Introduction to Python

For Data Science and Scientific Computing

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Outline

- **Python:**
  - **What is it?**
  - Why Python?
  - Installation
  - Terminal use and scripts
- Jupyter Notebooks:
  - What and why?
  - How?
- Python Basics:
  - Data Types and Data Structures
  - Methods
  - Packages
- Python for Data Science:
  - Numpy, Scipy and Pandas
  - Matplotlib and Seaborn
  - Scikit-learn and TensorFlow
- Data Cleaning and Visualisation Example:
  - Scores for CTQ data questionnaires.
- Further Ressources and Trainings
  - Python Integrations
  - Stack Overflow and Google
  - Python Learning Resources

What is it?

- Interpreted, high-level, object-oriented with dynamic semantics programming language created in 1989 by:
- Guido Van Rossum (ex-BDFL, 1990-2018)
- Named after the *Monty Python* British comedy group

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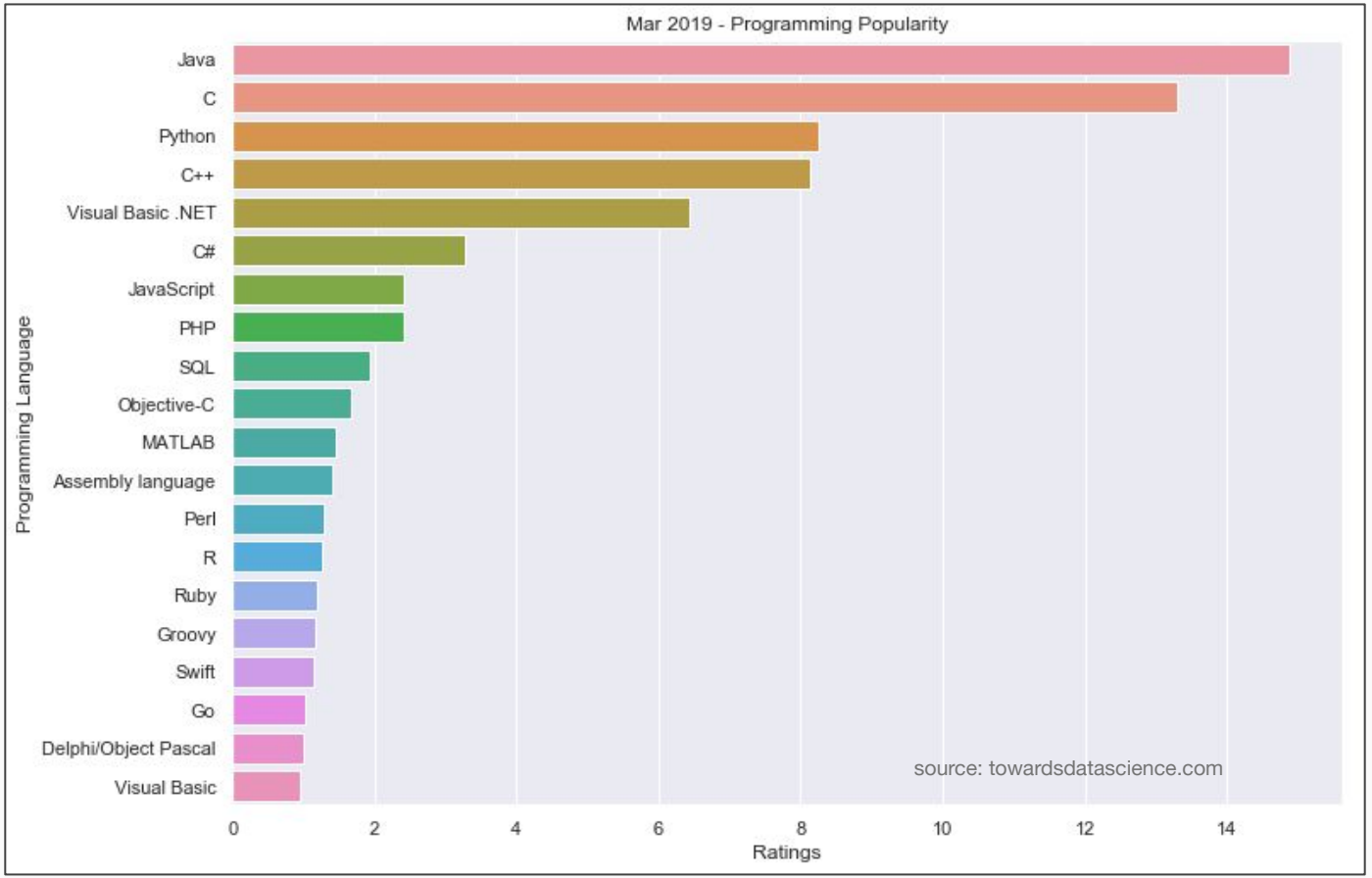
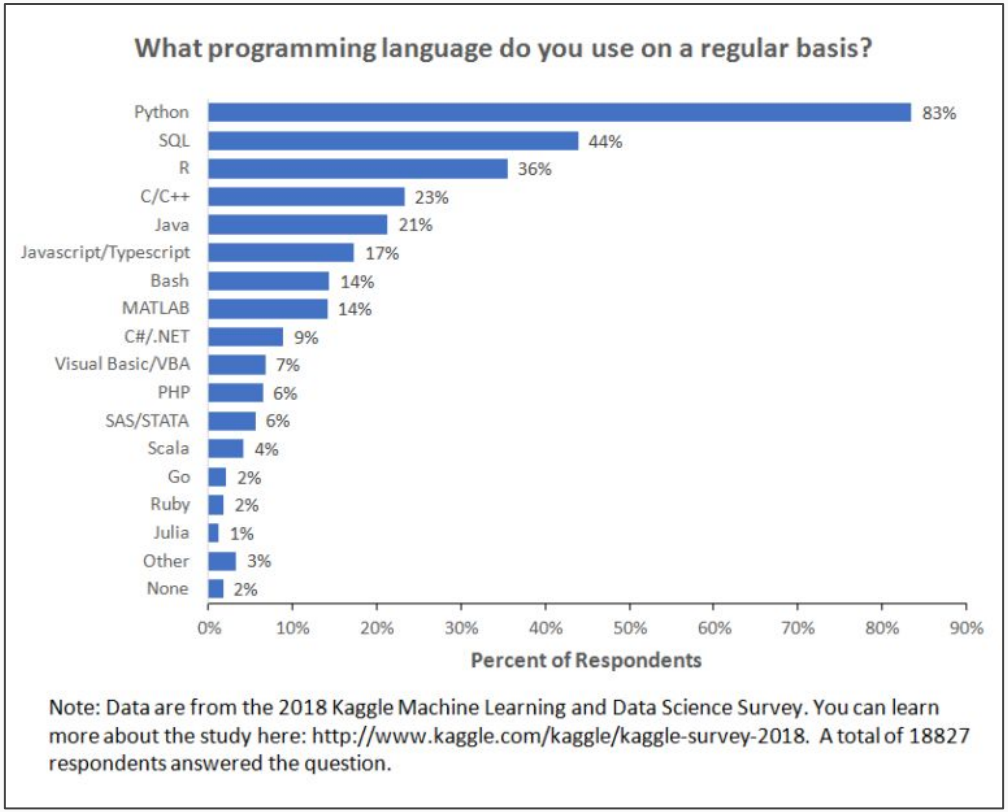
Why Python?

