>scrollbar</b>  | 捲軸                  |
| <b>listbox</b>     | 清單方塊            | <b>spinbox</b>    | 微調器                 |
| <b>menu</b>        | 選單列的下拉式選單       | <b>toplevel</b>   | 新增視窗                |

# Python - tkinter.messagebox



# python\_tkinter.py

```
# ex1 第一個範例
from tkinter import *
window = Tk() # 建立初使化物件
window.title("我的第1個Python視窗-107400168李明昌") # 視窗標題
window.mainloop() #
```



- `window.mainloop()`：Python 執行 Tkinter 事件循環。
- 此方法偵聽事件，例如按鈕，並暫停後續的程式執行，直到關閉視窗為止。

關閉視窗

# ex2 文字與按鈕範例

```
# ex2 文字與按鈕範例
from tkinter import *
window = Tk()
window.title("按鈕範例")
window.geometry('300x200')

# 建立文字
lbl = Label(window, text="Hello World!")
lbl.grid(column=0, row=0)

# 建立按鈕
btn = Button(window, text="按我")
btn.grid(column=1, row=0)

window.mainloop()
```



# ex3 按鈕事件

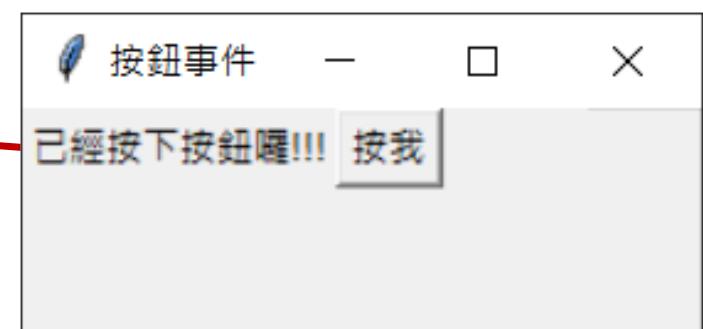
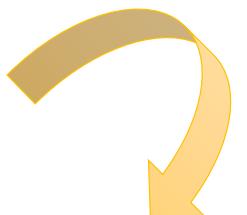
```
# ex3 按鈕事件
from tkinter import *
window = Tk()
window.title("按鈕事件")
window.geometry('200x200')

lbl = Label(window, text="請按下按鈕!")
lbl.grid(column=0, row=0)

# 按鈕事件
def clicked():
    lbl.configure(text="已經按下按鈕囉!!!")

btn = Button(window, text="按我", command=clicked)
btn.grid(column=1, row=0)

window.mainloop()
```



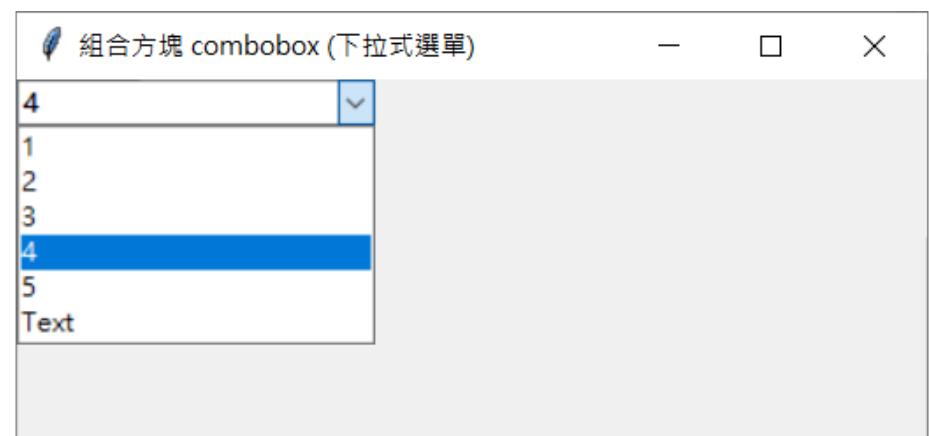
# ex4 組合方塊 combobox (下拉式選單)

```
# ex4 組合方塊 combobox (下拉式選單)
from tkinter import *
from tkinter.ttk import *

window = Tk()
window.title("組合方塊 combobox (下拉式選單)")
window.geometry('350x200')
combo = Combobox(window)

combo['values'] = (1, 2, 3, 4, 5, "Text")
combo.current(1) #set the selected item
combo.grid(column=0, row=0)

window.mainloop()
```



# Ex5 滑桿 scale

```
# ex5 滑桿 scale
from tkinter import *

window = Tk()
window.title("滑桿 scale")

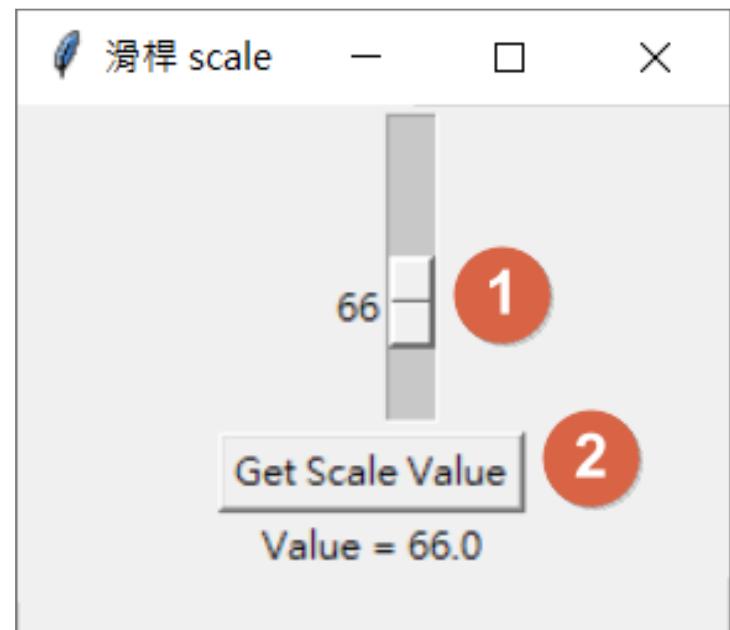
var = DoubleVar()
scale = Scale(window, variable = var )
scale.pack(anchor=CENTER)

def sel():
    selection = "Value = " + str(var.get())
    label.config(text = selection)

button = Button(window, text="Get Scale Value", command=sel)
button.pack(anchor=CENTER)

label = Label(window)
label.pack()

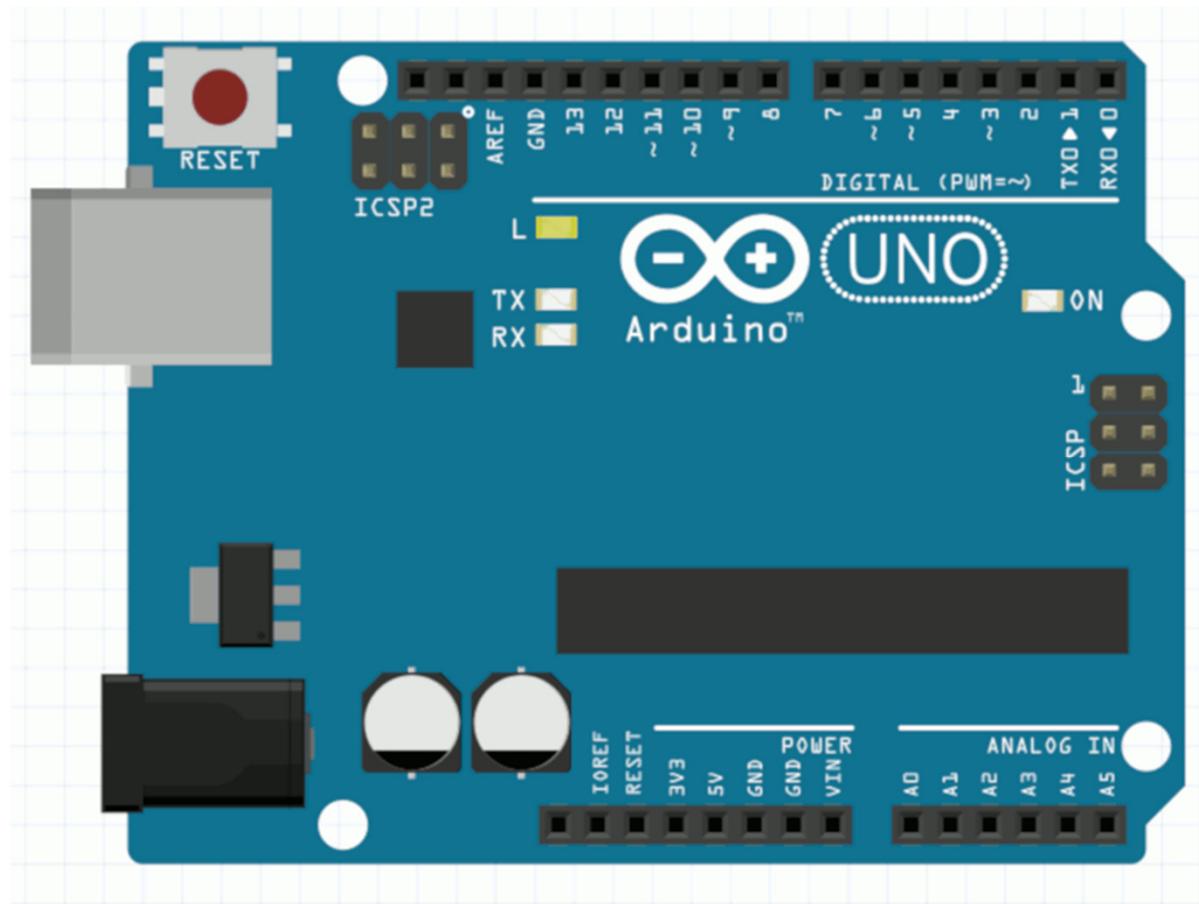
@RWEPA window.mainloop()
```



