



Introduction to Python

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How is your programming skill? 😊

- I do not know how to write a program at all. (0)
- I know it just a little bit (very basic).(1)
- I am an intermediate programmer (some experience). (2)
- I am a professional programmer.(3)



**Utrecht
University**

This workshop in particular is geared towards people new to programming.



The content of this workshop is as follows

1. *Python Overview*

- Brief History
- Usage of Python

2. *Installing Python*

- Install Anaconda Distribution for Python
- Briefly running Jupyter Notebook
- Exploring “no install” online options

3. *Running Python Code*

- Text Editors and Full IDEs
- Notebook Environments
- Jupyter Notebook
- A Quick Tour in Jupyter Notebook

4. *Python Coding*

- Python Object
- Python Data Structure Basics
- Python Comparison Operators
- Python Statements
- Methods and Functions
- A Tour in NumPy Library
- A Tour in Pandas Library
- A Tour in Matplotlib Library

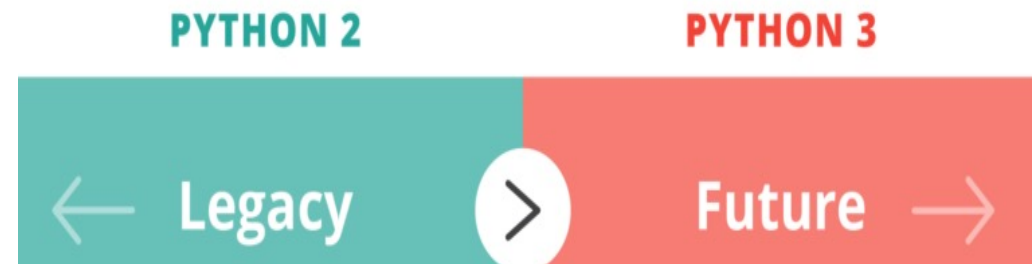
First let's see which one:

Python 2 vs Python 3





- Now every major external python package has been updated to support Python 3!
- This workshop now focuses on Python 3.
- If need be, going back to Python 2 syntax is a very easy jump once you know Python 3.
- Python 3 is indeed the future of Python.





Python Overview

Brief History of Python



- Created in 1990 by Guido van Rossum
- Python 3 released in 2008
- Specifically designed as an easy-to-use language

Why Choose Python?

- Designed for clear, logical code that is easy to read and learn.
- It has simplified syntax and not complicated.
- Lots of existing libraries and frameworks written in Python allowing users to apply Python to a wide variety of tasks.
- Can be easily written and executed much faster than other programming languages.
- Great documentation online:
docs.python.org/3

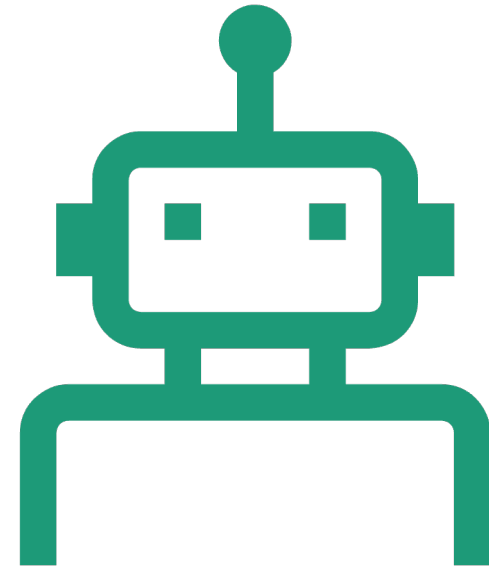
We first focus on “**base**” Python,
which consists of the core components of the language and
writing scripts and small programs.



What can you do with Python?

Automate simple tasks

- Searching for files and editing them
- Scraping information from a website
- Reading and editing excel files
- Work with PDFs
- Automate emails and text messages
- Fill out forms



What can you do with Python?

Data Science and Machine Learning

- Analyze large data files
- Create visualizations
- Perform machine learning tasks
- Create and run predictive algorithms



What can you do with Python?

