Introduction to Python

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Spring 2024

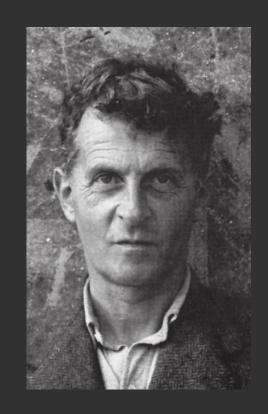




Linguistic Relativity / Sapir–Whorf hypothesis

The limits of my language mean the limits of my world.

Ludwig Wittgenstein



Pythonic

Uncluttered

Hitchhiker's

Guide
Python

Readable

Explicit

Simple Concise

The Zen of Python

Beautiful is better than ugly.

Explicit is better than implicit.

Simple is better than complex.

Complex is better than complicated.

Sparse is better than dense.

Readability counts.

Special cases aren't special enough to break the rules.

Although practicality beats purity.

Errors should never pass silently.

Unless explicitly silenced. (contd.)

Pearl Programming Motto

There is more than one way to do it.

TIMTOWTDI, pronounced Tim Toady

The Zen of Python

"There should be one

— and preferably only one — obvious way to do it."

Python is powerful... and fast; plays well with others; runs everywhere; is friendly & easy to learn; is Open.



"Python is an interpreted, object-oriented, high-level programming language with dynamic semantics."

IN DECEMBER 1989
Guido van Rossum,
a Dutch computer scientist,
set himself a Christmas project.

Irked by shortcomings in other programming languages, he wanted to build his own.

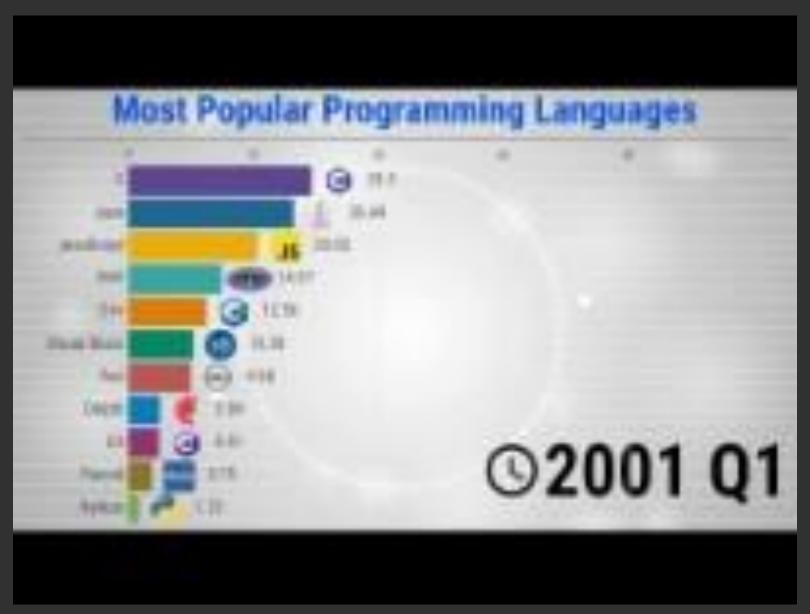


Guido van Rossum

Python's creator and emeritus BDFL (Benevolent Dictator For Life)

@gvanrossum







Who Uses Python?























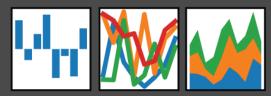
Trying to Learn Any Programming Language 100%





- O Anaconda is a free and open-source distribution of the Python and R programming languages for scientific computing, that aims to simplify package management and deployment.
- The Anaconda distribution is used by around 40 million users in settings ranging from small research institutions to academia to Fortune 100 companies. [source]





Provides high-performance, easy-to-use data structures and data analysis tools



Simple and efficient tools for data mining and data analysis

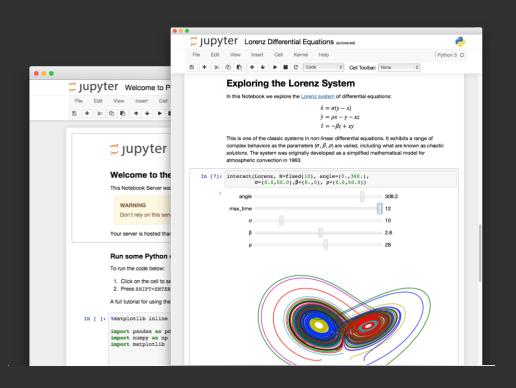
seaborn

Provides a high-level interface for drawing attractive and informative statistical graphics.