# 3. Arduino 簡介

---

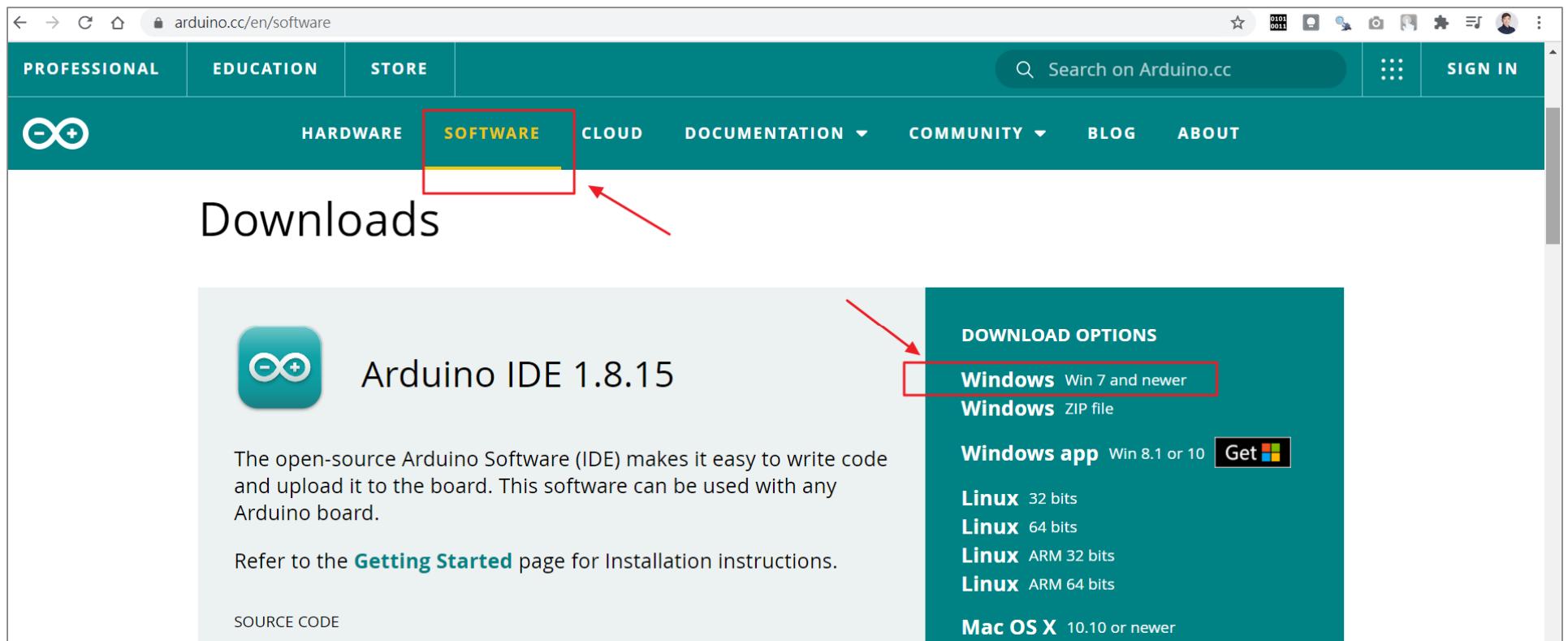
# Arduino硬體圖



# Arduino 簡介

- Arduino 秉持著具多樣性、簡易使用的精神，設計出結合了軟硬體且開放式原始碼的電控平台。
- Arduino除了在傳統嵌入式系統上的運用外，可以快速的結合各式感測器，來作偵測或辨識，並可透過控制光、馬達等 各式 I/O 裝置及各式驅動器來控制周遭環境或達成你想要的目的。
- Arduino利用類似Java，C 語言的 Arduino programming language 。
- Arduino開發IDE介面基於開放原始碼原(open source)，可以讓您免費下載使用。

<https://www.arduino.cc/en/software>



The screenshot shows the Arduino website at <https://www.arduino.cc/en/software>. The top navigation bar has tabs for PROFESSIONAL, EDUCATION, STORE, SOFTWARE (which is highlighted with a red box), CLOUD, DOCUMENTATION, COMMUNITY, BLOG, and ABOUT. A search bar and a sign-in button are also present. Below the navigation, there's a section titled "Downloads". On the left, there's an icon of the Arduino logo and the text "Arduino IDE 1.8.15". A paragraph describes the IDE as open-source software for writing code and uploading it to boards. It links to the "Getting Started" page for installation instructions. There's also a "SOURCE CODE" link. On the right, a "DOWNLOAD OPTIONS" section is shown with a red box around the "Windows" options. It lists "Windows Win 7 and newer", "Windows ZIP file", "Windows app Win 8.1 or 10" with a "Get" button, "Linux 32 bits", "Linux 64 bits", "Linux ARM 32 bits", "Linux ARM 64 bits", and "Mac OS X 10.10 or newer".

