Getting started, click by click

Open the notebooks in Google Colab and do your first exercises

Python lab: computing with a digital twin. Thomas Gomez, LBEPS (Université d'Évry Paris-Saclay) and Icam Grand Paris Sud

How to read this sheet

Do the steps **in order**, one at a time. After each step, check the line **You should see**. If you do not see it, read the line **If not**. Stuck for more than 5 minutes? Raise your hand. Words in **bold sans serif** are what you click on the screen; [Buttons] look like this; `Keys` are on your keyboard.

What you need

- A **laptop** (a tablet can work; a phone is too small), connected to the internet.
- A web browser, preferably **Google Chrome** (Firefox, Edge and Safari also work).
- A **Google account** (an address ending in `@gmail.com` is one). No account? Step 0 below, 3 minutes. Do not want one? Go to Part F (JupyterLite).
- The address of the lab, written on the board: **thomas-gomez.fr/python-lab**

Step 0. Create a Google account (only if you do not have one)

Step 0

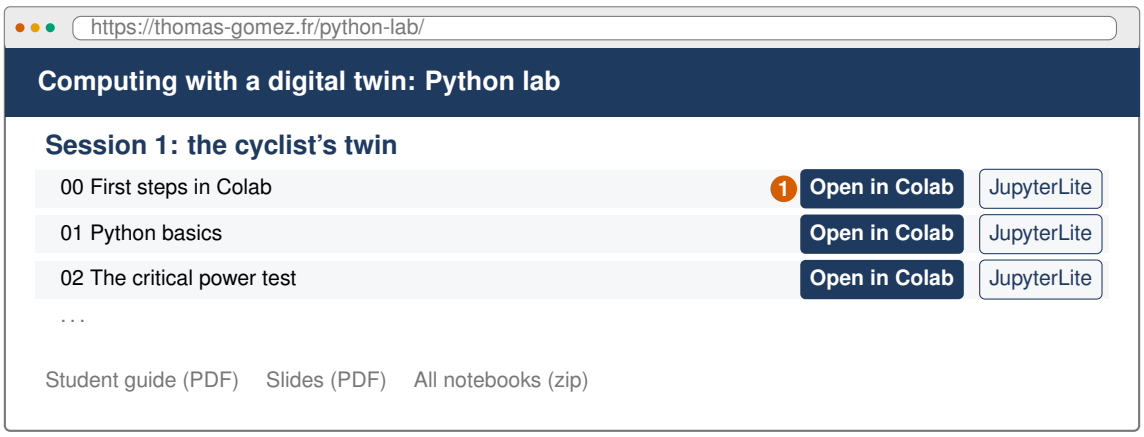
1. Open `https://accounts.google.com/signup`.
2. Type your first name and last name, click [Next]. Give your date of birth and gender, click [Next].
3. Choose **Create your own Gmail address**, type a name, click [Next]. Choose a password, type it twice, click [Next].
4. Phone number and recovery email: you can click **Skip**. Accept the terms: [I agree].

You should see: the Google home page, with a coloured circle with your initial at the top right.
If not: ask your neighbour to show you, or use Part F.
Write your address and password on paper now. You will need them in every session.

Part A. Open your first notebook (5 minutes)

Step A1. Open the lab page

Click in the address bar at the top of your browser, type **thomas-gomez.fr/python-lab** and press [Enter].
You should see: a page titled *Computing with a digital twin: Python lab*, with a list of notebooks (drawing below).
If not: check the spelling (a dash between *thomas* and *gomez*, no space). The teacher may also give you a Google Drive link instead: then go to Part F, way 2.



Simplified drawing: the real screen can look a little different.

Step A2. Open Notebook 0 in Colab

On the line **00 First steps in Colab**, click Open in Colab (red circle **1** in the drawing).
You should see: a new tab opens on `colab.research.google.com` with the notebook `00_first_steps_in_colab.ipynb`.
If not: if Google asks you to sign in, click Sign in at the top right, type your Gmail address and your password, and you come back to the notebook.