Create websites

- Use web frameworks such as Django and Flask to handle the backend of a website and user data
- Create interactive dashboards for users



Once you understand base Python and begin working with a few libraries, you'll quickly begin to see the vast potential Python has for your own projects!



Strongly recommended to
quick **Google** or **StackOverflow** search !





Installing Python

- There are many ways to run Python!
- Later on, we will explore the difference between running a Python *.py* script or running Python code in a *Notebook* environment.

Either way, we will still want to install Python!

Installation

- Install **Anaconda** Distribution for Python.
Anaconda installs Python. It is an easy-to-use development environment and navigator launch tool.
- Briefly run **Jupyter Notebook**.
- Explore “*no install*” online options.

Quick Note:

- Many online “no install” Python environments that can run in the browser (given that you have internet).
- We will give you a brief tour of these online “no install” options at the end.



Install Anaconda



- To install Python we will use the free Individual Anaconda distribution.
- This distribution includes Python as well as many other useful libraries, including Jupyter Notebook environment.
- Anaconda can also easily be installed on to any major OS, Windows, MacOS, or Linux.

www.anaconda.com/downloads



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Individual Edition

Your data science toolkit

With over 25 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

Anaconda Individual Edition

Download 

For MacOS

Python 3.9 • 64-Bit Graphical Installer • 515 MB

[Get Additional Installers](#)

Select the installer as per your operating system.

Anaconda Installers

Windows

Python 3.9

64-Bit Graphical Installer (510 MB)

32-Bit Graphical Installer (404 MB)

MacOS

Python 3.9

64-Bit Graphical Installer (515 MB)

64-Bit Command Line Installer (508 MB)

Linux

Python 3.9

64-Bit (x86) Installer (581 MB)

64-Bit (Power8 and Power9) Installer (255 MB)

64-Bit (AWS Graviton2 / ARM64) Installer (488 M)

64-bit (Linux on IBM Z & LinuxONE) Installer (242 M)

In case, you have trouble installing

- Tutorial video for installing anaconda on *Windows*
<https://www.youtube.com/watch?v=aN6OVm0mTHo>
- Tutorial video for installing anaconda on *MacOS*
<https://www.youtube.com/watch?v=2JeoNICcLOM>

Free “No Install” Options:

- <https://jupyter.org/try>
- *Google Colab* Online Notebooks
- *Repl.it*
- Google Search:
 “Python Interpreter Online”

jupyter/
try.jupyter.org

Try Jupyter!



Click “*Try JupyterLab*”



[Install](#) [Get Involved](#) [Documentation](#) [News](#) [Governance](#) [Security](#) [About](#)

Try Jupyter

You can try Jupyter out right now, without installing anything. Select an example below and you will get a temporary Jupyter server just for you, running on mybinder.org. If you like it, you can [install Jupyter](#) yourself.

Try Classic Notebook



A tutorial introducing basic features of the classic Jupyter Notebook interface.