## 4. Python + Arduino - LED 實作

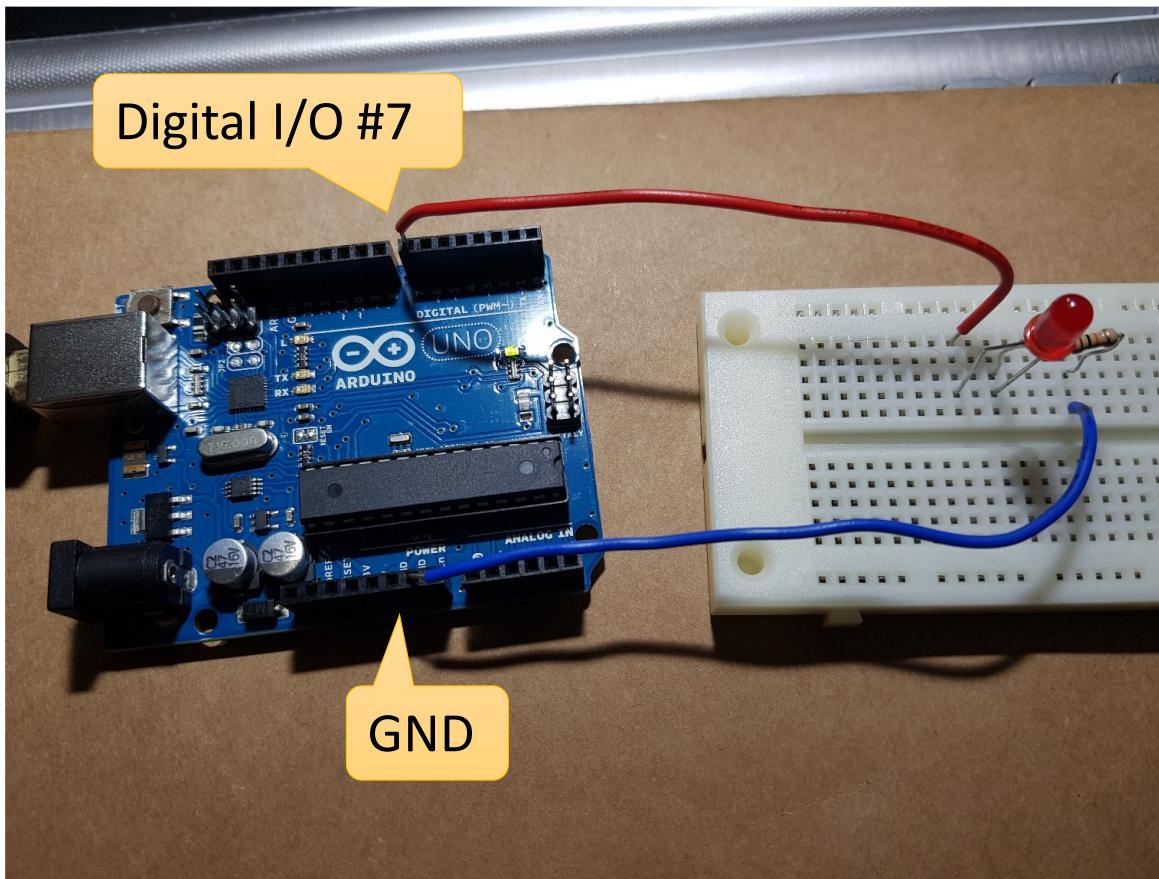
---

# 範例1 Arduino + LED

---

- Arduino 板子
- LED
- 電阻  $1K\Omega$
- 接線
- 麵包板

# 範例1 Arduino + LED



- LED 長腳接 Digital I/O #7
- 電阻接地 GND

# 程式碼 arduino\_led.ino

```
arduino_led
1/* 
2 file : arduino_led.ino
3 author: Ming-Chang Lee
4 email : alan9956@gmail.com
5 RWEPA : http://rwepa.blogspot.tw/
6 date : 2021.5.28
7 */
8
9 int led = 7;
10
11 void setup() {
12     pinMode(led, OUTPUT);
13 }
14
15 void loop() {
16     digitalWrite(led, HIGH);
17     delay(1000);
18     digitalWrite(led, LOW);
19     delay(1000);
20 }
```



