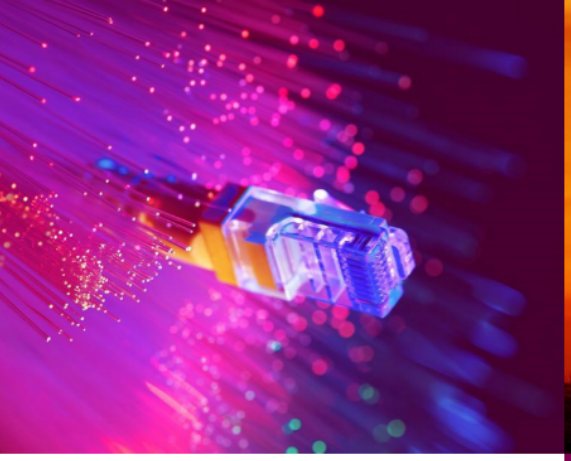


CSC

Introducing Python

CompCoffee 2017

CSC – Finnish expertise in ICT for research, education and public administration

What is Python?

- High-level general-purpose programming language by Guido van Rossum (1991)
- Interpreted
- Loosely/dynamically typed
- Aim for Python3 (2.7 support stops in 2020)
  - asynchronicity, generators, coroutines, …

Design

- Design philosophy emphasizes:
  - code readability
  - expressing concepts in fewer lines of code
  - support for **procedural** and **object-oriented** programming
- *code is read much more often than it is written*

Look and feel

```
# fibonacci
def fib(n):
    if n<2:
        return n
    return fib(n-1)+fib(n-2)
```

```
# statistics of random matrices
def randmatstat(t):
    n = 5
    v = zeros(t)
    w = zeros(t)
    for i in range(t):
        a = randn(n, n)
        b = randn(n, n)
        c = randn(n, n)
        d = randn(n, n)
        P = concatenate((a, b, c, d), axis=1)
        Q = concatenate((concatenate((a, b), axis=1), concatenate((c, d), axis=1)), axis=0)
        v[i] = trace(matrix_power(dot(P.T,P), 4))
        w[i] = trace(matrix_power(dot(Q.T,Q), 4))
    return (std(v)/mean(v), std(w)/mean(w))
```

AstroBetter Python summary:

- Free
- write once, run anywhere (unlike C or C++, dont need to manually recompile)
- All in one programming/plotting (replacement for IDL).
- Faster than IDL, slower than C but more user friendly.
- Gives full access to historical IRAF algorithms via PyRAF
- Used for Hubble/ALMA pipelines.
- Many statistics/numerical recipes packages available.
- Makes nicer plots than IDL… what you see is what you get, even in postscript (unlike IDL).

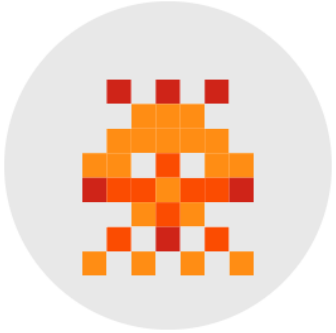
Core libraries (that I include almost every time)

- NumPy (numerics: matrices, integrators…)
- SciPy (toolbox for scientists: fft, optimization, statistics,…)
- matplotlib (THE plotting library)

```
import numpy as np
from scipy import NAME_OF_MY_TOOL
import matplotlib import pyplot as plt
```

Learning Python

- See *Learn X in Y minutes* series: https://learnxinyminutes.com/docs/python3/
- online CSC course on python: notebooks.csc.fi -> launch Introduction to Python
- **scipy**:
  - http://www.scipy-lectures.org/intro/scipy.html#scipy
- **visualization**:
  - http://www.scipy-lectures.org/intro/matplotlib/index.html#matplotlib
- **code cookbook**:
  - http://scipy-cookbook.readthedocs.io
- **why?**:



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