Try JupyterLab



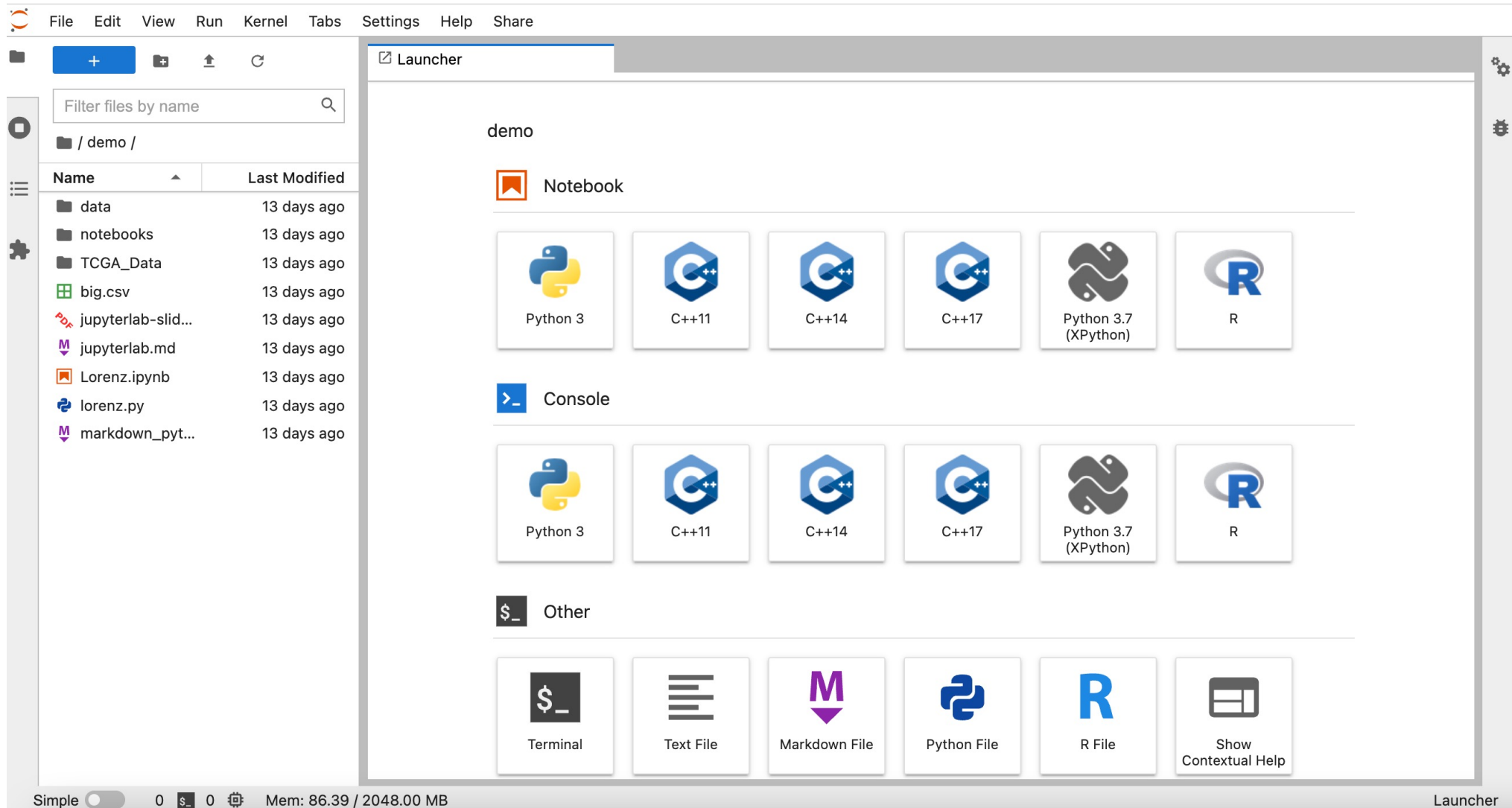
JupyterLab is the new interface for Jupyter notebooks and is ready for general use. Give it a try!

Try Voilà



An example with a variety of notebook dashboards.

Once you've landed in the *Launcher* page, you can start working on your own file by clicking:
“File → New → e.g. Notebook”





FileEditViewRunKernelTabsSettingsHelpShare

+

+

↑

↺

Filter files by name

🔍

📁 / demo /

Name	Last Modified
📁 data	13 days ago
📁 notebooks	a minute ago
📁 TCGA_Data	13 days ago
📄 big.csv	13 days ago
📄 jupyterlab-slid...	13 days ago
📄 jupyterlab.md	13 days ago
📄 Lorenz.ipynb	13 days ago
📄 lorenz.py	13 days ago
📄 markdown_pyt...	13 days ago
📄 Untitled.ipynb	in a few seconds

Launcher

Untitled.ipynb

Data.ipynb

📄 + ✂ 📄 📄 ▶ ■ ↺ ⏩ ⬇ Download ☁ ☁ 🔗 GitHub 🔗 Binder Code ▾

Python 3

This is jupyter notebook online try mode!