<https://youtu.be/9nDX06hpkXM>

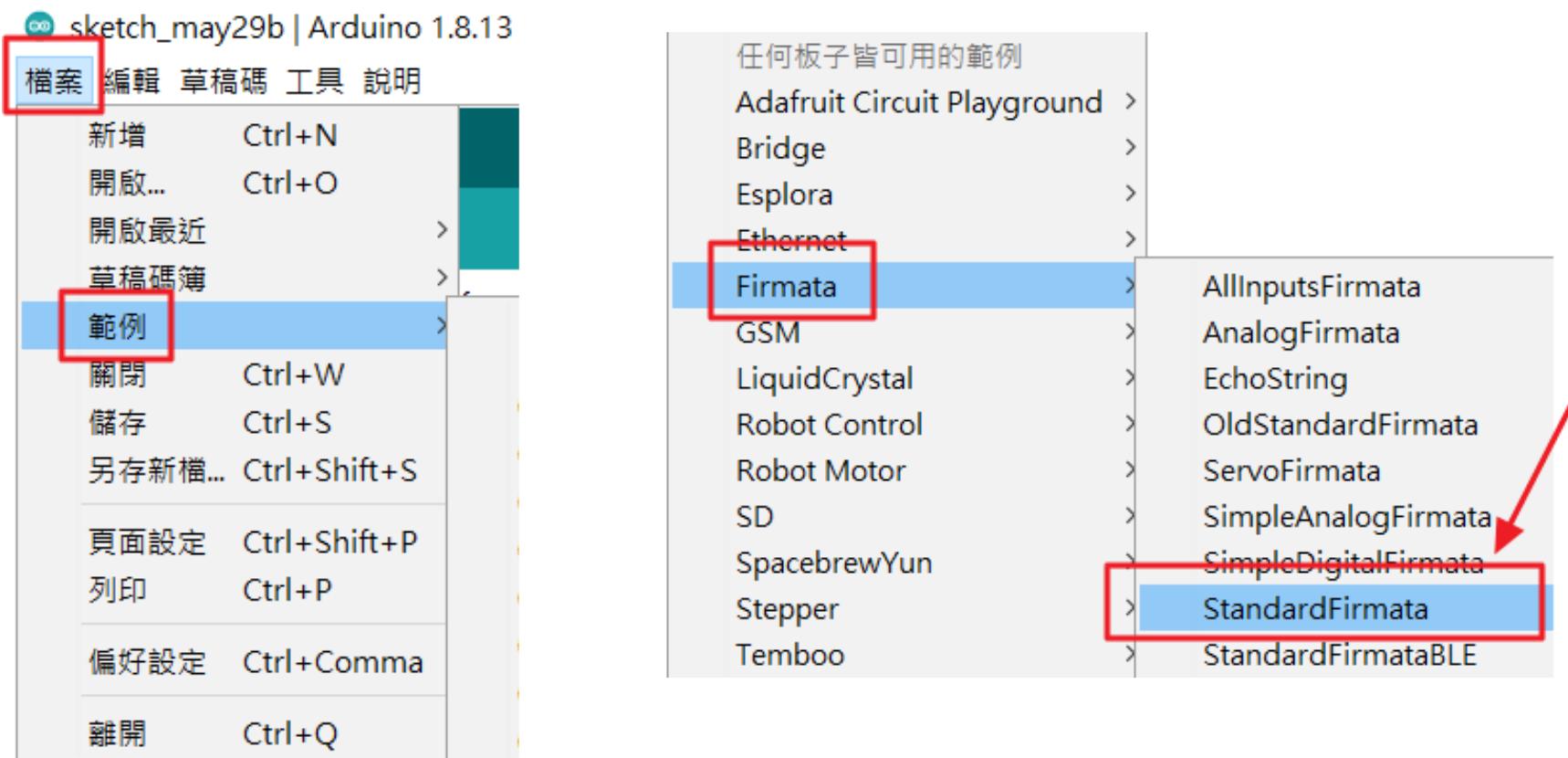
# 範例2 Arduino – Firmata

---

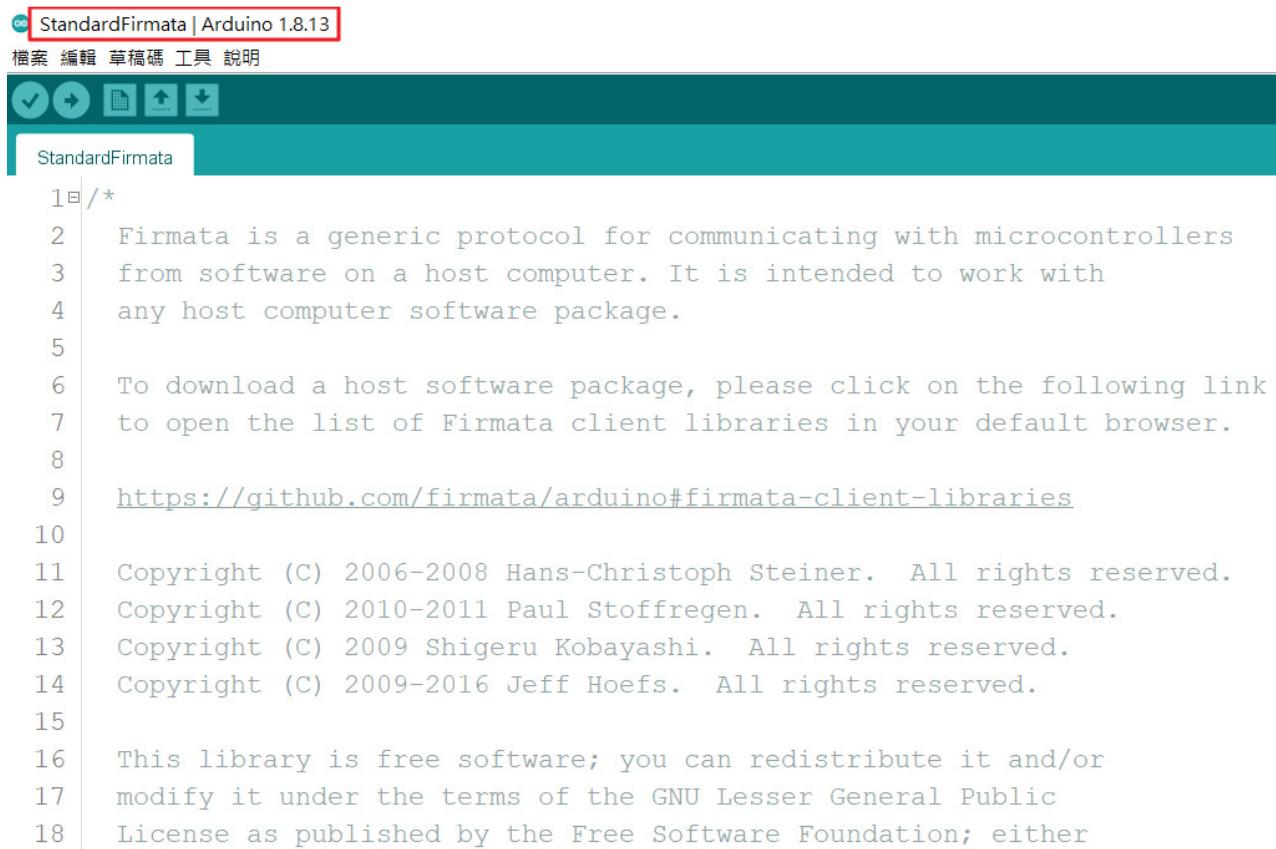
- Firmata 是一個控制器通訊協定。
- 使用該協定，可以讓電腦或手持式裝置進行Arduino控制。

# StandardFimata

- 檔案 \ 範例 \ Fimata\ StandardFimata



# 範例: StandardFimata.ino



The screenshot shows the Arduino IDE interface with the title bar "StandardFimata | Arduino 1.8.13". Below the title bar is a menu bar with "檔案" (File), "編輯" (Edit), "草稿碼" (Sketch), "工具" (Tools), and "說明" (Help). The main workspace displays the "StandardFimata" sketch. The code is as follows:

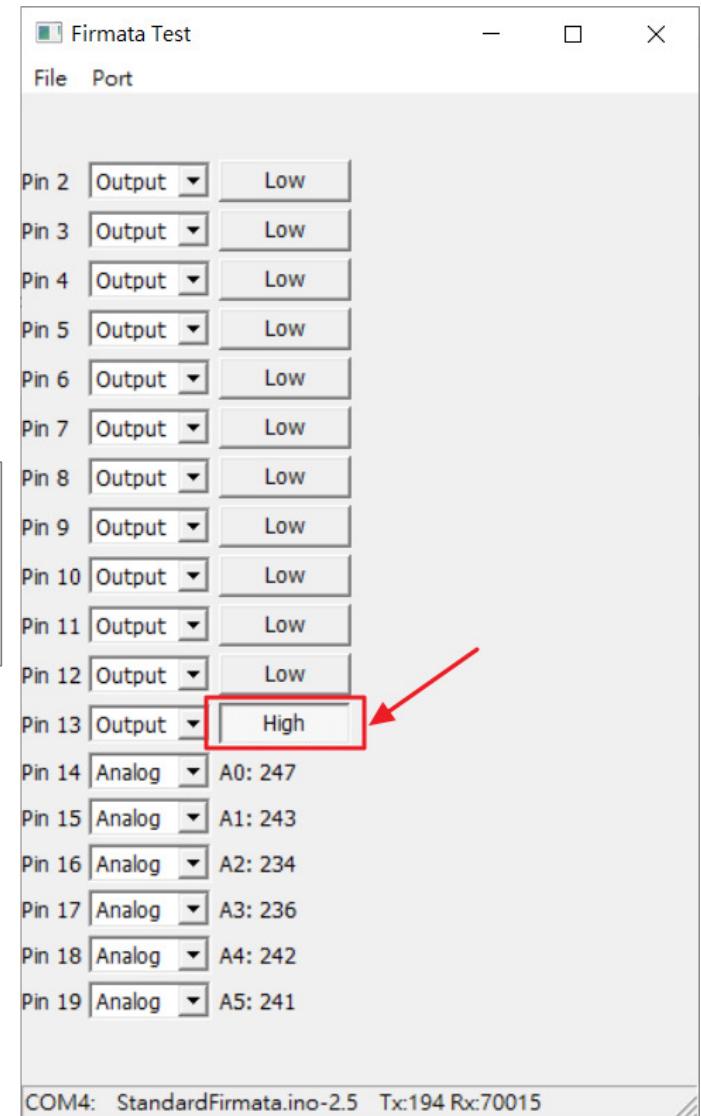
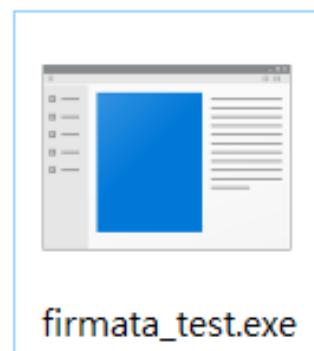
```
1 ///*
2 Firmata is a generic protocol for communicating with microcontrollers
3 from software on a host computer. It is intended to work with
4 any host computer software package.
5
6 To download a host software package, please click on the following link
7 to open the list of Firmata client libraries in your default browser.
8
9 https://github.com/firmata/arduino#firmata-client-libraries
10
11 Copyright (C) 2006-2008 Hans-Christoph Steiner. All rights reserved.
12 Copyright (C) 2010-2011 Paul Stoffregen. All rights reserved.
13 Copyright (C) 2009 Shigeru Kobayashi. All rights reserved.
14 Copyright (C) 2009-2016 Jeff Hoefs. All rights reserved.
15
16 This library is free software; you can redistribute it and/or
17 modify it under the terms of the GNU Lesser General Public
18 License as published by the Free Software Foundation; either
```

# Fimata 測試程式

- 下載測試程式
- [http://www.firmata.org/wiki/Main\\_Page](http://www.firmata.org/wiki/Main_Page)