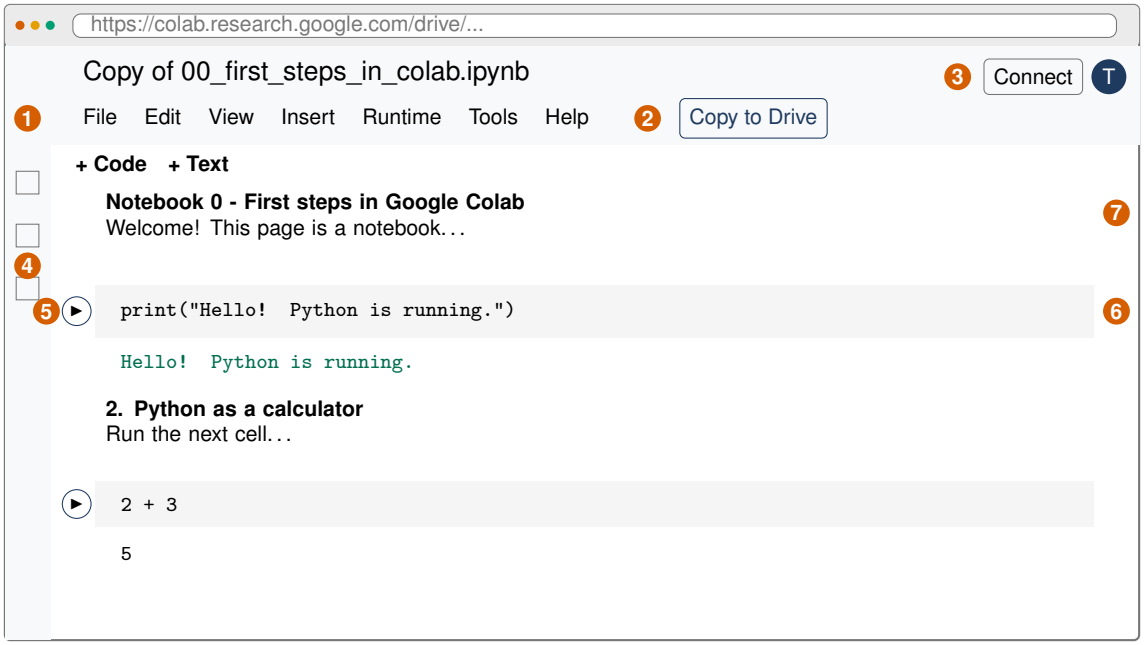
Step A3. Make your own copy (very important)

The notebook belongs to the teacher: you can run it, but your changes would be lost. Make it yours:

1. Click the button Copy to Drive at the top of the page (red circle **2** in the drawing of Part B). If you do not see it: menu **File** (top left) → **Save a copy in Drive**.
2. Wait a few seconds.

You should see: a **new tab** opens. Its title starts with **Copy of** `00_first_steps_in_colab.ipynb`. **From now on, work only in this "Copy of" tab.** You can close the other tab. It is saved automatically in your Google Drive, in a folder named `Colab Notebooks`.

Part B. The Colab screen



Simplified drawing: the real screen can look a little different.

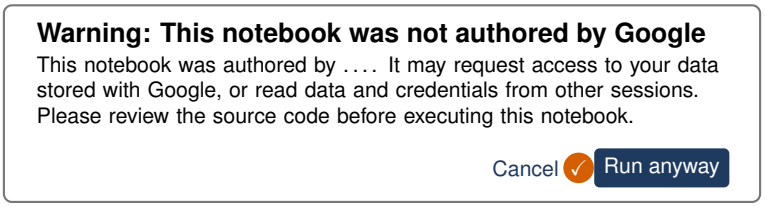
	What	What it is for
1	the menus	**File** (save, open), **Runtime** (run all, restart).
2	Copy to Drive	make your own copy (Step A3). It disappears once the copy is yours.
3	**Connect** / RAM, Disk	Colab's computer for you. It connects by itself when you run a cell.
4	the left bar	the folder icon **Files** shows the files your notebook created (figures).
5	the ▶ button	runs the code cell. Same as `Shift` + `Enter`.
6	a **code cell** (grey)	Python code. Click inside to edit it. Its result appears just below.
7	a **text cell**	explanations and instructions. Read them.

