
Linear Algebra

Google Colab Tutorial

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Introduction

Colaboratory, or "Colab" for short, allows you to write and execute Python in your browser, with

- Zero configuration required
- Easy sharing
 - The main reasons to use Colab in this course.
- Free access to GPUs
 - You will find it useful if you learn machine learning in the future.
- Maintained by Google → handy Google APIs

Introduction

Colab Demo: <https://reurl.cc/43p8zK>

In this demo, you will learn the following :

- Basics about Colab (how to use it)
- Connect google colab with your google drive

Modified from the ML 2021 version:

https://speech.ee.ntu.edu.tw/~hylee/ml/ml2021-course-data/hw/Colab/Google_Colab_Tutorial.pdf

You can learn more about Colab from it.

Languages in Colab

(IPython → Jupyter Notebook → Google Colab)

3 main programming languages involved in Google Colaboratory.

- Python → The **main** language (We assume you've learnt it.)
- Shell script → a script language used to control the computer a.k.a. the command line. The *bash* and *zsh* are the most common ones.
- Markdown → a *markup* language, formatting the text (and more!)

Python -- Executing Code Blocks

Simply type your Python code into a **cell**, and press Shift + Enter or click on the play button to execute it.

Tips:

1. In[1], Out[2]
2. Ctrl + Enter, Alt + Enter

```
✓ [1] 1 print("Hello world!")  
0 秒  
Hello world!
```

```
✓ [2] 1 for i in range(10):  
0 秒 2 | print(i)
```

```
↳ 0  
1  
2  
3  
4  
5  
6  
7  
8  
9
```

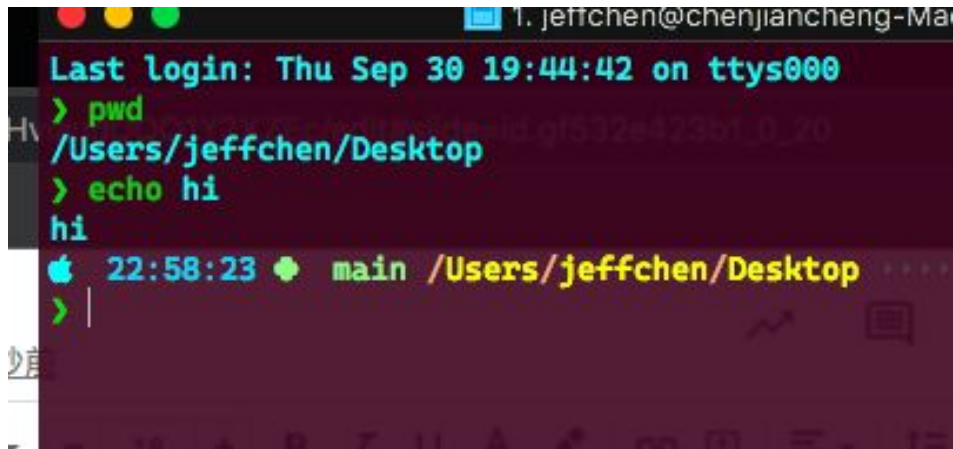
Shell Script

a.k.a. Command Line or Terminal

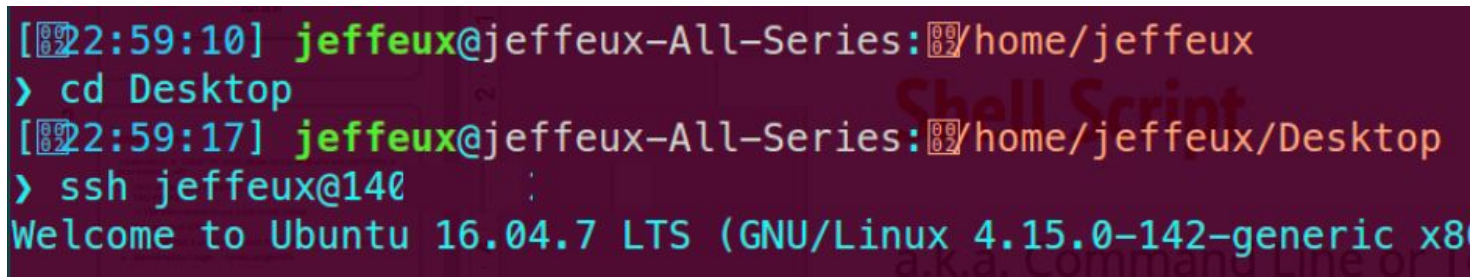
Linux or Mac OS X

(Windows computers use another language.)

