Awesome Python for Science

by Nathan Hartman, and Nicholas Maxwell

python

A Python

Guido van Rossum
BDFL

Who Am I?

Software Developer

Python

What is it?

Programming Language

Like Ruby, Perl, Java, C, C++, C#, Objective-C, Clojure

Python vs Ruby

Python vs Perl

```
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello, world!");
    }
}
```

```
print "hello world"
```

Python vs Java

Python vs C/C++

```
using System;

internal static class HelloWorld{
    private static void Main(){
        Console.WriteLine("Hello, world!");
    }
}
```

```
print "hello world"
```

Python vs C#

```
NSString *s =
    [NSString stringWithFormat:
        @"I am %d verbose", "very"];
//I am very verbose
```

```
s = "I am not %s verbose" % "very"
```

Python vs Objective C

Python vs Clojure

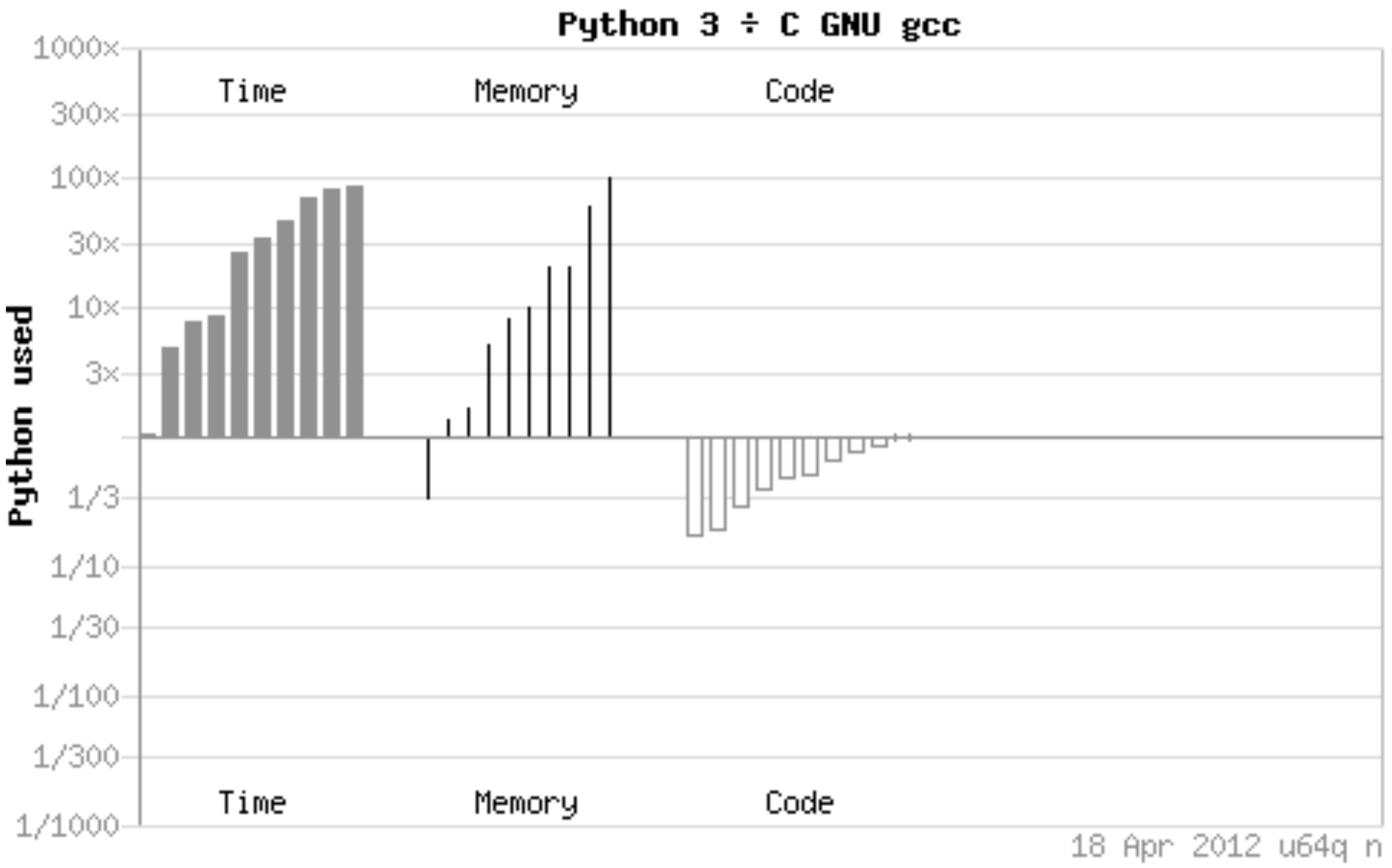
Dynamic

and strongly typed

Automatic Memory Management

Reference Counting / Garbage Collection

Poor Concurrency



Poor Performance

Has Many Libraries

Scipy
Numpy
Obspy
BioPython
PyWavelets
Matplotlib
OpenCV

Django
Flask
Bottle

wxPython
pyGtk
pyQt
PySide
Tkinter

pyOpenGL
PIL

ctypes
SWIG

Basics of Python

Numbers

- Integers
  - 1 + 1 # 2
  - 1 / 2 # 0
- Floats
  - 1.1 + 2.2 # 3.3000000000003
- Decimal
  - Never used them
- Fractions
  - Never used them
- Complex Numbers

  You might use them

Strings

- Immutable
  - "foo"[0] = 'a' # ERROR
- Sequence of Characters
  - for c in "hello": print c
- Lots of Nice String Operations
  - strip()
  - join()
  - +=

