

CDS 230

Modeling and Simulation I

Module 2

Setting up your Python environment



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Topics covered

1. Python programming language
2. Installing Python
3. Running Python

Conception of Python

- Dates back to the late 1980s
- Developed by Guido van Rossum while at the National Research Institute for Mathematics and Computer Science in the Netherlands.
- Inspired by the ABC language
 - More clear syntax (indentation, namespaces,...)
 - More comprehensive standard library
 - Extensible (C language support)



Figure source: python.org, <https://gvanrossum.github.io>

Python programming language features

- General purpose
- Interpreted (vs. compiled)
- Procedural, object-oriented, and supports functions
- Comprehensive standard library



<https://xkcd.com/303/>

Python version history

V.1 (1990-2000)

- 1.0: 1994
- ...
- 1.5.2: April 1999
- 1.6.1: September 2000

V.2 (2000-2020)

- 2.0: October 2000
- 2.0.1: June 2001
- ...
- 2.6: October 2008
-
- 2.7.17: October 2019

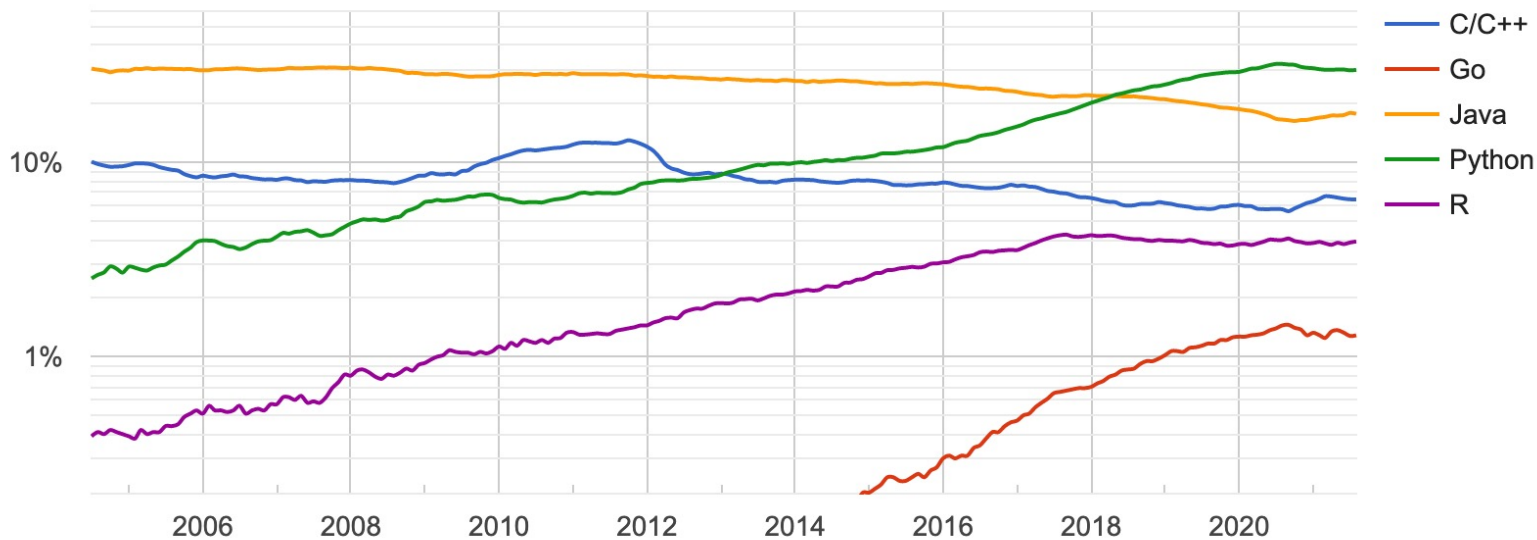
V.3 (2008-...)