Part C. Notebook 0, cell by cell (15 minutes)

Step C1. Run your first cell

1. Scroll down to the first grey cell: `print("Hello! Python is running.")`.
2. Click once inside it, then click the ▶ button on its left (or press `Shift` + `Enter`).
3. A window may appear: *Warning: This notebook was not authored by Google*. Click Run anyway. This is normal: the notebook was written by your teacher, not by Google.

You should see: after 5 to 20 seconds (Colab switches on a computer for you), the text `Hello! Python is running.` under the cell, and a green tick next to the button.
If not: if the button keeps spinning for more than one minute: menu **Runtime** → **Restart session**, then try again.



Simplified drawing: the real screen can look a little different.

Step C2. Python as a calculator

1. Run the cell `2 + 3` (click inside, then ▶).

   You should see: `5` under the cell.

2. Run the next cell (three `print` lines).

   You should see: `42`, `2.5` and `1024`.

3. Now **change** it: click inside the cell, replace `7 * 6` by `12 * 12`, and run it again.

   You should see: `144` instead of `42`.

Step C3. Your first exercise: replace the ...

The cell says:

```
# YOUR TURN: replace ... by your calculation
seconds = ...
print(seconds)
```

A ride lasts 1 h 30 min: how many seconds is that?

1. Click inside the cell, just after `seconds = `.
2. Delete the three dots with the `Backspace` key (Mac: `delete`).
3. Type `90 * 60` (90 minutes, 60 seconds per minute). The line is now `seconds = 90 * 60`.
4. Run the cell.

You should see: `5400`.

Step C4. The setup cell and the check

1. Run the cell that starts with `# SETUP CELL`. It loads tools; nothing is printed.

   You should see: a green tick, no red message.

2. Run the next cell, `check(seconds, 5400, ...)`.

   You should see: `Correct!` with a green mark.

If not: `NameError: name 'check' is not defined`: you did not run the setup cell. Run it, then run the check again.

Step C5. Read and fix an error

1. Run the cell `print(Hello)`.

   You should see: a red message. Its **last line** is `NameError: name 'Hello' is not defined`.

2. Python does not know `Hello`: the quotes are missing. Click in the cell and add the quotes: `print("Hello")`. Run it again.

   You should see: `Hello`, and no red message.

Tip

Errors are normal: programmers see them all day. Always read the **last line** of the red message. The table at the end of Notebook 0 gives the four errors you will meet most often.

Part D. Notebook 1: your first exercises (40 minutes)

Step D1. Open Notebook 1

1. Go back to the tab of the lab page (thomas-gomez.fr/python-lab) and click Open in Colab on the line **01 Python basics**.
2. Click Copy to Drive (or **File** → **Save a copy in Drive**), and work in the new tab **Copy of 01_python_basics.ipynb**.
3. Run the **setup cell** at the top first.

Do this for every new notebook: open, copy, setup cell.

Step D2. Variables

Run the cell that starts with `power = 250`.
You should see: `Work done:  300000 J` and `Work done:  300.0 kJ`. Read the comments after #: they explain each line. Change `power = 250` into `power = 300` and run again: the work changes.

Step D3. Exercise 1: power per kilogram

In the cell of Exercise 1, replace the `...` of the line `watts_per_kg = ...` by a division of the power by the mass. The sign of division is `/`. Use the names of the boxes, not the numbers: `power` and `mass`. Run the cell.
You should see: `4.0` and `Correct!`
If not: `Not yet`: read the hint printed by `check`. Still stuck? The answer is at the bottom of this page.

Then continue the notebook alone, section by section (lists, loops, `if`, functions, NumPy). Read each text cell, run each code cell, do each exercise.

