Getting things done with Python

Python programming language & ecosystem:
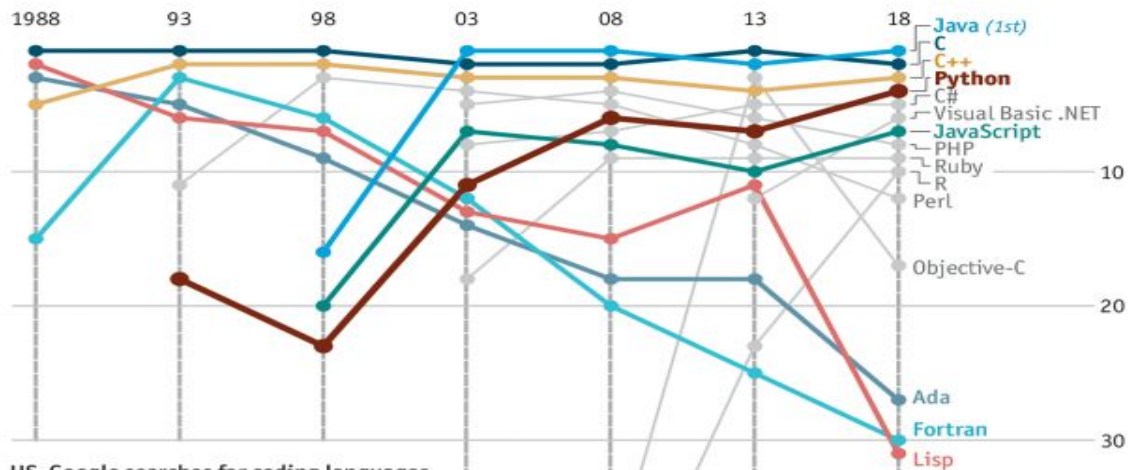Why? What? How?

Why Python?

- Python is easy to use and effective.
- Its code is easy to read and write.
- Python is a flexible language that can support many programming paradigms.
- Suitable for beginners and professionals alike.
- Popular and well-supported.
- Used by large and small companies and organizations worldwide.
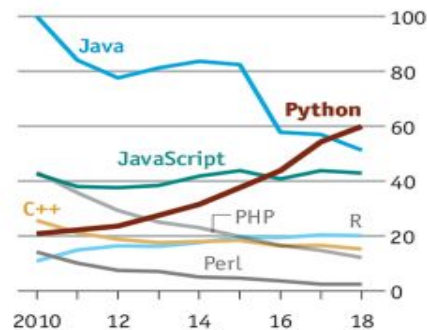- Used in many courses and workshops.

Python is popular...

Code of conduct
Ranking of programming languages*

1988 · 93 · 98 · 03 · 08 · 13 · 18

Java (1st)
C
C++
Python
C#
Visual Basic .NET
JavaScript
PHP
Ruby
R
Perl
Objective-C
Ada
Fortran
Lisp

US, Google searches for coding languages
100 = highest annual traffic for any language