- 3.0: December 2008
- 3.0.1: February 2009
- ...
- 3.4: March 2014
- ...
- 3.9.6: June 2021

See the release list at <https://www.python.org/downloads/>

Popularity of Python

PYPL Popularity of Programming Language



“how often language tutorials are searched on Google”

Worldwide, Aug 2021 compared to a year ago:

Rank	Change	Language	Share	Trend
1		Python	29.93 %	-2.2 %
2		Java	17.78 %	+1.2 %
3		JavaScript	8.79 %	+0.6 %
4		C#	6.73 %	+0.2 %
5	↑	C/C++	6.45 %	+0.7 %
6	↓	PHP	5.76 %	-0.0 %
7		R	3.92 %	-0.1 %
8		Objective-C	2.26 %	-0.3 %
9	↑	TypeScript	2.11 %	+0.2 %
10	↓	Swift	1.96 %	-0.3 %
11	↑	Kotlin	1.81 %	+0.3 %
12	↓	Matlab	1.48 %	-0.4 %
13		Go	1.29 %	-0.2 %

Source: <http://pypl.github.io/PYPL.html>

Popularity of Python

- Used in companies like
 - Netflix
 - Google
 - Dropbox
 - Facebook...
- Contributions come from these companies too...



Sources: <https://www.techrepublic.com/article/how-netflix-uses-python-streaming-giant-reveals-its-programming-language-libraries-and-frameworks/> <https://ncube.com/blog/6-huge-tech-companies-that-use-python-does-it-fit-your-project>

Installing Python

Option 1: Python 3 Installer

- Global installation
- Need to follow different ways for Different OSs
- No native notebook support

Option 2: Anaconda Distribution

- Standard but portable installation
- Package management using `conda`
- Native Jupyter Notebook support

Installing Python

This is our way to move forward

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The Jupyter Notebook

pros

- A web application to make it easier to develop and share code
- Open source
- Contain live **code**, **equations**, **visualization**, and **text** on a web page.
- Portable (share your notebook easily,.. even on GitHub).
- Very popular among Python programmers (esp. data scientists).

cons

- No code management and organization imposed
- Challenging to make a product

What if you have a lightweight computer?

- You can use Google's Colaboratory or Colab
 - <https://colab.research.google.com/notebooks/intro.ipynb>
- Colab is a web-based environment allowing you to run Python code on your browser.
- Easy to run and share.
- You're free to use it but we will install and use Anaconda.



Installing plain version (vanilla) Python

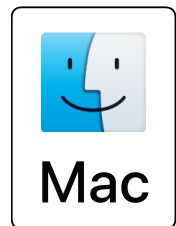
- Perhaps, you already have it installed if you have a Mac or Linux?
- Open command line (or Terminal) and type `python --version` hit enter ↵
- Version number 3.7 or later is preferred. Version 2.X is NOT suitable for this class.

Installing plain version (vanilla) Python

- If you have python 2.X or don't have anything at all



- Visit <https://www.python.org/downloads/windows/> Download **Windows x86-64 executable installer** and install. Don't forget to check "Add Python 3.X to PATH"



- install **homebrew** first, then type `brew install python` ↵

- use your package manager (e.g., `sudo apt-get install python3.8` for Debian, Ubuntu, etc.)



Installing Python via Anaconda

<https://www.anaconda.com/products/individual-d>

Scroll down and you will see the following




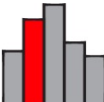


Anaconda Installers

Windows 	MacOS 	Linux 
Python 3.8	Python 3.8	Python 3.8
64-Bit Graphical Installer (466 MB)	64-Bit Graphical Installer (462 MB)	64-Bit (x86) Installer (550 MB)
32-Bit Graphical Installer (397 MB)	64-Bit Command Line Installer (454 MB)	64-Bit (Power8 and Power9) Installer (290 MB)