Project Jupyter exists to develop open-source software, open-standards, and services for interactive computing across dozens of programming languages.

Julia, Python and R



The **Jupyter Notebook** is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text.



Language of choice

The Notebook has support for over 40 programming languages, including Python, R, Julia, and Scala.



Share notebooks

Notebooks can be shared with others using email, Dropbox, GitHub and the Jupyter Notebook Viewer.



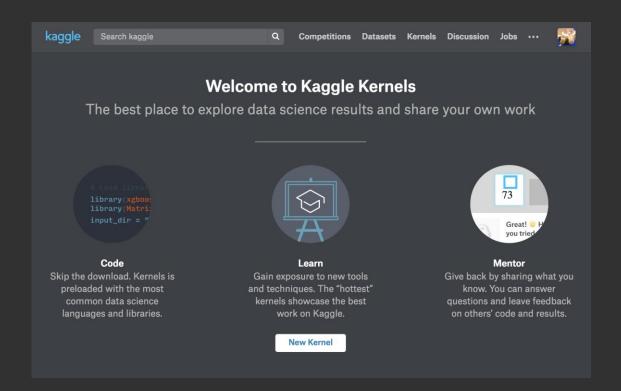
Interactive output

Your code can produce rich, interactive output: HTML, images, videos, LaTeX, and custom MIME types.



Big data integration

Leverage big data tools, such as Apache Spark, from Python, R and Scala. Explore that same data with pandas, scikit-learn, ggplot2, TensorFlow.





Amazon SageMaker

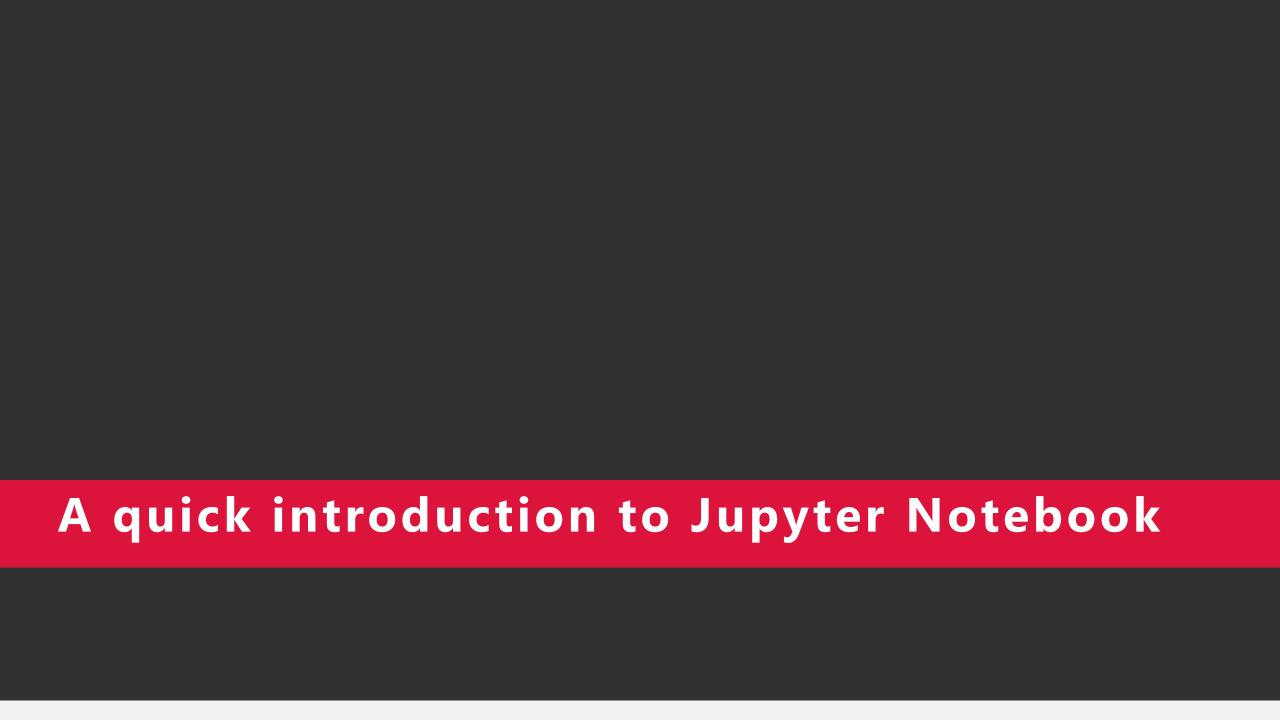
Machine learning for every data scientist and developer