Java
Python
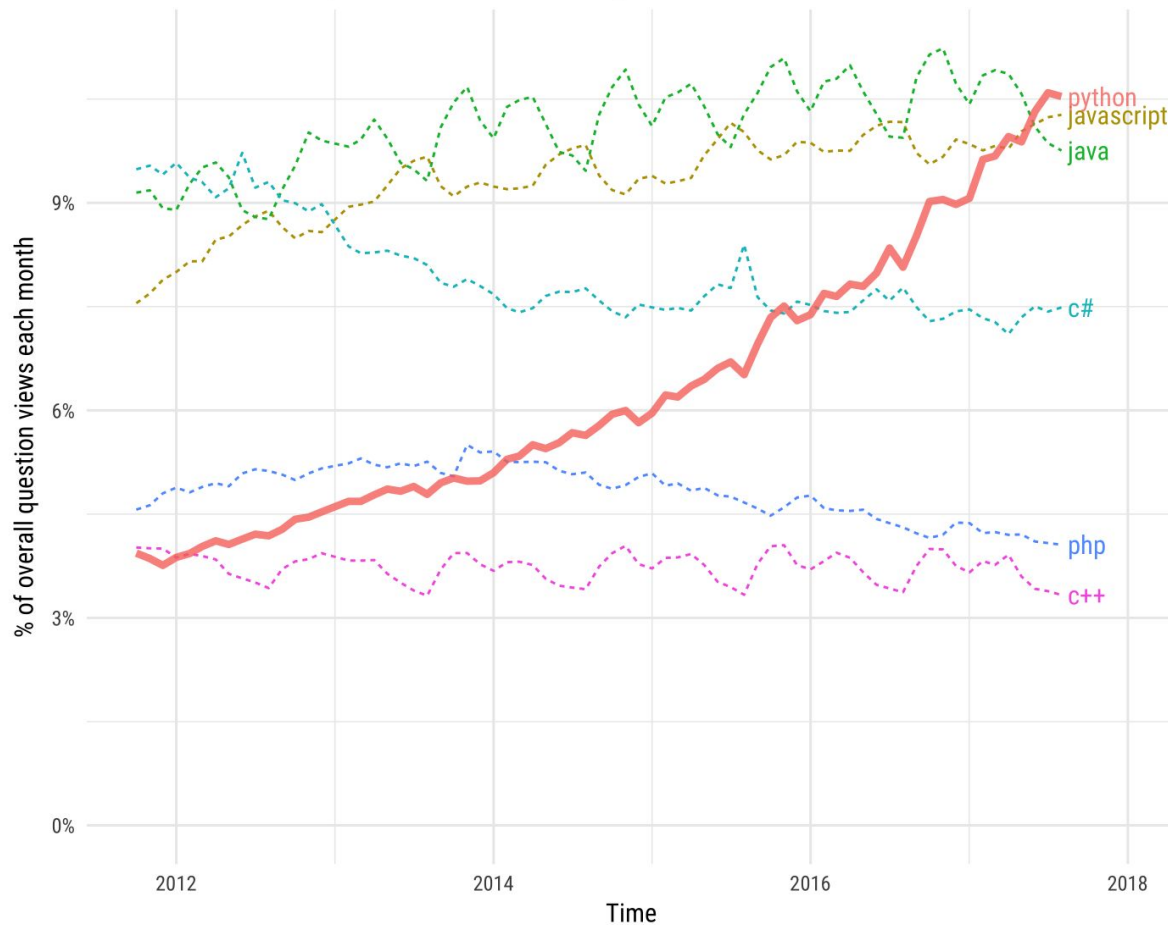JavaScript
C++
PHP
R
Perl

2010 · 12 · 14 · 16 · 18

Source: TIOBE, Google Trends

*Ranked by global search-engine popularity

The Economist

...and continues to grow...

Growth of major programming languages

Based on Stack Overflow question views in World Bank high-income countries

... both for large computers

and tiny computers ...

Language Rank	Types	Spectrum Ranking		Spectrum Ranking
1. Python	🌐 🖥 🔲	100.0		100.0
2. C++	📱 🖥 🔲	98.4		99.7
3. C	📱 🖥 🔲	98.2		99.4
4. Java	🌐 📱 🖥	97.5		97.3
5. C#	🌐 📱 🖥	89.8		88.7
6. PHP	🌐	85.4		88.7
7. R	🖥	83.3		86.0
8. JavaScript	🌐 📱	82.8		81.9
9. Go	🌐 🖥	76.7		76.8
10. Assembly	🔲	74.5		76.0

IEEE Spectrum Survey 2018

Simple
But powerful
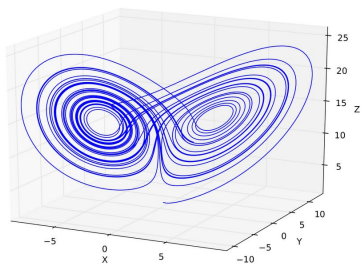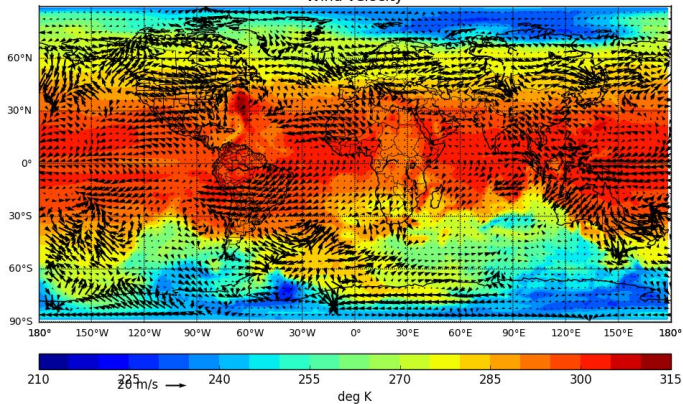
IP[y]: Notebook spectrogram Last Checkpoint: a few seconds ago (autosaved)

IPython (Python 3)