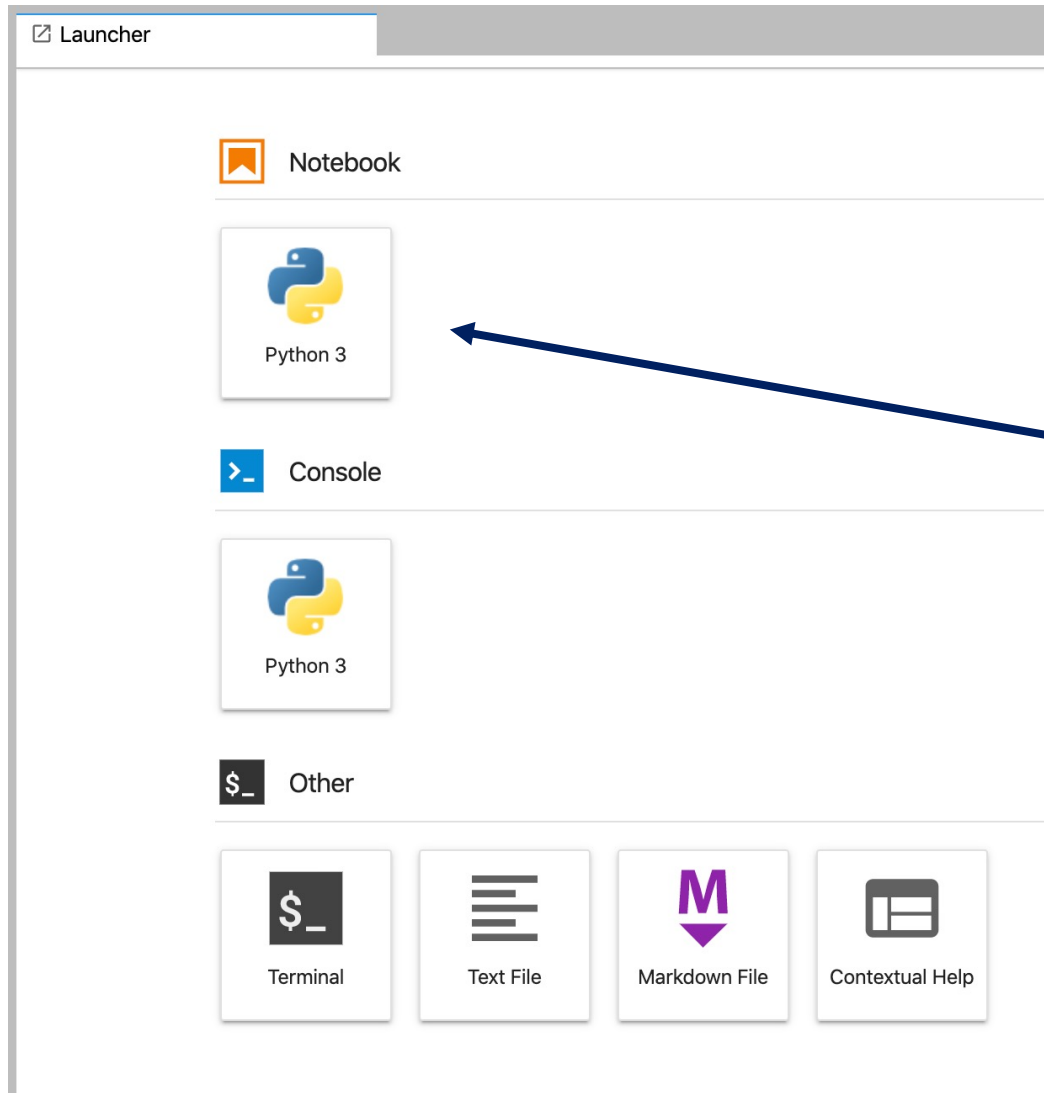
Anaconda Navigator

We will use JupyterLab

An interactive development environment for **Jupyter** Notebooks

 JupyterLab 1.1.4 An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture. Launch	 Notebook 6.0.1 Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis. Launch	 Spyder 3.3.6 Scientific PYTHON Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features Launch
 Glueviz 0.15.2 Multidimensional data visualization across files. Explore relationships within and among related datasets. Install	 Orange 3 3.23.0 Component based data mining framework. Data visualization and data analysis for novice and expert. Interactive workflows with a large toolbox. Install	 RStudio 1.1.456 A set of integrated tools designed to help you be more productive with R. Includes R essentials and notebooks. Install

Launcher



This is what you should see once you hit the “Launch” button in the previous slide.