[1]:

```
# it is easy to use!  
x = 3  
y = 5  
x + y
```

[1]:















8

Simple 0 s 3 Python 3 | Idle Mem: 243.61 / 2048.00 MB

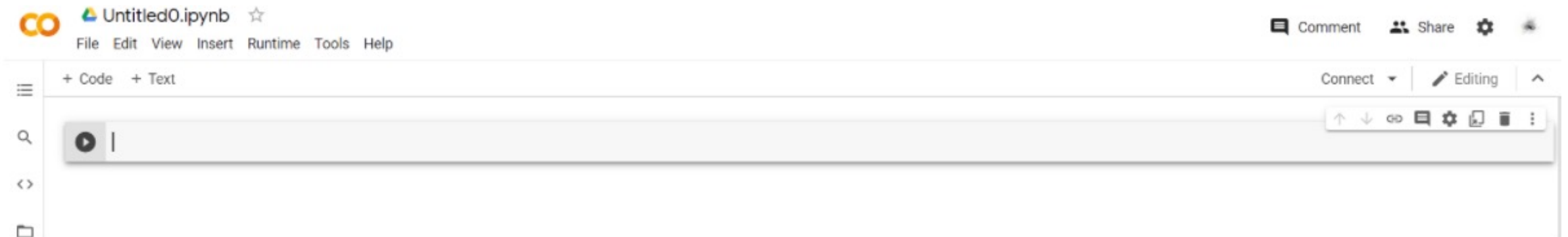
Mode: Command Ln 4, Col 6 Untitled.ipynb

“Google Colab” <https://colab.research.google.com/>

- To start using Google Colab, you first have to log in to your Google account.
- The home screen of Google Colab will look like this.

ExamplesRecentGoogle DriveGitHubUpload				
Filter notebooks				
Title	First opened	Last opened		
 Welcome To Colaboratory	0 minutes ago	0 minutes ago		
 221910311023day10.ipynb	Jul 28, 2020	Jul 28, 2020		
 221910311023day8	Jul 25, 2020	Jul 25, 2020		
 221910311023 day7.ipynb	Jul 24, 2020	Jul 24, 2020		
 assignment1.ipynb	Jul 15, 2020	Jul 15, 2020		

- To open a new Python notebook, click 'new notebook' on the bottom right corner.
- The opened notebook will look like this.



Quick Note

Free “No Install” Options:

- *Hard to upload your own code, data, or notebooks!*
- *May not save your code in the free version!*





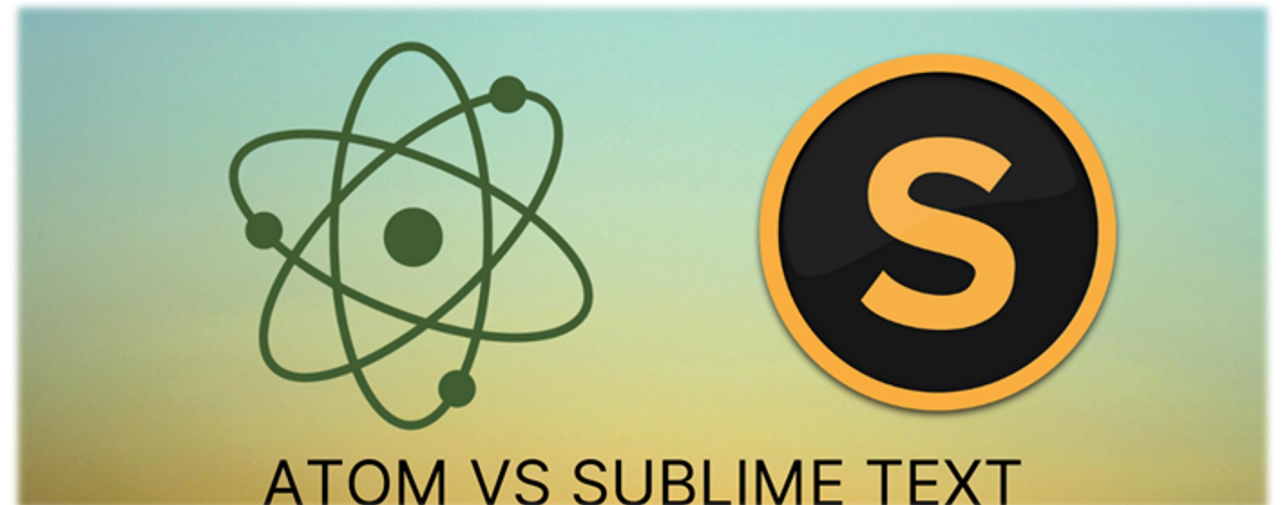
Running Python Code

- There are several ways to run Python code.
- First, let's discuss the various options for development environments.
- There are 3 main types of environments:
 - Text Editors
 - Full IDEs
 - Notebook Environments