File   Edit   View   Insert   Cell   Kernel   Help

Code   Cell Toolbar: None

Simple spectral analysis

An illustration of the Discrete Fourier Transform using windowing, to reveal the frequency content of a sound signal.

$$X_k = \sum_{n=0}^{N-1} x_n e^{-\frac{2\pi i}{N} kn} \qquad k = 0, \ldots, N-1$$

We begin by loading a datafile using SciPy's audio file support:

```
In [1]: from scipy.io import wavfile
        rate, x = wavfile.read('test_mono.wav')
```

And we can easily view its spectral structure using matplotlib's builtin specgram routine:

```
In [2]: %matplotlib inline
        from matplotlib import pyplot as plt
        fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(12, 4))
        ax1.plot(x); ax1.set_title('Raw audio signal')
        ax2.specgram(x); ax2.set_title('Spectrogram');
```

Wind velocity

Raw audio signal

Spectrogram
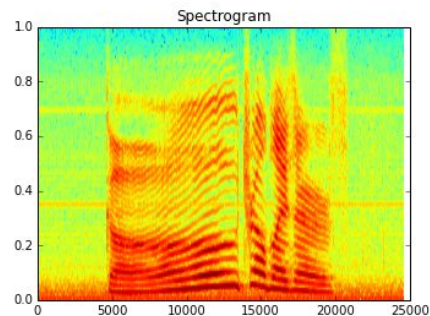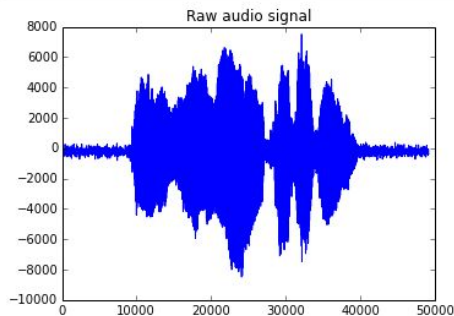
Flexible and widely used

What do you use Python for?

Data analysis — 52%
Web development — 45%
Machine learning — 39%
System administration / DevOps / Automation scripts — 38%
Programming of web parsers / scrapers / crawlers — 32%
Educational purposes — 30%
Software prototyping — 26%
Software testing / writing automated tests — 25%
Network programming — 18%
Desktop development — 11%
Embedded development — 6%
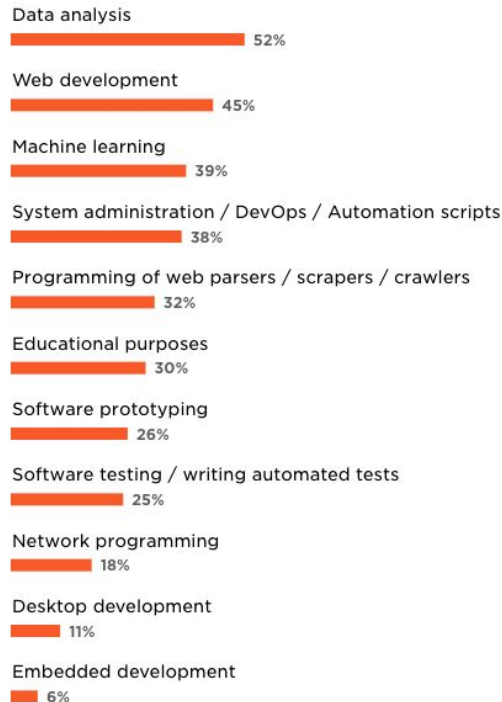
What libraries and/or frameworks do you use in addition to Python, if any?

NumPy / matplotlib / SciPy / Pandas and similar — 47%
Django — 39%
Flask — 39%
Requests — 32%
Anaconda — 25%
SQLAlchemy — 23%
Keras /Theano/ TensorFlow/ scikit-learn and similar — 22%
Scrapy — 16%
Pillow — 15%
PyQT/PyGTK/wxPython — 11%
asyncio — 9%
Tornado — 7%