- **Easy to learn**, very simple language (no garbage collection or variable declaration)
- **Open source**, with one of the biggest communities in the world (a lot of available and maintained packages)
- **Easy to read**, almost written as plain english (great for collaborations)
- **Extremely versatility**, you can analyse and visualize data, code websites or video games, do statistical work and machine learning

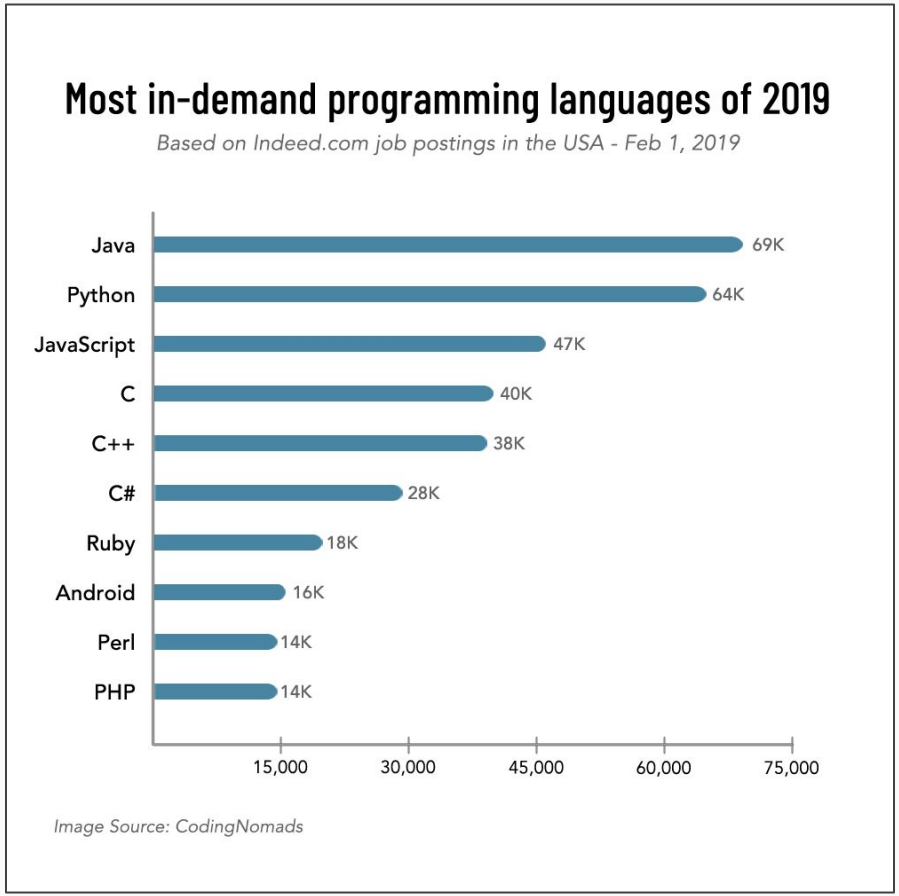
Most used programming languages **Worldwide** (2019)