- **bash**
- **zsh**



```
1. jeffchen@chenjiancheng-Ma
Last login: Thu Sep 30 19:44:42 on ttys000
> pwd
/Users/jeffchen/Desktop
> echo hi
hi
22:58:23 main /Users/jeffchen/Desktop
> |
```



```
[22:59:10] jeffex@jeffex-All-Series:~/home/jeffex
> cd Desktop
[22:59:17] jeffex@jeffex-All-Series:~/home/jeffex/Desktop
> ssh jeffex@140
Welcome to Ubuntu 16.04.7 LTS (GNU/Linux 4.15.0-142-generic x86_64)
a.k.a. Command Line or Terminal
```

Common Shell Commands

ls : List all files in the current directory (“-l” for details)

pwd : Output the working directory

cd [dir] : Move into the directory named [dir] (default to the home directory)

mv oldpath newpath : Rename or move files from oldpath to newpath

cp filename dir : Copy a file named filename into a directory named dir

echo [sometext] : display “sometext” == print in Python

cat <filename> : display the contents of filename

Common Shell Commands

touch <filename> : Create a file named <filename>

mkdir <dirname> : Create a directory named <dirname>

rm <filename> : Remove a file named <filename> ("-r" for recursively)

Be careful when using this!

rmdir <dirname> : Remove an **empty** directory named <dirname>

wget : Download files from the internet

python <python_file> : Executes a python file

Shell Script in Colab

You can use most shell script commands by prepending an exclamation mark “!”

e.g.

```
!echo
```

```
!pwd
```

```
!cp p1.py myfolder
```



The screenshot shows a terminal window with two command execution blocks. The first block shows a play button icon, a green checkmark, '0 秒', the command '!pwd', and the output '/content/sample_data'. The second block shows a play button icon, a green checkmark, '0 秒', the command '!echo hi', and the output 'hi'.

```
✓ 0 秒 1 !pwd  
/content/sample_data  
✓ 0 秒 [14] 1 !echo hi  
hi
```

Shell Script in Colab -- Advanced (Optional)

IPython magics -- Some special commands defined in the IPython language by prepending one “%” (line) or two percentage marks “%%” (cell).

e.g.

```
%cd sample_data
```

```
%pwd
```

```
%history -n
```

```
%%bash
```

```
%%time
```

```
1 %cd sample_data  
/content/sample_data
```

```
[20] 1 %pwd  
'/content/sample_data'
```

```
[21] 1 %history -n  
1: print("Hello world!")  
2:  
for i in range(10):  
    print(i)  
3: !ls  
4: %pwd  
5: !pwd  
6: cd content
```

Shell Script in Colab -- Advanced (Optional)

IPython magics -- Some special commands defined in the IPython language by prepending one “%” (line) or two percentage marks “%%” (cell).

e.g.

```
%cd sample_data
```

```
%pwd
```

```
%history -n
```

```
%%bash
```

```
%%time
```

```
[22] 1 %%bash
      2 for file in *.csv; do
      3 |     echo $file;
      4 done
```

```
california_housing_test.csv
california_housing_train.csv
mnist_test.csv
mnist_train_small.csv
```

```
[23] 1 %%time
      2 print(1)
```

```
1
CPU times: user 494 µs, sys: 0 ns, total: 494 µs
Wall time: 412 µs
```

Shell Script in Colab -- Note

Syntax conflicts(?) between shell and IPython magic:

Don't prepend "!" when using

```
cd
```

and

```
pwd
```

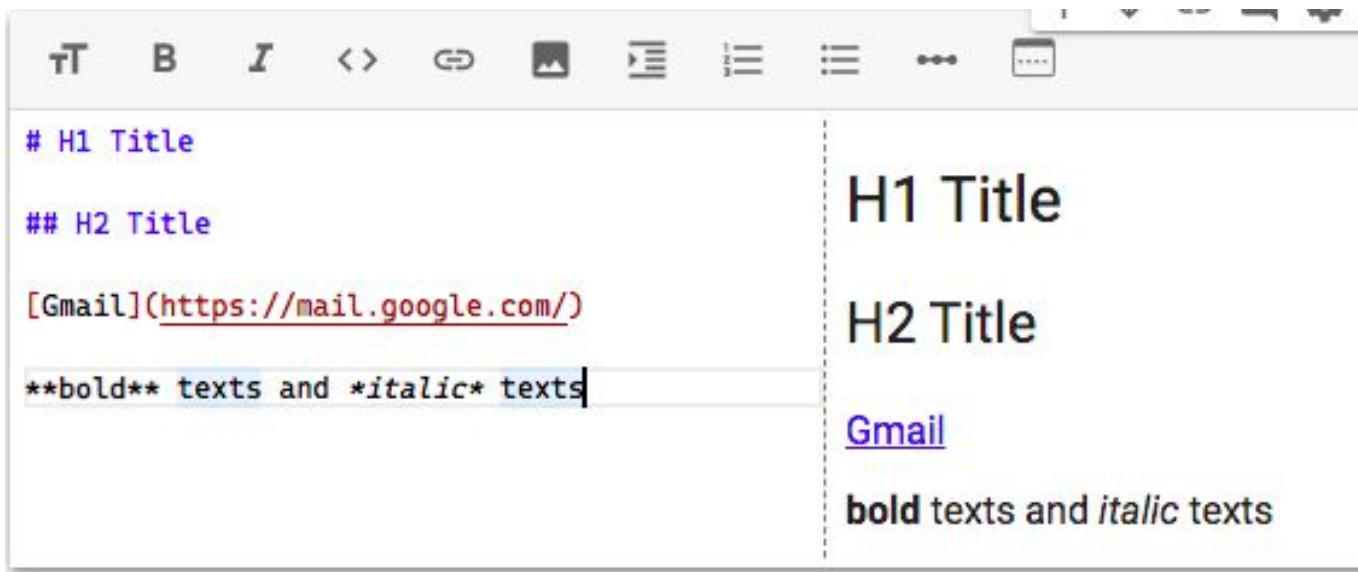
Colab will work normally if you don't.



The screenshot shows two terminal cells in Google Colab. The first cell contains the command `cd /content` and shows a play button icon, a green checkmark, and a timer of 0 seconds. Below the command, the output is `/content`. The second cell contains the command `[25] 1 pwd` and shows a play button icon, a green checkmark, and a timer of 0 seconds. Below the command, the output is `'/content'`.