JetBrains Python Developers Survey 2018
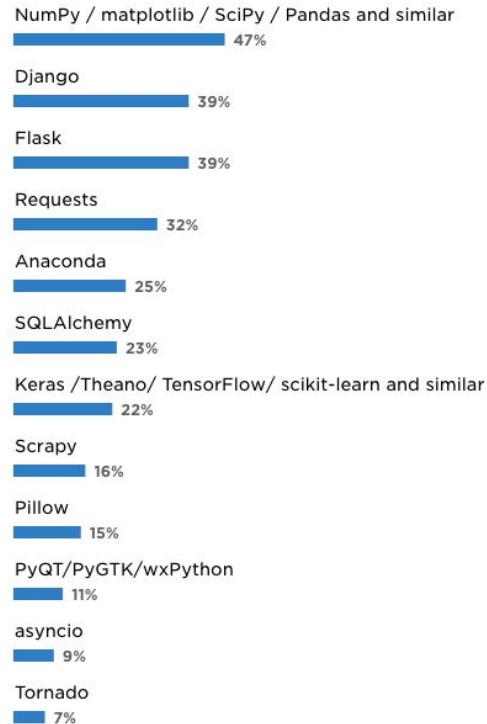
Python is cool
+ can be fun :)
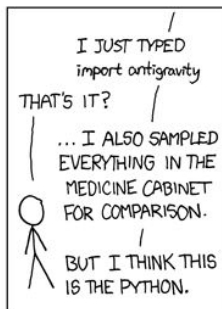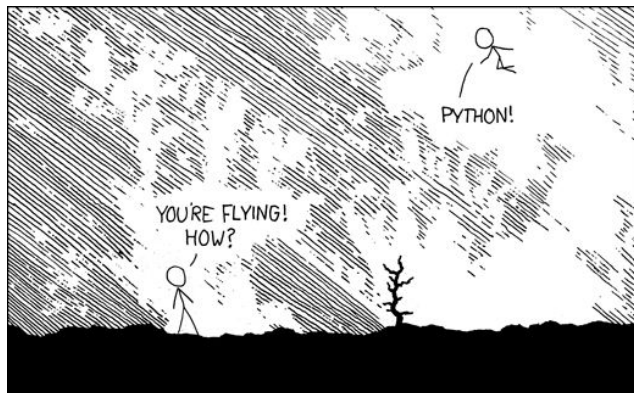
XKCD.com

```
In [9]: import matplotlib.pyplot as plt

plt.xkcd()
fig = plt.figure()

x = range(5)
y = [0, 1, 3.3, 4.5, 5]

plt.plot(x, y)
plt.xlabel("Gadi universita'te'")
plt.ylabel("kafijas / diena'")
plt.title("Studijas nav vieglas")

plt.show()
```

Contents

Two parts:

- Introduction to the Python programming language (What is Python)
  - Assumption: students already familiar with programming

- Practical applications of Python, with examples (Getting things done with Python)
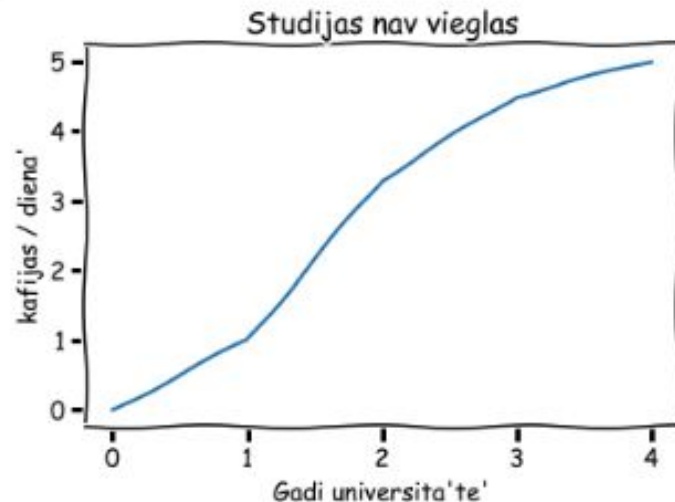 - Tools, libraries, frameworks
  - Examples:
    - Libraries: NumPy, SciPy, Pandas, Matplotlib, Flask, ...
    - Environments and tools: IPython, Jupyter notebook, PyCharm IDE, ...

Form

- Seminar time & location: Fridays @ 14:45 - room 336 (Raiņa bulv. 19)
  - Language: English
  - Course materials, schedule: see seminar website
  - Guest lectures from Python users & enthusiasts

- Discussions in person and online (Slack channel)
  - Follow Slack channel for announcements, discussion and useful links
- Assignments and projects
  - Initially - simple assignments
  - Later - group projects according to your interests

- Final grade - based on project work, presentations and participation in seminar and its discussions (active participation is encouraged)

The team

Organizers: Uldis Bojārs un Valdis Saulespurēns

We also plan to have guest lectures.

Resources

Course website (wiki):

http://selavo.lv/pysem

Slack channel: http://bit.ly/py-df-slack

- Everyone should join Slack channel (course announcements, …)

Github repository: see the course website