This button starts a new Jupyter Notebook

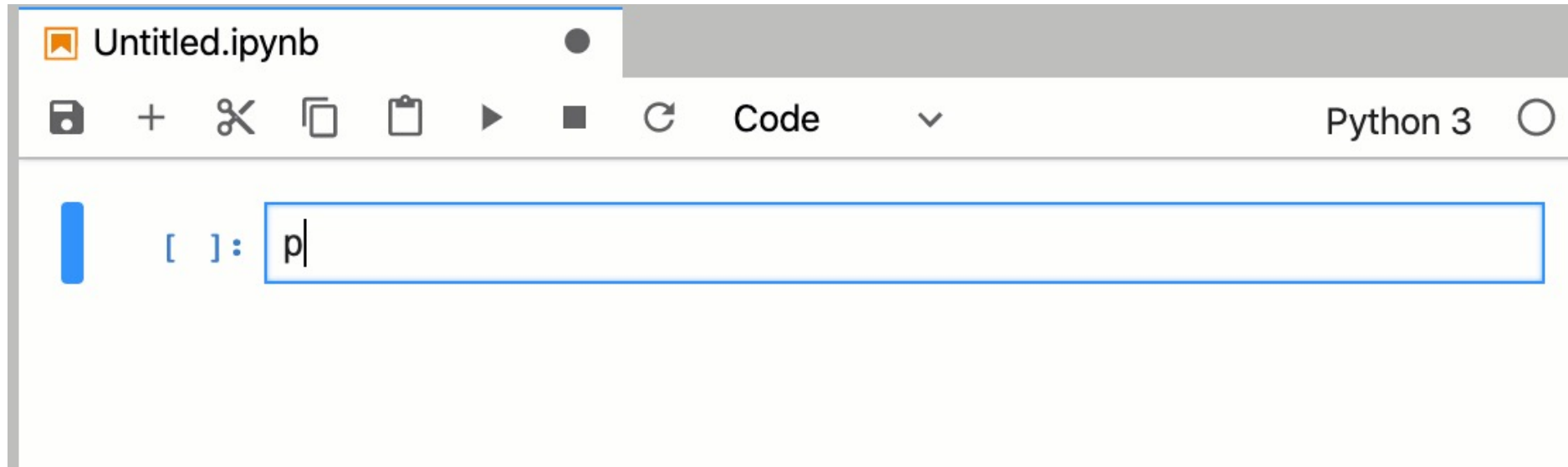
JupyterLab

The image shows a screenshot of the JupyterLab web interface. On the left is a file browser showing a folder named "/ cds230spring2020 /" containing a file named "Untitled.ipynb" with a last modified time of "11 minutes ago". The main area displays a notebook titled "Untitled.ipynb" with a toolbar containing icons for saving, adding a new cell, deleting, copying, pasting, and refreshing. Below the toolbar is a code cell containing "[]:". The interface also shows a menu bar with "File", "Edit", "View", "Run", "Kernel", "Tabs", "Settings", and "Help".

Annotations with yellow boxes and blue arrows point to various parts of the interface:

- Working folder**: Points to the file browser path "/ cds230spring2020 /".
- Adds a new cell**: Points to the "+" icon in the notebook toolbar.
- Newly created notebook. Right-click and rename it**: Points to the "Untitled.ipynb" tab title.
- A cell – can be used to write code or text**: Points to the code input area containing "[]:".
- Execute**: Points to the right-pointing arrow icon in the notebook toolbar.
- Running indicator**: Points to the "Python 3" label and its associated circular indicator in the top right corner.

Hello, world!



The screenshot shows a Jupyter Notebook window titled "Untitled.ipynb". The interface includes a toolbar with icons for saving, adding, deleting, copying, pasting, running, and refreshing. The code editor shows a single code cell with the prompt "[]:" and a cursor positioned after the letter "p".

```
[1]: print('Hello, world! This is CDS 230 class.')
```

```
Hello, world! This is CDS 230 class.
```

How to run via command line (or terminal)

- Running Python via command line `python filename.py`

File

```
~/cds230fall2019/helloworld.py -  
1 print("Hello, world!")  
2 print("This is a .py file")  
3
```

Running via command line

```
$ python helloworld.py  
Hello, world!  
This is a .py file
```

If you need help

- Google it (easiest way)
 - Make sure to check Python version
- python.org
- stackoverflow.com
- STARs
- Your instructor



Figure sources: <https://stackoverflow.com/company/logos>, <http://python.org>, Wikimedia Commons

Sources

- Bill Venners (2003). *The Making of Python*.
<https://www.artima.com/intv/pythonP.html>
- <https://gvanrossum.github.io>
- <http://www.python.org>
- <https://www.anaconda.com>
- <https://jupyter.org/>