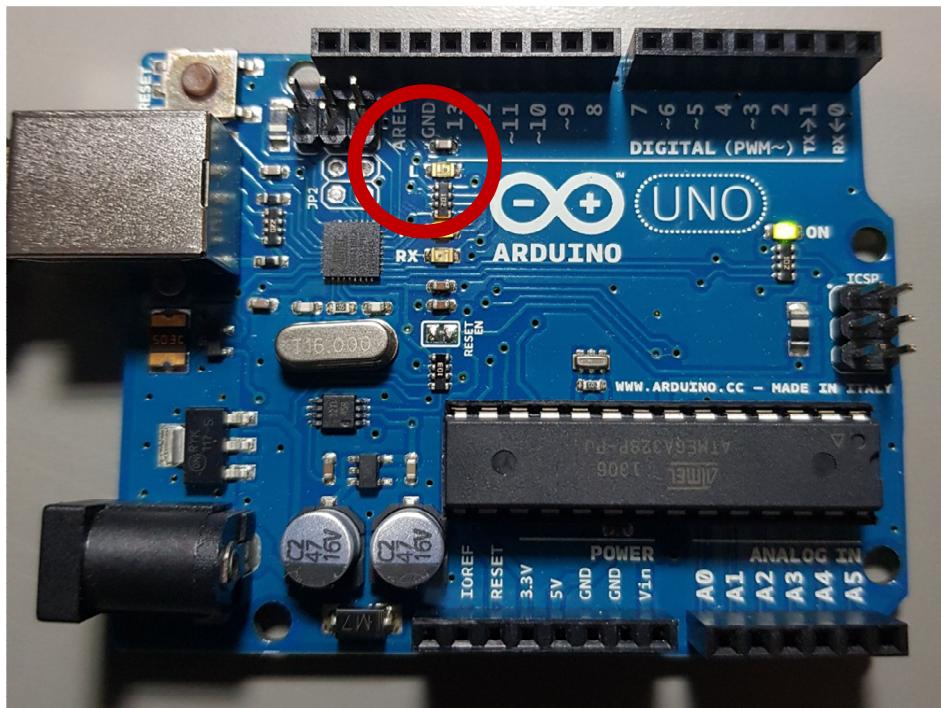
For Windows

[http://www.pjrc.com/teensy/firmata\\_test/firmata\\_test.exe](http://www.pjrc.com/teensy/firmata_test/firmata_test.exe)