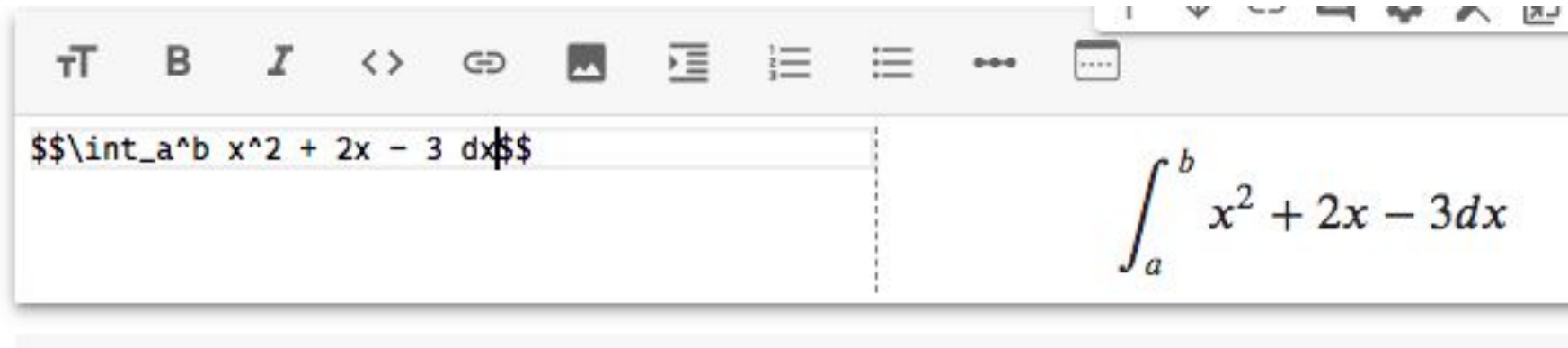
Markdown -- A Brief Introduction

A markup language that can be transformed into HTML in an intuitively syntax.



Markdown -- A Brief Introduction

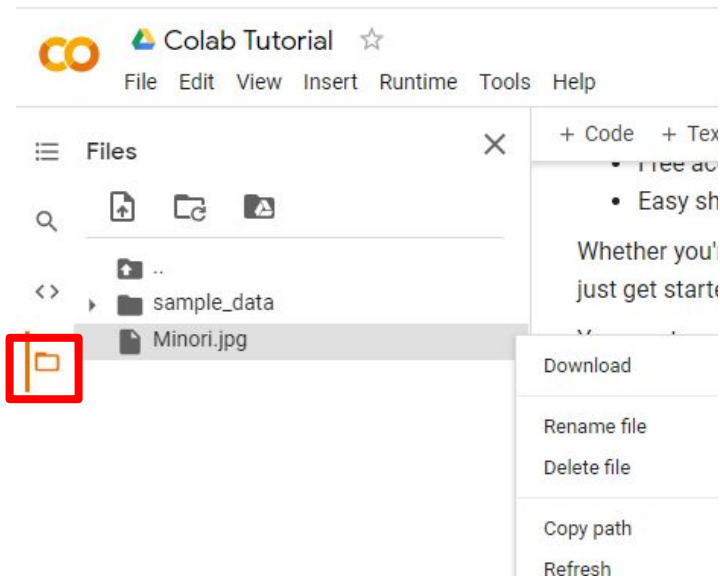
LaTeX formula supported!



File Structure

Clicking on the folder icon will give you the visualization of the file structure

The file is temporarily stored, and will be removed once you end your session. You can download the file to your local directory.



Mounting Google Drive

Execute the code block with `drive.mount('/content/drive')`

or click on the Google Drive icon, a code block will appear



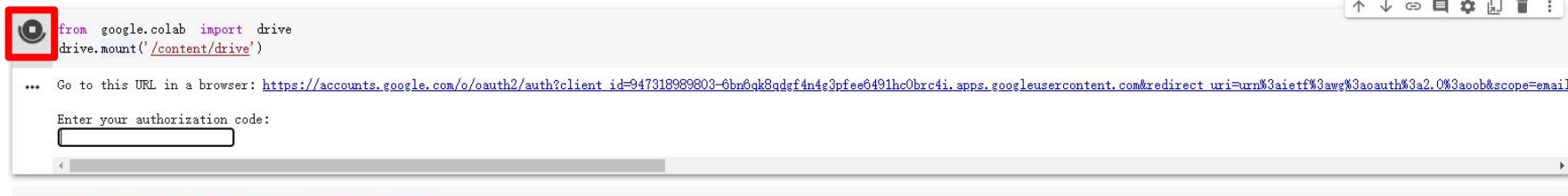
The screenshot displays the Google Colab interface. In the top-left corner, the Google Colab logo and the title "Google Colab Tutorial" are visible. Below the title is a menu bar with options: File, Edit, View, Insert, Runtime, Tools, and Help. On the left side, there is a "Files" panel with a search icon and a file explorer showing a directory structure: .., ML2021, drive, and sample_data. A red box highlights the Google Drive icon in the file explorer. A red arrow points from this icon to a code block in the main editor area. The code block contains the following Python code:

```
[1] # Import a library named google.colab
from google.colab import drive
# mount the content to the directory '/content/drive'
drive.mount('/content/drive', force_remount=True)
```

Below the code block, the output shows "Mounted at /content/drive". At the bottom of the code block, there is a red box highlighting the code again, with a play button icon to its left. In the top-right corner, there are icons for Comment, Share, RAM, and Disk usage.