Most used programming languages for **Machine Learning and Data Science** (2018)



Most in-demand programming languages for **Jobs** (2019)



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Installing Python

Refer to pdfs/python_training_setup_guide.pdf

https://www.python.org/downloads/

https://www.anaconda.com/distribution/

https://docs.conda.io/en/latest/miniconda.html

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Terminal use and Scripts.

Refer to pdfs/python_terminal_and_scripts.pdf

- Run from terminal or miniconda terminal
- Scripts always end in **.py**
- Use of text editors with syntax highlighting such as Visual Studio Code or Atom

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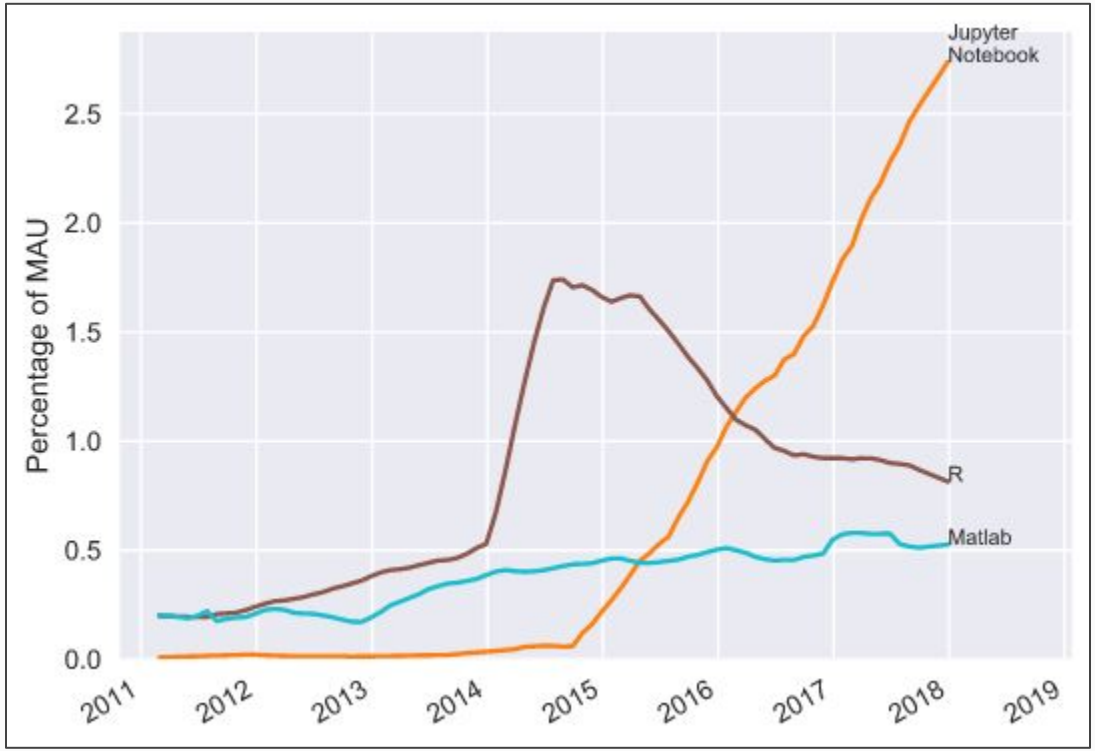
Jupyter: What and Why?

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. Uses include: **data cleaning** and **transformation**, numerical **simulation**, **statistical modeling**, data **visualization**, **machine learning**, and much more.