# Fimata 測試

Pin 13 Low



Pin 13 High

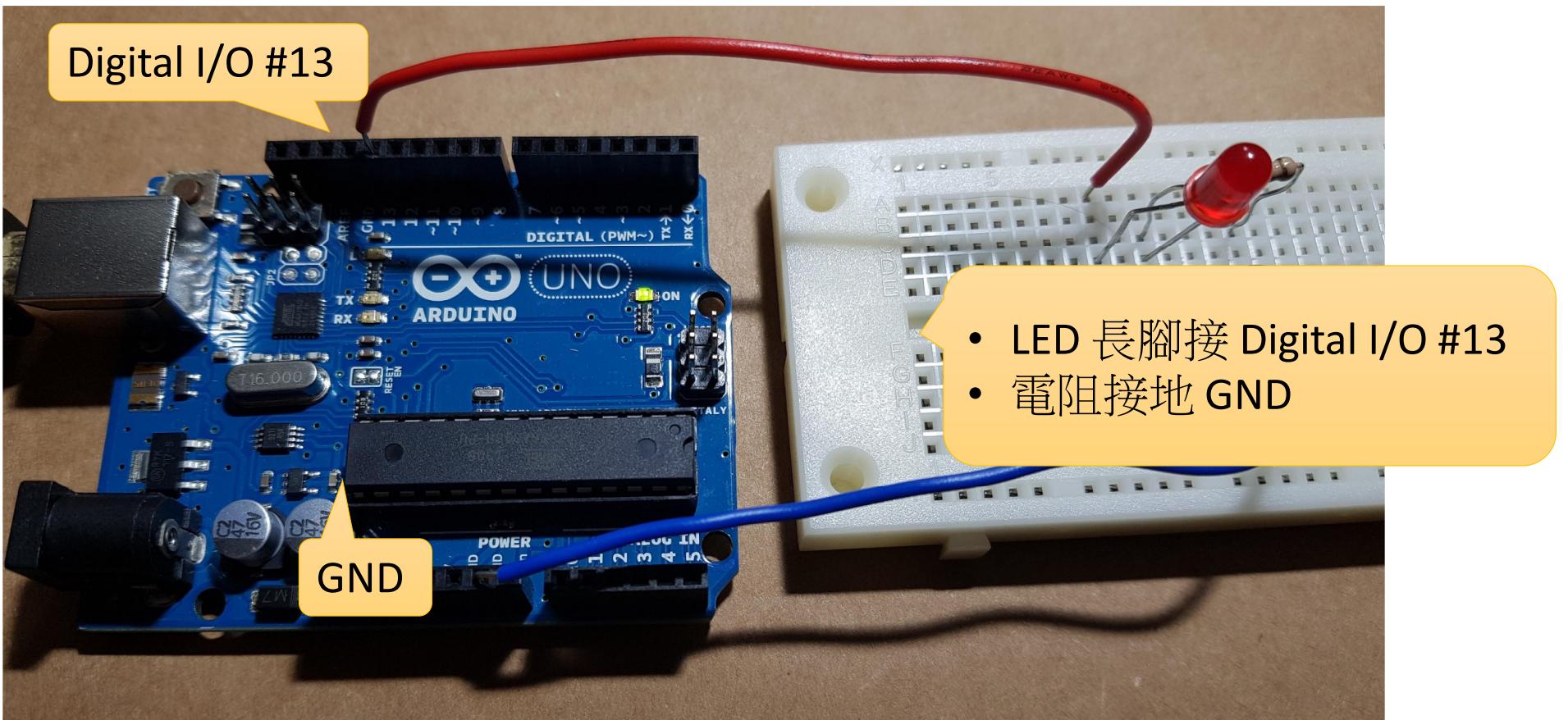


# 範例3 Arduino + Python- pyfirmata 套件

---

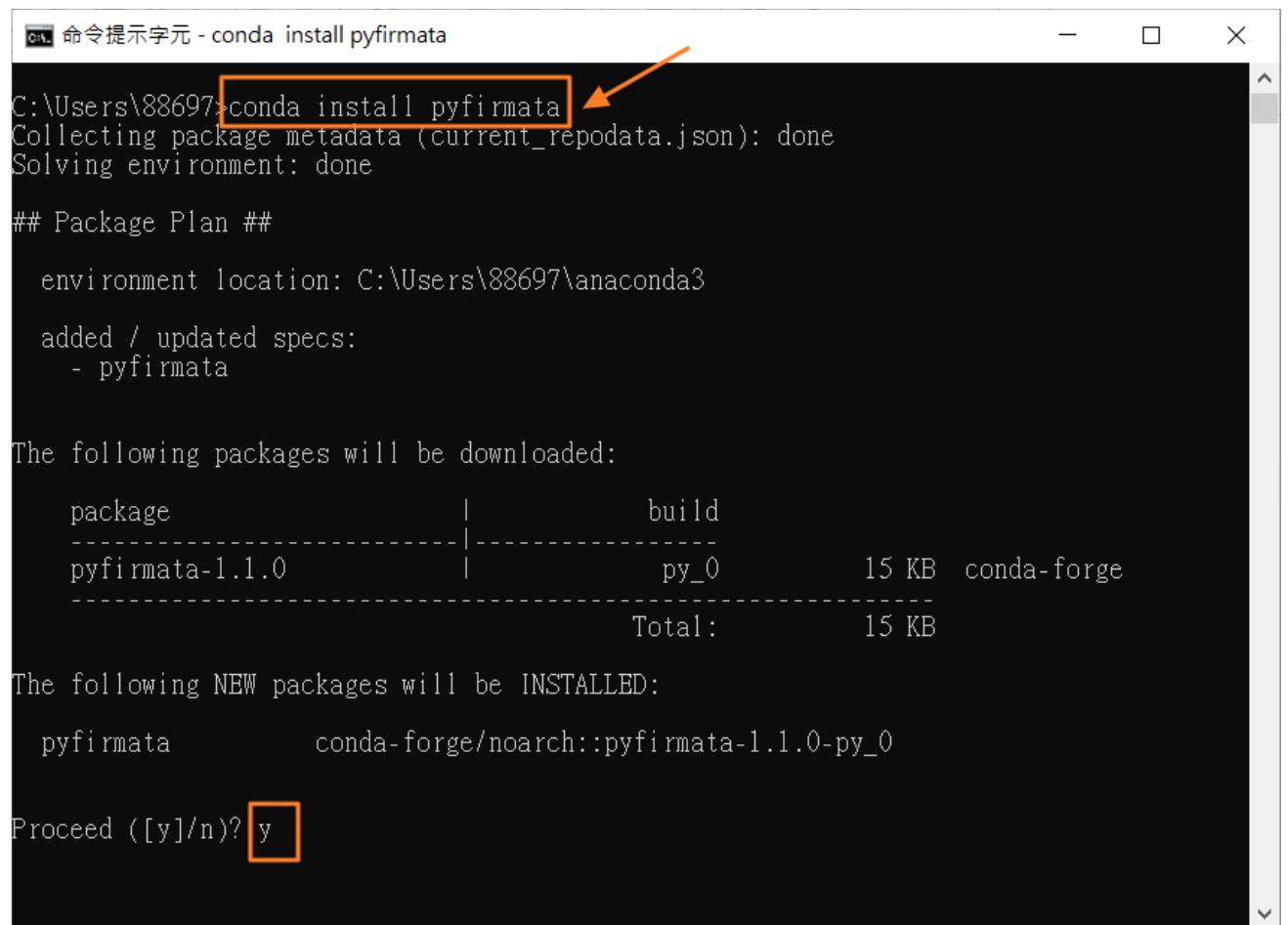
- 使用 pyfirmata 套件可以與 Arduino 連結

# 範例3 Arduino + Python- pyfirmata 套件



# 安裝 pySerial 套件

- 方法1:  
`conda install pyfirmata`
- 方法2:  
`pip install pyfirmata`



The screenshot shows a terminal window titled "命令提示字元 - conda install pyfirmata". The command entered is "C:\Users\88697>conda install pyfirmata". An orange box highlights this command, and an orange arrow points from it to the question "Proceed ([y]/n)?". The terminal output includes:

```
C:\Users\88697>conda install pyfirmata
Collecting package metadata (current_repodata.json): done
Solving environment: done

## Package Plan ##

environment location: C:\Users\88697\anaconda3

added / updated specs:
- pyfirmata

The following packages will be downloaded:

  package          |      build
pyfirmata-1.1.0   | py_0           15 KB  conda-forge
                                                               Total:        15 KB

The following NEW packages will be INSTALLED:

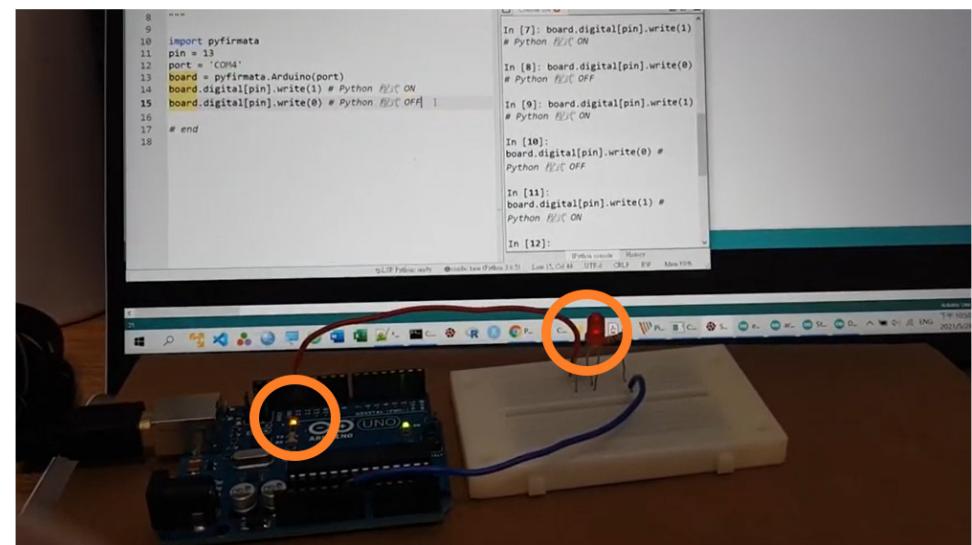
  pyfirmata         conda-forge/noarch::pyfirmata-1.1.0-py_0

Proceed ([y]/n)? 
```

# python\_arduino\_led.py

```
python_arduino_led.py ✘
```

```
1 # -*- coding: utf-8 -*-
2 """
3     file  : python_arduino_led.py
4     author: Ming-Chang Lee
5     email : alan9956@gmail.com
6     RWEPA : http://rwepa.blogspot.tw/
7     date  : 2021.5.28
8 """
9
10 # conda install pyfirmata
11 import pyfirmata
12 pin = 13
13 port = 'COM4'
14 board = pyfirmata.Arduino(port)
15 board.digital[pin].write(1) # Python 程式 ON
16 board.digital[pin].write(0) # Python 程式 OFF
```



[https://youtu.be/YGpsoZ5n\\_Tg](https://youtu.be/YGpsoZ5n_Tg)