Lists (Basic)

```python
xs = [1,2,3] #literal
xs.append(1) #vector
xs.pop() #stack
xs.pop(0) #queue
```

```java
ArrayList<Integer> arr = new ArrayList<integer>();
arr.add(1);
arr.add(2);
arr.add(3);
```

Lists (Advanced)

```
squares = [x * x for x in [1,2,3]]
#comprehension
uniques = set([1,1,1,1,2,3,4]) #sets

#loops
for x in range(100):
    print x
```

Dictionaries

- Custom Syntax: {'a' : 1, 'b' : 2}
  Key -> Value Mappings
  Discussed in "Beautiful Code"
  Basis for Classes and Modules
  Relatively fast (in a Python sense)

Tuples

- Immutable
- Multiple Assignment
- Multiple Return Values

```
x,y = 1,2

def multiple_values():
    return 1,2
```

Files

Read
Write
Nothing Fancy

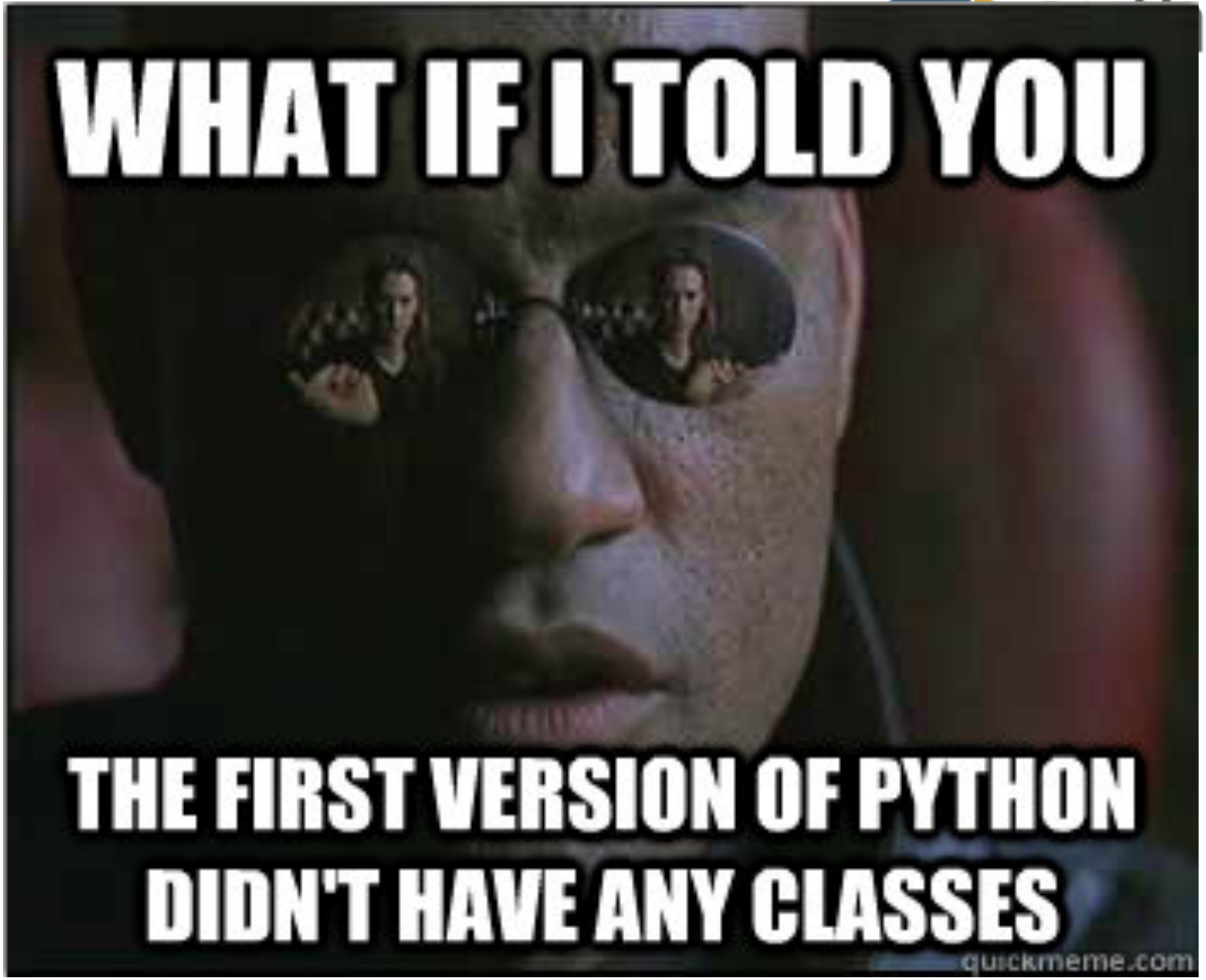
```
with open('hello.txt', 'w') as f:
    f.write("Hello from a file\n")
```

Control Structures

- Typical C-ish Language Stuff
  - for/while, break/continue
  - if/elif/else
  - try/except
- Exotic Fancy Stuff
  - with
  - yield
  - lambda

Function

Standard Stuff
Means of combination
Multiple Return Values
Keyword Arguments
Variable Arguments
Default Arguments


WHAT IF I TOLD YOU
THE FIRST VERSION OF PYTHON DIDN'T HAVE ANY CLASSES
quickmeme.com

Classes

OOP, Polymorphism, Inheritance

Operating Overloading

Multiple Inheritance

Duck Typing

End of Part 1