Mounting Google Drive

Sign in to your google account to get the authorization code. Enter the authorization code in the box below.



```
from google.colab import drive
drive.mount('/content/drive')
```

... Go to this URL in a browser: https://accounts.google.com/o/oauth2/auth?client_id=947318989803-6bn6qk8qdef4n4g3pfee6491hc0brc4i.apps.googleusercontent.com&redirect_uri=urn%3Aietf%3Awww%3Aoauth%3A2.0%3Aaob&scope=email

Enter your authorization code:

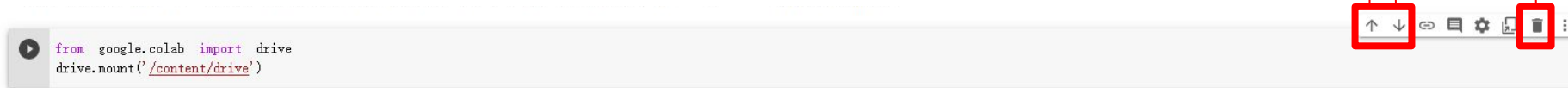
Moving and Creating a New Code Block

You can create a new code block by clicking on +Code(程式碼) on the top

Move cell up

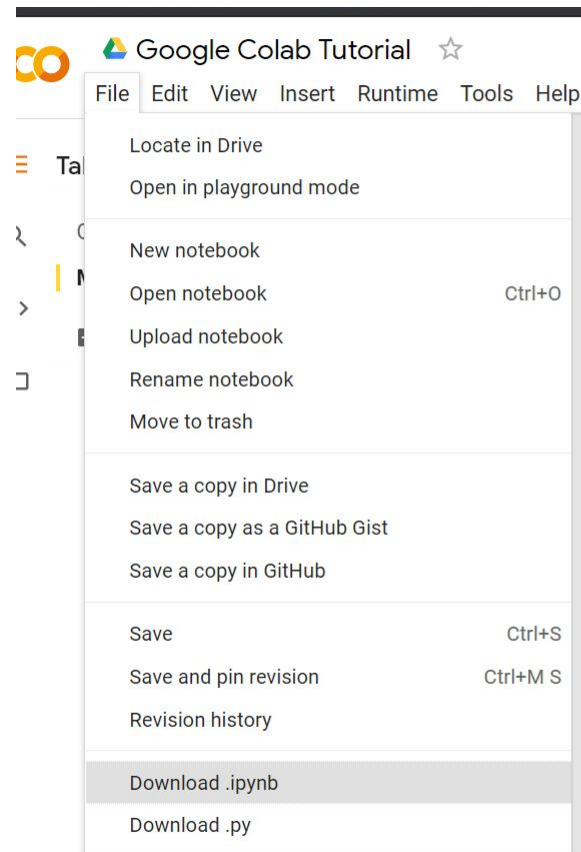
Move cell down

Delete cell



Saving Colab

You can download the ipynb file to your local device (File > Download .ipynb), or save the colab notebook to your google drive (File > Save a copy in Drive).



Recovering Files in Google Drive

Right Click on File > Manage Versions (版本管理) to recover old files that have been accidentally overwritten.

Manage versions

Older versions of 'main.py' may be deleted after 30 days or after 100 versions are stored. To avoid deletion, select **Keep forever** in the file's context menu. [Learn more](#)

UPLOAD NEW VERSION

	Current version main.py Dec 18, 2020, 1:40 AM 許湛然	⋮
	Version 1 main.py Dec 17, 2020, 9:21 AM 許湛然	⋮

CLOSE

Tips

Direct modification after clicking a file

+ 程式碼 + 文字

There is also an icon for mounting google drive. The icon will automatically generate the c above.

檔案



..

sample_data

Minori.jpg



編輯

demo.py X

```
1 for j in range(5):  
2 | print(j)
```

Q & A