# 範例4 Arduino + Python- pySerial 套件

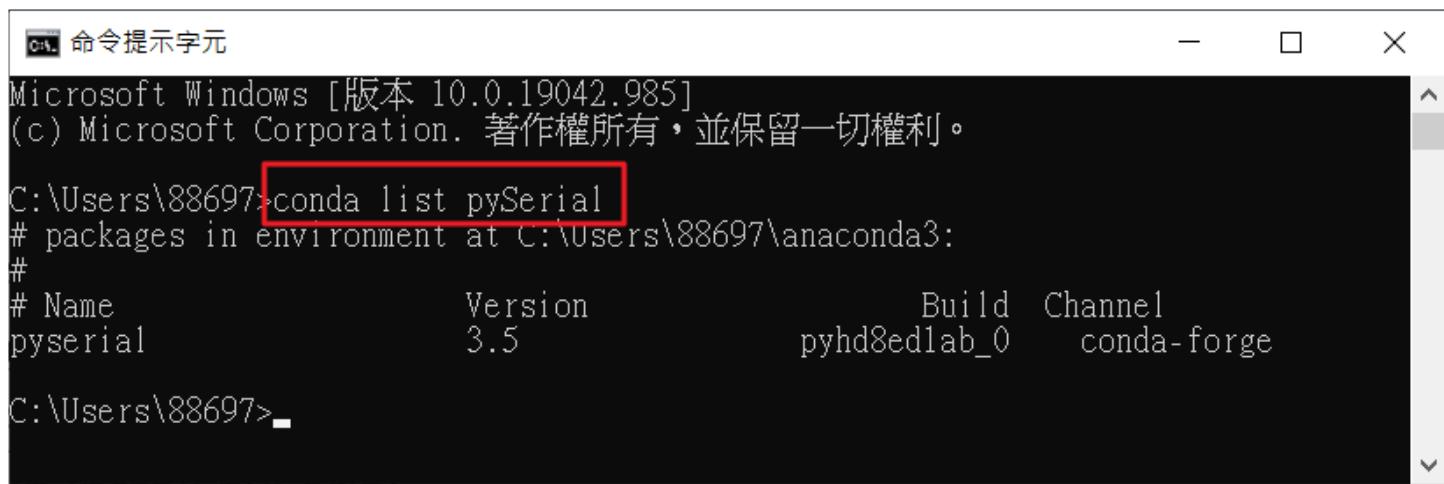
---

- 使用 pySerial 套件可以與 Arduino 連結

# 步驟1: 下載套件

- 方法1:  
conda install pySerial
- 方法2:  
pip install pySerial

顯示版本: conda list pySerial

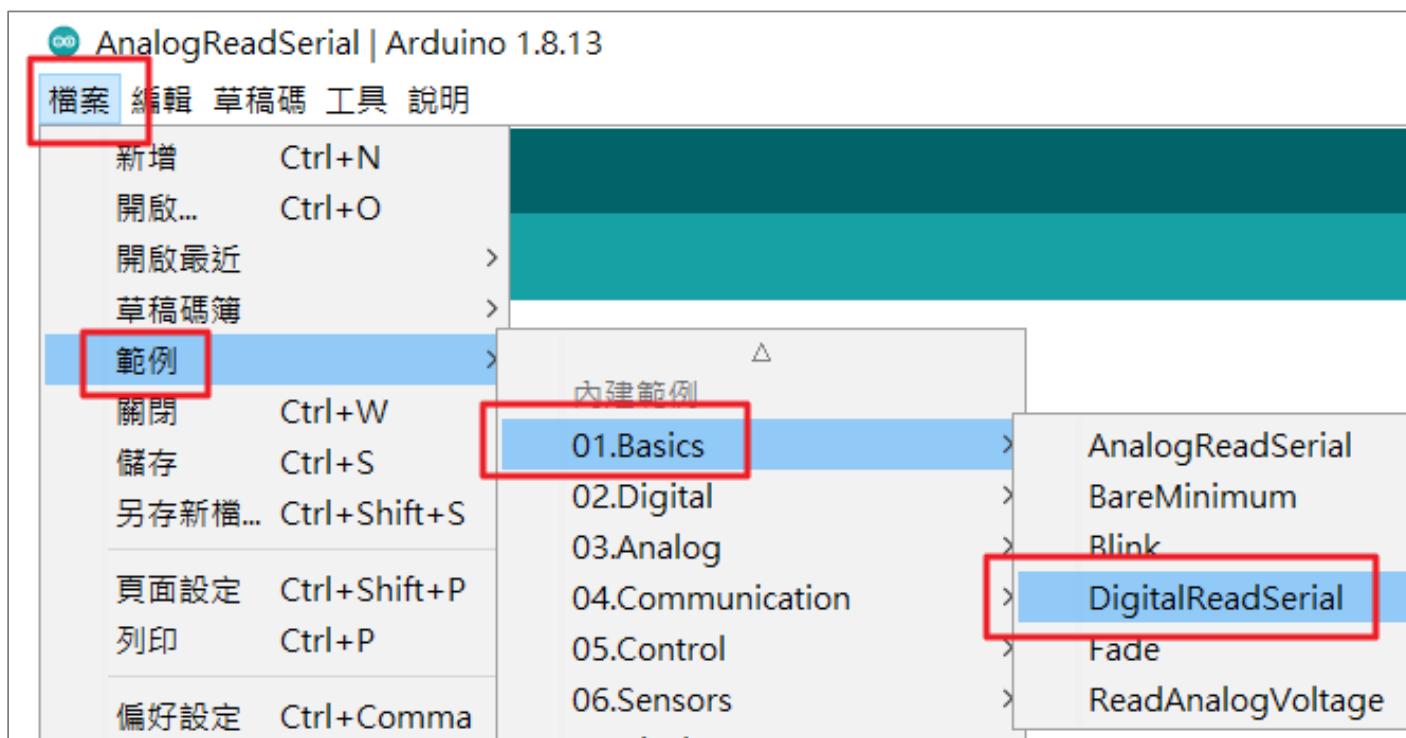


```
命令提示字元
Microsoft Windows [版本 10.0.19042.985]
(c) Microsoft Corporation. 著作權所有，並保留一切權利。
C:\Users\88697>conda list pySerial
# packages in environment at C:\Users\88697\anaconda3:
#
#          Name                    Version         Build  Channel
pyserial           3.5            pyhd8edlab_0  conda-forge

C:\Users\88697>
```

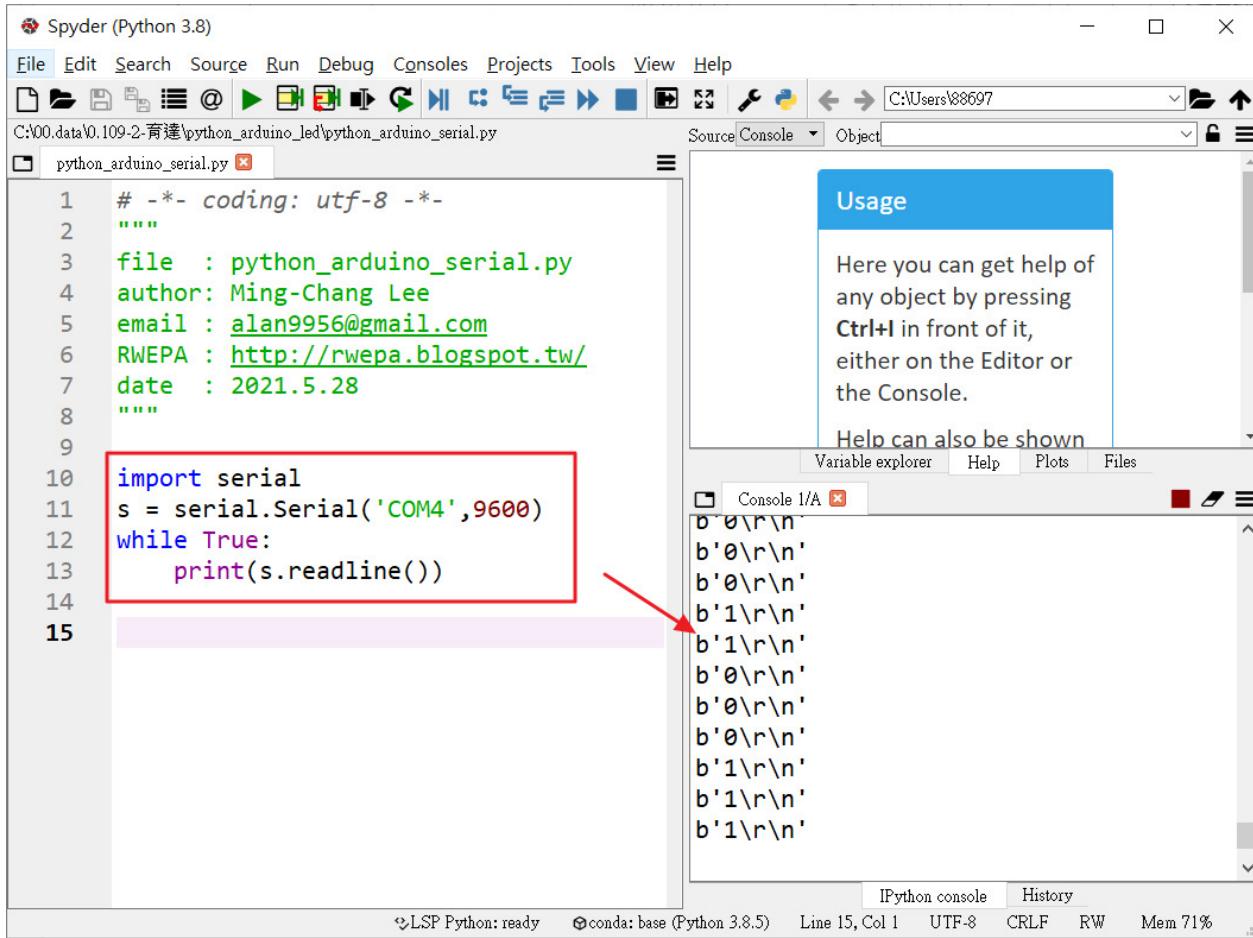
# 步驟2: 開啟 DigitalReadSerial

- 檔案 \ 範例 \ 01.Basics \ DigitalReadSerial → 驗證 → 上傳



- 上傳時，先關閉 Spyder 比較沒問題。

# 步驟3: python\_arduino\_serial.py



The screenshot shows the Spyder Python 3.8 IDE interface. The main window displays the code for `python_arduino_serial.py`. A red box highlights the following code block:

```
# -*- coding: utf-8 -*-
"""
file  : python_arduino_serial.py
author: Ming-Chang Lee
email : alan9956@gmail.com
RWEPA : http://rwepa.blogspot.tw/
date  : 2021.5.28
"""

import serial
s = serial.Serial('COM4',9600)
while True:
    print(s.readline())
```

An arrow points from the right margin of the highlighted code block to the `Console 1/A` window, which shows the output of the `s.readline()` command. The console output consists of alternating binary strings `b'0\r\n'` and `b'1\r\n'`, indicating the state of the digital pins being read.