Text Editors

Most popular : ***Sublime Text*** and ***Atom***



Full IDEs

- Development Environments designed specifically for Python.
- Larger programs.
- Designed specifically for Python, lots of extra functionality.

Most popular: ***PyCharm*** and ***Spyder***



*Quick note:

PyCharm is available in three editions: “*Professional*”, “*Community*”, and “*Edu*”.

Only the “*Community*” and “*Edu*” editions are **free**, but they have relatively fewer features available.

Notebook Environments

- Great for learning.
- See input and output next to each other.
- Support in-line markdown notes, visualizations, videos, and more.
- Special file formats that are *not* `.py`

Most popular: ***Jupyter Notebook***



Choose whichever development environment you prefer!

Here we work with Jupyter notebook.



Course Notebooks

Initiate Anaconda and launch Jupyter Notebook.

Anaconda Navigator

File Help



Sign in

Home

Environments

Learning

Community

Documentation

Anaconda Blog



Applications on

base (root)

Channels

Refresh



Notebook

6.3.0

Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.

Launch



Powershell Prompt

0.0.1

Run a Powershell terminal with your current environment from Navigator activated

Launch

You will see a following Jupyter Notebook page open in your browser.

 jupyter

QuitLogout

FilesRunningClusters

Select items to perform actions on them.