Step D4. Exercise 4: save a figure and put it in a document

1. Run the cell of section 7.

   You should see: a red curve of heart rate against time.
2. In the empty cell of Exercise 4, copy the code of the figure: select the code of the cell above with the mouse, Ctrl + C (Mac: Cmd + C), click in the empty cell, Ctrl + V (Mac: Cmd + V).
3. Change `"tab:red"` into `"tab:blue"` and change the title between the quotes.
4. Click at the start of the line `plt.show()`, press Enter to make a new line above it, and type `save_figure("my_first_figure")` on that new line.
5. Run the cell.

You should see: the figure, and the message `Figure saved and sent to your Downloads folder.` Your browser shows a download (top right in Chrome).
If not: if the browser asks *"This site is trying to download multiple files"*, click Allow. If nothing is

downloaded: click the folder icon **Files** in the left bar of Colab, find `my_first_figure.png`, click the three dots next to it, **Download**.
Put the figure in a document.

- **Word** / **LibreOffice**: open your document, click where the figure must go, menu **Insert** → **Pictures** (LibreOffice: **Image**) → **This Device**, open the `Downloads` folder, choose `my_first_figure.png`, Insert.
- **Google Docs**: menu **Insert** → **Image** → **Upload from computer**, choose the file in `Downloads`.

Under the figure, write a caption: what is drawn, with the units.

Answer of Step D3: `watts_per_kg = power / mass`.

Part E. Next time: find your work again

Your copies are in Google Drive

1. Open `https://drive.google.com`, signed in with the same account.
2. Double-click the folder `Colab Notebooks`.
   You should see: your files `Copy of 00_...`, `Copy of 01_...`
3. Double-click a file: it opens in Colab, with your changes.
4. Python has forgotten what was run last time: run the cells again from the top (**Runtime** → **Run before** on the cell where you stopped, or **Runtime** → **Run all**).

Other way, from Colab: menu **File** → **Open notebook** → tab **Google Drive**.

Part F. If Colab does not work for you

Way 2: the teacher gives you a Google Drive folder link.

1. Click the link: Google Drive opens on the folder `Python lab`, with `session1`, `session2`, `session3`.
2. Double-click `session1`, then double-click `00_first_steps_in_colab.ipynb`.
3. At the top of the preview, click **Open with** → **Google Colaboratory**.
   If not: in the menu, click **Connect more apps**, type `Colaboratory` in the search box, click the result, Install, then **Open with** → **Google Colaboratory** again.
4. Continue with Step A3 (Copy to Drive).

Way 3: JupyterLite, no account at all. Python runs inside your browser.

1. On the lab page thomas-gomez.fr/python-lab, click JupyterLite on the line of the notebook (or Open JupyterLite at the bottom of the page).
2. Wait until the page is loaded: the first time it can take one minute (your browser downloads Python).
   You should see: a file list on the left with `session1`, `session2`, `session3`.
3. Double-click `session1`, then the notebook. Run the cells with `Shift` + `Enter` or the ▶ button of the toolbar.

4. Figures: `save_figure("name")` puts the image in the file list on the left; right-click it → **Download**.

Watch out

JupyterLite keeps your work **in this browser only**. Before leaving: menu **File** → **Download** for each notebook, and download your figures. Do not use a private window, and do not clear the browser data.

Common problems.

Problem	What to do
`NameError` on something that exists above	a cell above was not run: **Runtime** → **Run before**.
Runtime disconnected / *Reconnect*	Colab stopped after a long pause: click Reconnect, then **Runtime** → **Run before**.
The cell keeps spinning	**Runtime** → **Interrupt execution**; if needed **Runtime** → **Restart session**, then **Run all**.
You cannot save changes to this notebook	you are working in the teacher's version: **File** → **Save a copy in Drive** (Step A3).
There is still a ... in this cell	you left a `...` in the cell (look for the pencil sign): replace it by your code.
I deleted a cell by mistake	**Edit** → **Undo delete cells** (Ctrl+M then Z).
Everything is strange	**Runtime** → **Restart session**, then **Runtime** → **Run all**.