Tutorial | Useful shortcuts

Jupyter: What and Why?



Source: GitHub

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Installing and using Jupyter Notebook

Refer to pdfs/jupyter_notebook.pdf

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Data Types and Structures

Data Types:

- Integer
- Float
- String
- Boolean

Data Structures:

- List
- Dictionary
- Tuple
- Set
- DataFrame

Refer to notebooks/python_basics_part1.ipynb

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Data Types and Structures

- Variables
- Loops (**for** and **while**)
  - break/continue
- if/elif/else
  - and/or
- Commenting:
  - **First rule** of programming: **Always Comment!**
- Errors and Exception Catching.

Refer to notebooks/python_basics_part1.ipynb

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Functions and Packages

- **Functions**
  - **methods** are also fonctions but within a **Class** object. Classes will not be covered in this training (but are what make python and object-oriented programming language)!
  - On how to call a function from a script, refer to **pdfs/python_terminal_and_scripts.pdf**

- Best **Packages** for data science and scientific computing:
  - **Jupyter**: https://jupyter.org/
  - **Numpy**: https://numpy.org/
  - **Scipy**: https://www.scipy.org/
  - **Pandas**: https://pandas.pydata.org/
  - **Matplotlib**: https://matplotlib.org
  - **Seaborn:** https://seaborn.pydata.org/
  - **sklearn**: https://scikit-learn.org/
  - **TensorFlow**: https://www.tensorflow.org/

Refer to notebooks/python_basics_part2.ipynb

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Python for Data Science and Scientific Computing:

Tutorials:

- Jupyter: (Notebooks interface to handle and visualize data)
- Numpy: (Mostly written in C, methods for mathematics and data handling)
- Scipy: (Based on Numpy, scientific computations and methods)
- Pandas: (Based on Numpy, offers Dataframes and eases data manipulation)
- Matplotlib: (Python's core graphics library, can plot anything from basics graphs to 3D)
- Seaborn: (Beautifies and simplifies matplotlib plotting, many other packages do so as well)
- sklearn: (Based on Numpy and Matplotlib, offers more advanced statistical tools)
- TensorFlow: (Recent packages with amazing tools for machine learning, notably deep-learning)

Refer to notebooks/python_basics_part2.ipynb

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CTQ Data Cleaning and Visualisation Example:

Refer to notebooks/CTQ_A1.ipynb

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Python Integrations

- Rpython and/or rpy2 : with R
- Cython : with C
- Jython : With Java

BUT best of all is to save your data to **CSV** or **JSON** formats, which all these languages can also read!

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Stack Overflow and Google

The Third rule of programming: Google it!

Does Python have a string 'contains' substring method?

Asked 9 years, 2 months ago Active 13 days ago Viewed 3.8m times

3602

I'm looking for a `string.contains` or `string.indexof` method in Python.

I want to do:

```
if not somestring.contains("blah"):
   continue
```

457

python string substring contains

share

edited May 26 '17 at 18:02
Peter Mortensen
14.5k • 19 • 89 • 118

asked Aug 9 '10 at 2:52
Blankman
103k • 277 • 677 • 1061

10 Answers active oldest votes

5735

You can use the `in` operator:

```
if "blah" not in somestring:
    continue
```

share improve this answer

edited Nov 11 '15 at 23:30

answered Aug 9 '10 at 2:56
Michael Mrozek
127k • 20 • 147 • 156

161 Under the hood, Python will use `__contains__(self, item)`, `__iter__(self)`, and `__getitem__(self, key)` in that order to determine whether an item lies in a given contains. Implement at least one of those methods to make `in` available to your custom type. – BallpointBen Aug 17 '18 at 7:02

17 Just make sure that somestring won't be None. Otherwise you get a `TypeError: argument of type 'NoneType' is not iterable` – Nan Zhong Oct 10 '18 at 22:44

5 FWIW, this is the idiomatic way to accomplish said goal. – Trenton Nov 13 '18 at 21:41

4 For strings, does the Python `in` operator use the Rabin-Carp algorithm? – Sam Chats Dec 18 '18 at 20:23

1 This is inconsistent and ugly in code like `".so." in filename or filename.endswith(".blah")`. – Kaz Feb 12 at 20:24

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Learning Resources

https://www.codecademy.com/catalog/language/python

https://learnpythonthehardway.org/book/

https://realpython.com/learning-paths/python3-introduction/

edX or coursera

Stackoverflow and Towards Data Science on Medium

GOOGLE!

The rules of programming

- Always comment
- Never repeat yourself
- Google it!
- You learn by doing

Thanks!

pedrobordignon@hotmail.com

https://github.com/pedrodcb/python_training