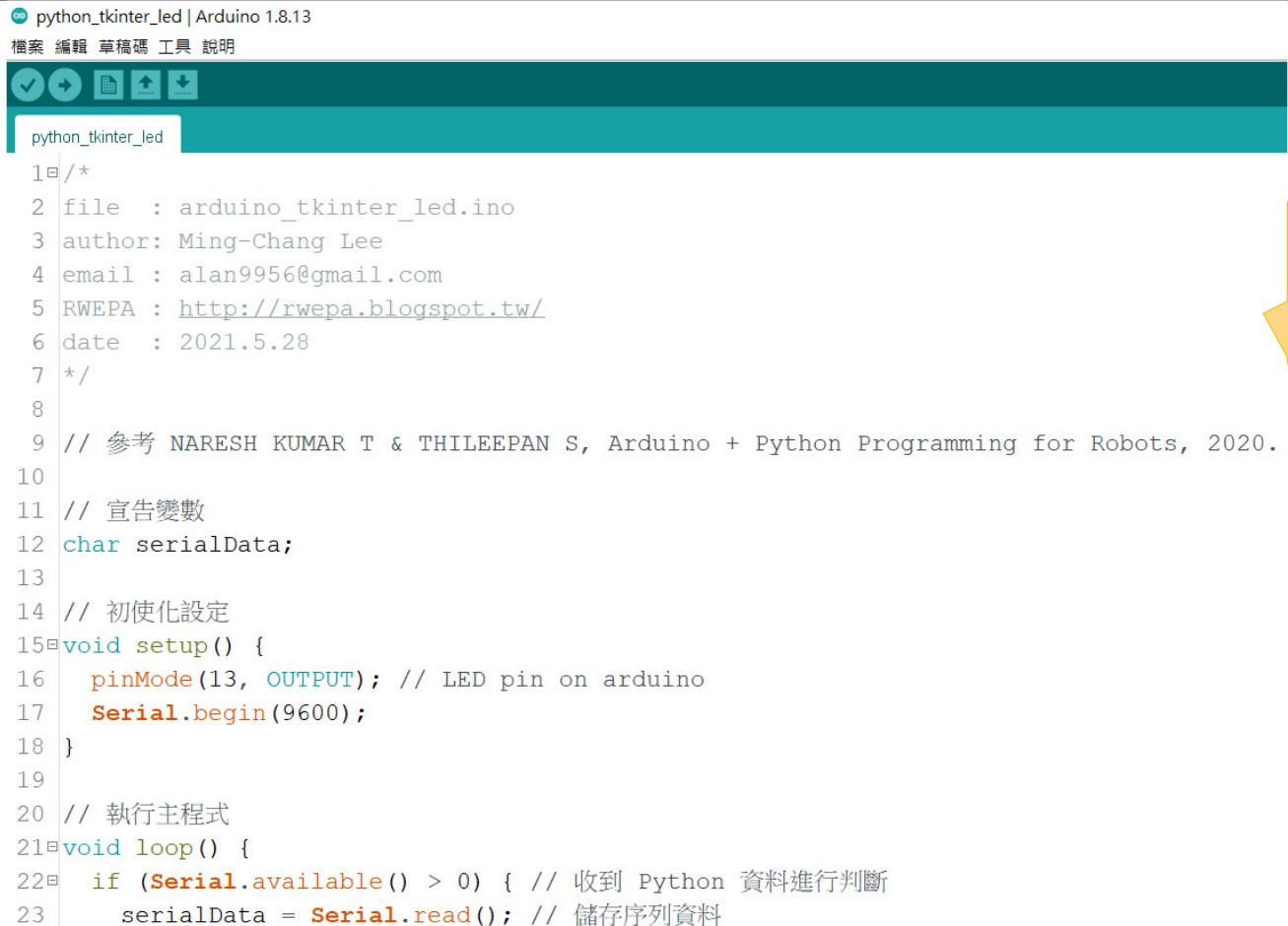
Console 1/A output:

```
b'0\r\n'
b'0\r\n'
b'0\r\n'
b'1\r\n'
b'1\r\n'
b'0\r\n'
b'0\r\n'
b'0\r\n'
b'1\r\n'
b'1\r\n'
b'1\r\n'
```

# 範例5 Arduino + Python - tkinter - 套件

---

# 步驟1: arduino\_tkinter\_led.ino



```
python_tkinter_led | Arduino 1.8.13
檔案 編輯 草稿碼 工具 說明
python_tkinter_led

1/* 
2 file   : arduino_tkinter_led.ino
3 author: Ming-Chang Lee
4 email : alan9956@gmail.com
5 RWEPA : http://rwepa.blogspot.tw/
6 date   : 2021.5.28
7 */
8
9 // 參考 NARESH KUMAR T & THILEEPAN S, Arduino + Python Programming for Robots, 2020.
10
11 // 壓告變數
12 char serialData;
13
14 // 初使化設定
15 void setup() {
16     pinMode(13, OUTPUT); // LED pin on arduino
17     Serial.begin(9600);
18 }
19
20 // 執行主程式
21 void loop() {
22     if (Serial.available() > 0) { // 收到 Python 資料進行判斷
23         serialData = Serial.read(); // 儲存序列資料
24     }
25     if (serialData == '1') { // 判斷串列資料是否為 1
26         digitalWrite(13, HIGH); // 若為 1 則打開 LED
27     } else {
28         digitalWrite(13, LOW); // 否則關閉 LED
29     }
30 }
```

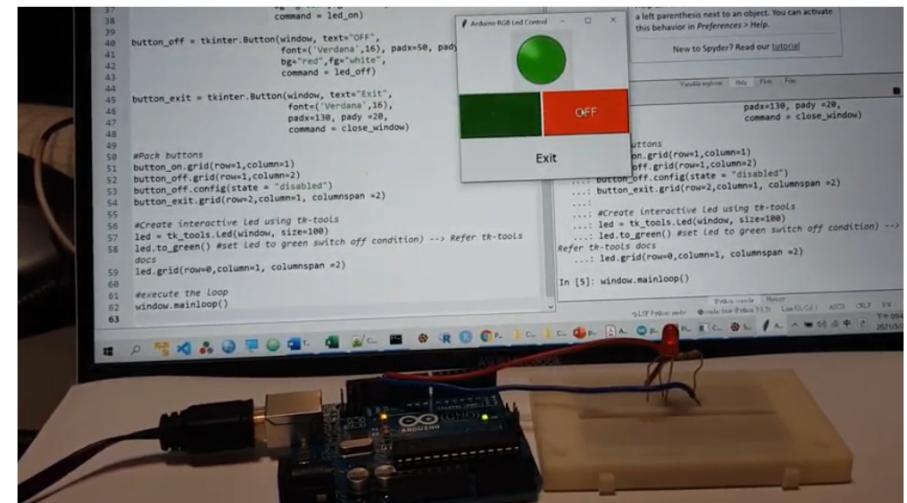
- 關閉 Spyder
- 驗證 → 上傳

# 步驟2: python\_tkinter\_led.py

```

1  # -*- coding: utf-8 -*-
2  """
3      file : python_tkinter_led.py
4      author: Ming-Chang Lee
5      email : alan9956@gmail.com
6      RWEPA : http://rwepa.blogspot.tw/
7      date  : 2021.5.28
8  """
9
10 # Import following packages
11 import serial
12 import tkinter
13 import tk_tools
14
15 # Connect to arduino via serial port
16 # com4 --> Change port accordingly to yours
17 arduino = serial.Serial('com4', 9600)
18

```



<https://youtu.be/LjgFlm1S7tw>

# 參考資料

- Python 程式設計-李明昌 免費電子書 - PDF 分享, 220頁,  
<http://rwepa.blogspot.com/2020/02/pythonprogramminglee.html>
- Python與Arduino,  
<http://andrewpythonarduino.blogspot.com/2018/04/python13-led.html>
- NARESH KUMAR T & THILEEPAN S, Arduino + Python Programming for Robots, 2020.
- tkinter - Python interface to Tcl/Tk,  
<https://docs.python.org/3/library/tkinter.html>
- Python GUI examples (Tkinter Tutorial), <https://likegeeks.com/python-gui-examples-tkinter-tutorial/>

# Q & A

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URL: <http://rwepa.blogspot.tw/>

WEB: RWPEA