Get Started with SageMaker

A gallery of interesting Jupyter Notebooks

Jupyter Notebook

- 1. The **Jupyter Notebook App** (formerly IPython Notebook) is a server-client application that allows editing and running notebook documents via a web browser.
- 2. A notebook **kernel** is a "computational engine" that executes the code contained in a Notebook document.
- 3. The Jupyter Notebook App gets installed automatically when you install Anaconda.
- 4. The Jupyter Notebook App can be launched by clicking on the Jupyter Notebook icon installed by Anaconda in the start menu.



Closing the Jupyter Notebook App

- 1. Closing the browser (or the tab) **will not close** the Jupyter Notebook App. To completely shut it down you need to **close the associated terminal**.
- To shut it down, go to the associated notebook and click on menu File → Close and Halt.
 - 1. Alternatively, the Notebook Dashboard has a tab named *Running* that shows all the running notebooks (i.e. kernels) and allows shutting them down (by clicking on a *Shutdown* button).

A Few Useful Commands

Task	Command/Short-cut
Run selected cell	Ctrl + Enter
Run selected cell and insert a new cell below	Alt + Enter
Run all cells	Menu: <i>Cell -> Run All</i> .
Restart the kernel	Menu: Kernel -> Restart
Delete a cell	



▼ Visual Studio Code

Docs Updates

Blog

Extensions

Learn

Version 1.52 is now available! Read about the new features and fixes from November.

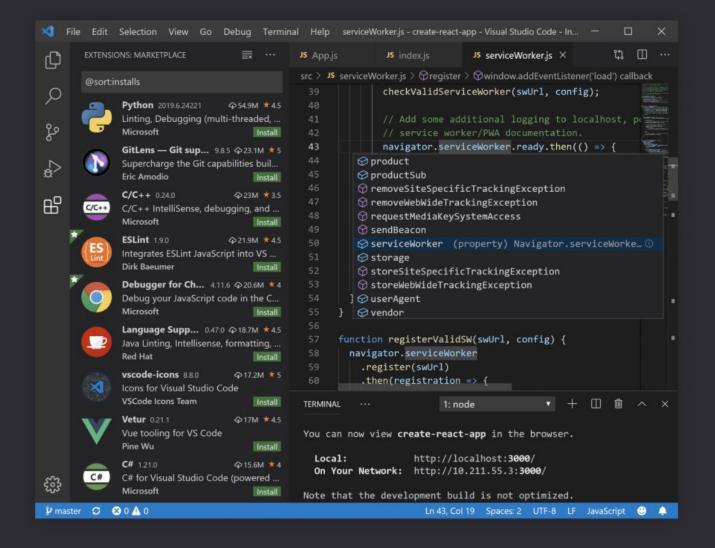
Code editing. Redefined.

Free. Built on open source. Runs everywhere.



Other platforms and Insiders Edition

By using VS Code, you agree to its



How much of coding experience do you have?

- O None / Less than 1 year
- O 1-5 years
- 5+ years

Python Intro Tutorial

00_intro_python_tutorial.ipynb

Case Sensitive

```
temp = 1
print(temp)
 1
print(Temp)
 NameError
                                          Traceback (most recent call last)
 <ipython-input-3-086e40c91607> in <module>
 ----> 1 print(Temp)
 NameError: name 'Temp' is not defined
```

Whitespace / Indentation

```
for i in [1, 2, 3, 4, 5]:
    print(i)
for i in [1, 2, 3, 4, 5]:
print(i)
   File "<ipython-input-2-500429ebfc34>", line 2
    print(i)
 IndentationError: expected an indented block
```

```
In [1]: (1+3) == (1 + 3)

True
```

Whitespaces within lines do not matter.