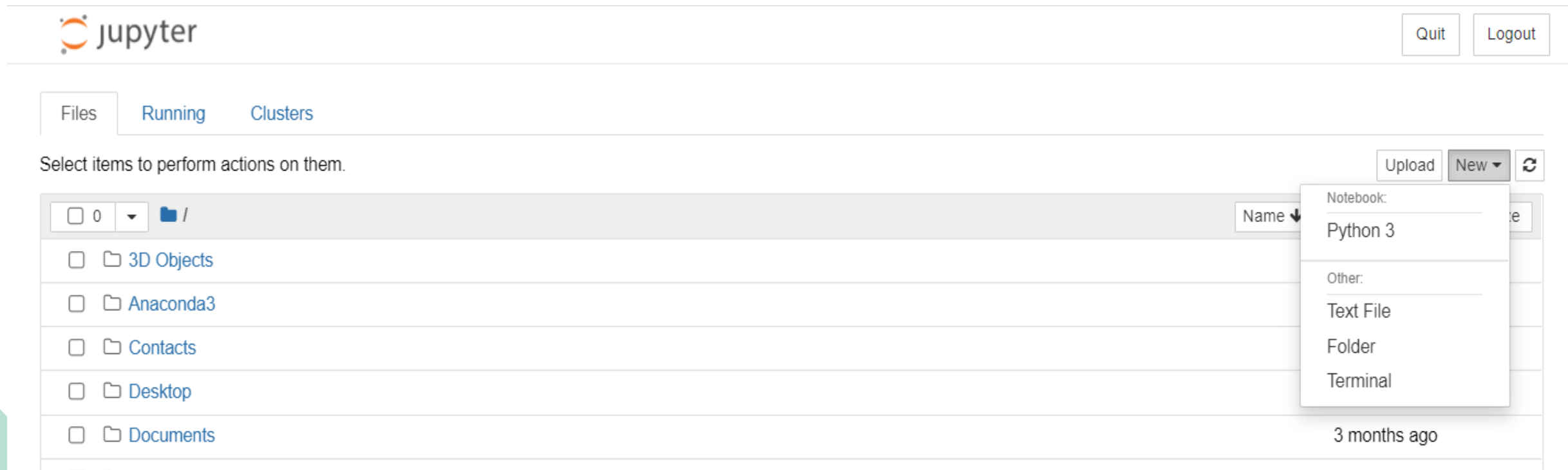
UploadNew ↕

☐ 0 ▾  /

Name ▾Last ModifiedFile size

<input type="checkbox"/>  3D Objects	3 months ago	
<input type="checkbox"/>  Anaconda3	2 months ago	
<input type="checkbox"/>  Contacts	3 months ago	
<input type="checkbox"/>  Desktop	2 years ago	
<input type="checkbox"/>  Documents	3 months ago	
<input type="checkbox"/>  Downloads	2 minutes ago	
<input type="checkbox"/>  Favorites	2 years ago	
<input type="checkbox"/>  Links	a month ago	
<input type="checkbox"/>  Music	3 months ago	
<input type="checkbox"/>  My python_stuff	2 months ago	
<input type="checkbox"/>  OneDrive	3 months ago	
<input type="checkbox"/>  OneDrive - Universiteit Utrecht	6 hours ago	
<input type="checkbox"/>  Pictures	2 years ago	

Click “*New* → *Python3*” to start with a new notebook file.



The image shows the JupyterLab web interface. At the top left is the Jupyter logo. On the top right are 'Quit' and 'Logout' buttons. Below the header is a tab bar with 'Files', 'Running', and 'Clusters'. The 'Files' tab is active, showing a file browser. A message says 'Select items to perform actions on them.' Above the file list are 'Upload', 'New', and a refresh icon. The 'New' dropdown menu is open, showing 'Notebook: Python 3' and 'Other: Text File, Folder, Terminal'. The file list includes a root directory and folders like '3D Objects', 'Anaconda3', 'Contacts', 'Desktop', and 'Documents'. A '3 months ago' timestamp is visible at the bottom right of the file list.

jupyter

Quit Logout

Files Running Clusters

Select items to perform actions on them.