Dynamic Typing

```
a = 3
print(a, type(a))
 3 <class 'int'>
a = 'Python'
print(a, type(a))
 Python <class 'str'>
a = 3.14
print(a, type(a))
 3.14 <class 'float'>
```

Arithmetic Operations

Operator	Name	Description
a + b	Addition	Sum of a and b
a - b	Subtraction	Difference of a and b
a * b	Multiplication	Product of a and b
a / b	True division	Quotient of a and b
a // b	Floor division	Quotient of a and b, removing fractional parts
a % b	Modulus	Integer remainder after division of a by b
a ** b	Exponentiation	a raised to the power of b
-a	Negation	The negative of a
+a	Unary plus	a unchanged (rarely used)

```
counter = 1
counter = counter + 1
print(counter)
counter = 1
counter += 1
print(counter)
```

Scalar Types

Туре	Example	Description
int	x = 1	integers (i.e., whole numbers)
float	x = 1.0	floating-point numbers (i.e., real numbers)
complex	x = 1 + 2j	Complex numbers (i.e., numbers with real and imaginary part)
bool	x = True	Boolean: True/False values
str	x = 'abc'	String: characters or text
NoneType	x = None	Special object indicating nulls

Data Structures

Type Name	Example	Description
list	[1, 2, 3]	Ordered collection
tuple	(1, 2, 3)	Immutable ordered collection
dict	{'a':1, 'b':2, 'c':3}	Unordered (key,value) mapping
set	{1, 2, 3}	Unordered collection of unique values

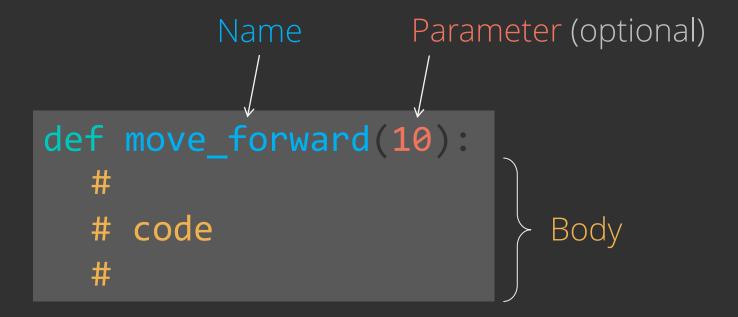
Indexing and Slicing

```
mylist = [1, 50, 100]
print(mylist)
 [1, 50, 100]
print(type(mylist))
 <class 'list'>
len(mylist)
mylist.append(99)
print(mylist)
 [1, 50, 100, 99]
```

```
mylist[0]
                         Indexing
mylist[3]
mylist[-1]
mylist[0:2]
 [1, 50]
mylist[::-1]
                             Slicing
 [99, 100, 50, 1]
```

Python Functions

- igcup Functions pprox Actions, verbs, commands
- Parameters ≈ adverbs



Python Packages

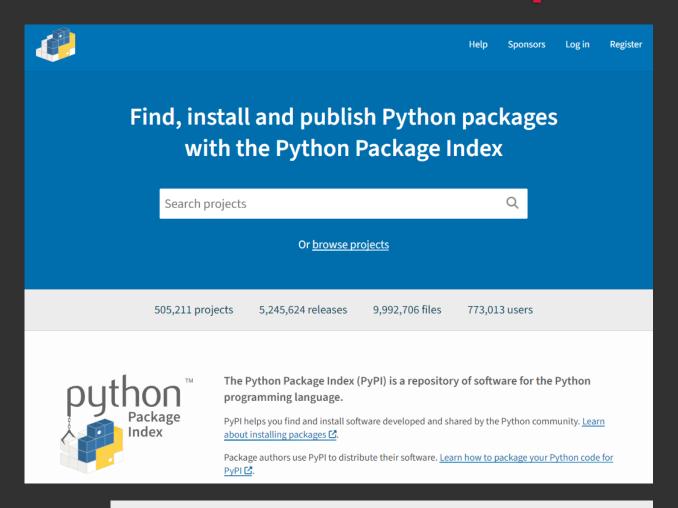
1. Installing a package on your computer:

- 1. Go to Anaconda command prompt (search for it on your computer using the search bar).
- Type 'pip install <package-name>' or 'conda install <package-name>' to install a specific package.

Importing a package into your program:

- 1. Explicit module import: e.g., import math
- 2. Explicit module import by alias: e.g., import numpy as np
- 3. Explicit import of module contents: e.g., from math import cos, pi

"The Cheese Shop"



 Jan 2023
 426,421 projects
 4,064,431 releases
 7,333,845 files
 655,788 users

 Jan 2022
 281,813 projects
 2,297,688 releases
 3,708,457 files
 476,044 users



Do I have to like "Monty Python's Flying Circus"?

No, but it helps. :)