Upload New ↕

0 /

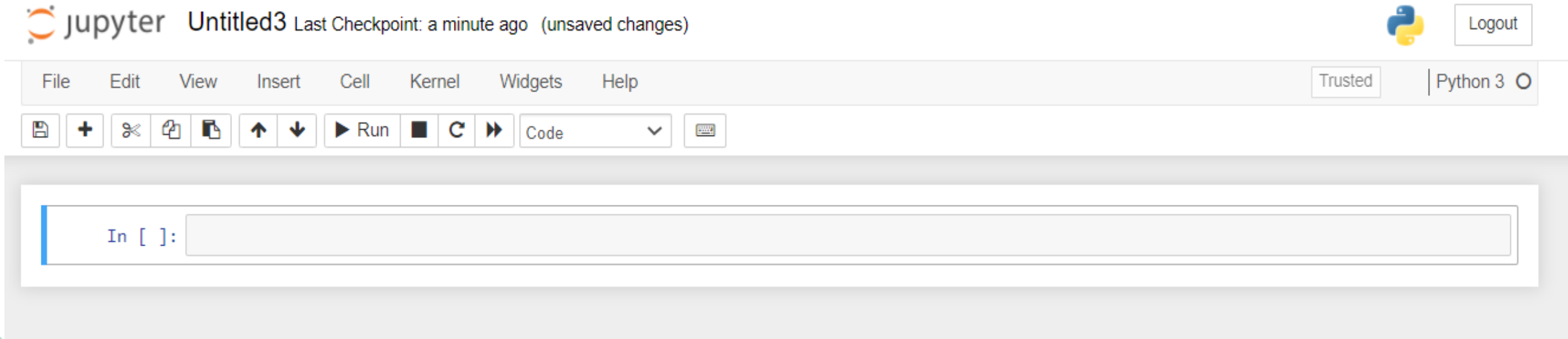
Name ↓

Notebook:
Python 3

Other:
Text File
Folder
Terminal

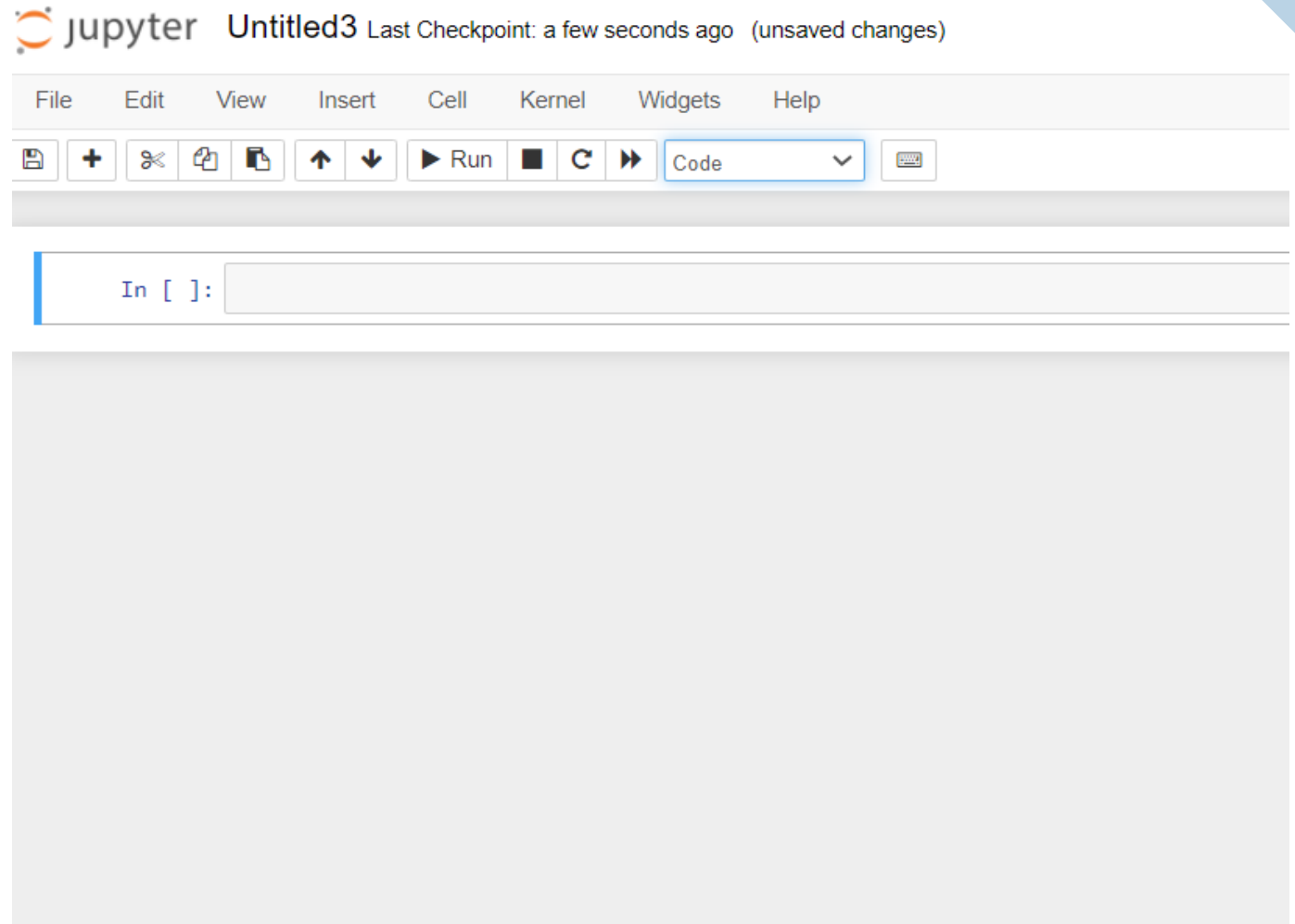
3 months ago

You will see an Untitled notebook page with an empty cell like below.



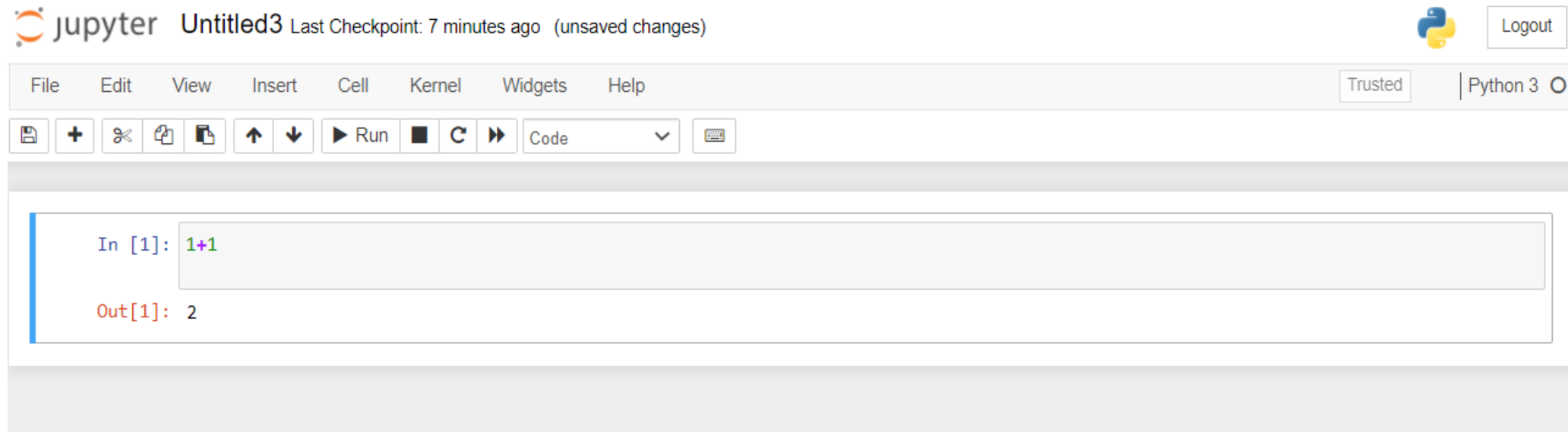
CELLS IN JUPYTER NOTEBOOK

- Two types of cells: **Markdown** and **Code** cells
 - Markdown cells : For text
 - Code cells: For python code



RUN PYTHON

- Write some code in a code cell (the default one) and click the “run (play) button” (shortcut: “*Ctrl+Enter*”).



“Running” TAB

- In the Jupyter Notebook dashboard, there is a tab named “*Running*” that shows all running notebooks (i.e. kernels) and allows shutting them down (by clicking on a “*Shutdown*” button).



The screenshot shows the Jupyter Notebook dashboard interface. At the top left is the Jupyter logo. At the top right are 'Quit' and 'Logout' buttons. Below the logo is a navigation bar with three tabs: 'Files', 'Running' (which is selected), and 'Clusters'. The main content area is titled 'Currently running Jupyter processes' and features a refresh button in the top right corner. It is divided into two sections: 'Terminals' and 'Notebooks'. The 'Terminals' section shows a single entry '>_ terminals/1' with a 'Shutdown' button to its right. The 'Notebooks' section shows a single entry 'Untitled1.ipynb' with 'Python 3' to its right, followed by a 'Shutdown' button and the text 'seconds ago'.

jupyter

Quit Logout

Files Running Clusters

Currently running Jupyter processes

Terminals ▾

>_ terminals/1 Shutdown

Notebooks ▾

Untitled1.ipynb Python 3 Shutdown seconds ago

WHY JUPYTER NOTEBOOK ?

- Allow for interactive use.
- Can combine text, code, and plots easily.
- *Jupyter notebook* allows you to do fancy things. For instance :
Simply hit the “*Tab*” key while writing code. This will open a menu with suggestions. Hit “*Enter*” to choose the suggestion.
- Help if you type “?” (example in next cell)
- Magic cells like “*%matplotlib inline*”, which makes the plot inside the notebooks.
- Shortcuts: “*Ctrl+Enter*”: Run cell. “*Shift+Enter*”: Run cell and go to the next one.
- Check the link below for other useful tricks :

<https://towardsdatascience.com/15-tips-and-tricks-to-use-jupyter-notebook-more-efficiently-ef05ede4e4b9>