Learn Python Programming

TCEF IT Club, 2018

Class Info

- Learn Python from beginning
- Class time: Saturday 7pm – 8:30pm EST
- Reference book: **Python for Kids: A Playful Introduction To Programming (Jason R. Briggs)**
- Instructors

Learning Plan

- ✓ Lectures in ZOOM Cloud meeting (45 minutes)
- ✓ Hands-on Lab with TA (Teaching Assistant)
- ✓ Home work
- ✓ Study & Practice on your own

What is Python?

- Programming language

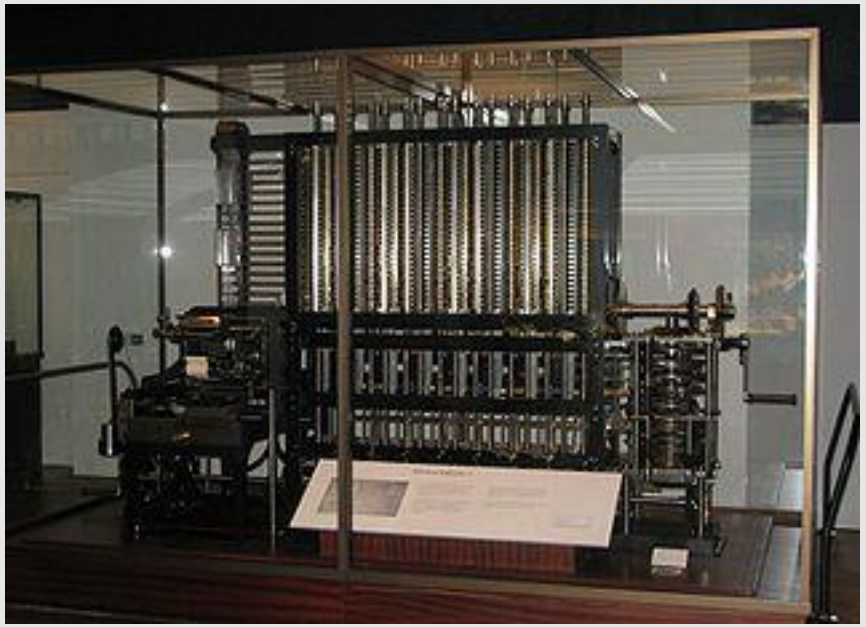
- Then what is Programming Language?
  - A formal **language** that specifies a set of instructions that can be used to produce various kinds of output. **Programming languages** generally consist of instructions for a **computer**.

- What is computer?
  - A **computer** is a device that can be instructed to carry out arbitrary sequences of arithmetic or logical operations automatically.

Computing History

Abacus: 2600 years ago

Modern Computer



- 1819 – 1822: Charles Babbage, proposed Difference Engine was a special-purpose digital computing machine for the automatic production of mathematical tables (such as logarithm tables, tide tables, and astronomical tables).
- Can calculate logarithmic and trigonometric functions, can be approximated by polynomials.

Modern Computer- first programming language

Ada Lovelace

- the first to recognize that the machine had applications beyond pure calculation
- published the first algorithm for Charles Babbage's Analytical Engine: calculating *Bernoulli numbers*
- Is regarded as the first to recognize the full potential of a "computing machine"
- The first computer programmer

Modern Computer History

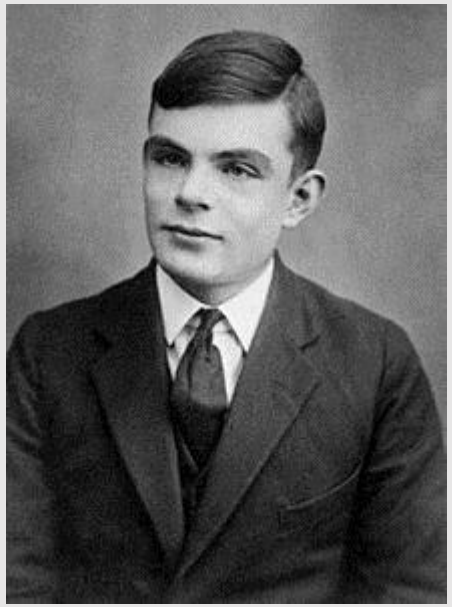
1890: **Herman Hollerith** designed a punch card system to calculate the 1880 census, accomplishing the task in just three years, saving the government $5million. He establishes a company that later became part of IBM(International Business Machine) .

Modern Computer History

The Universal Turing Machine

Alan Turing

- 1936, Turing invented the principle of the modern computer.
- The father of theoretical computer science and artificial intelligence.
- Turing Award: highest award in computer science



Apple™

Modern Computer History

1937: Bell Laboratories

"Model K" Adder

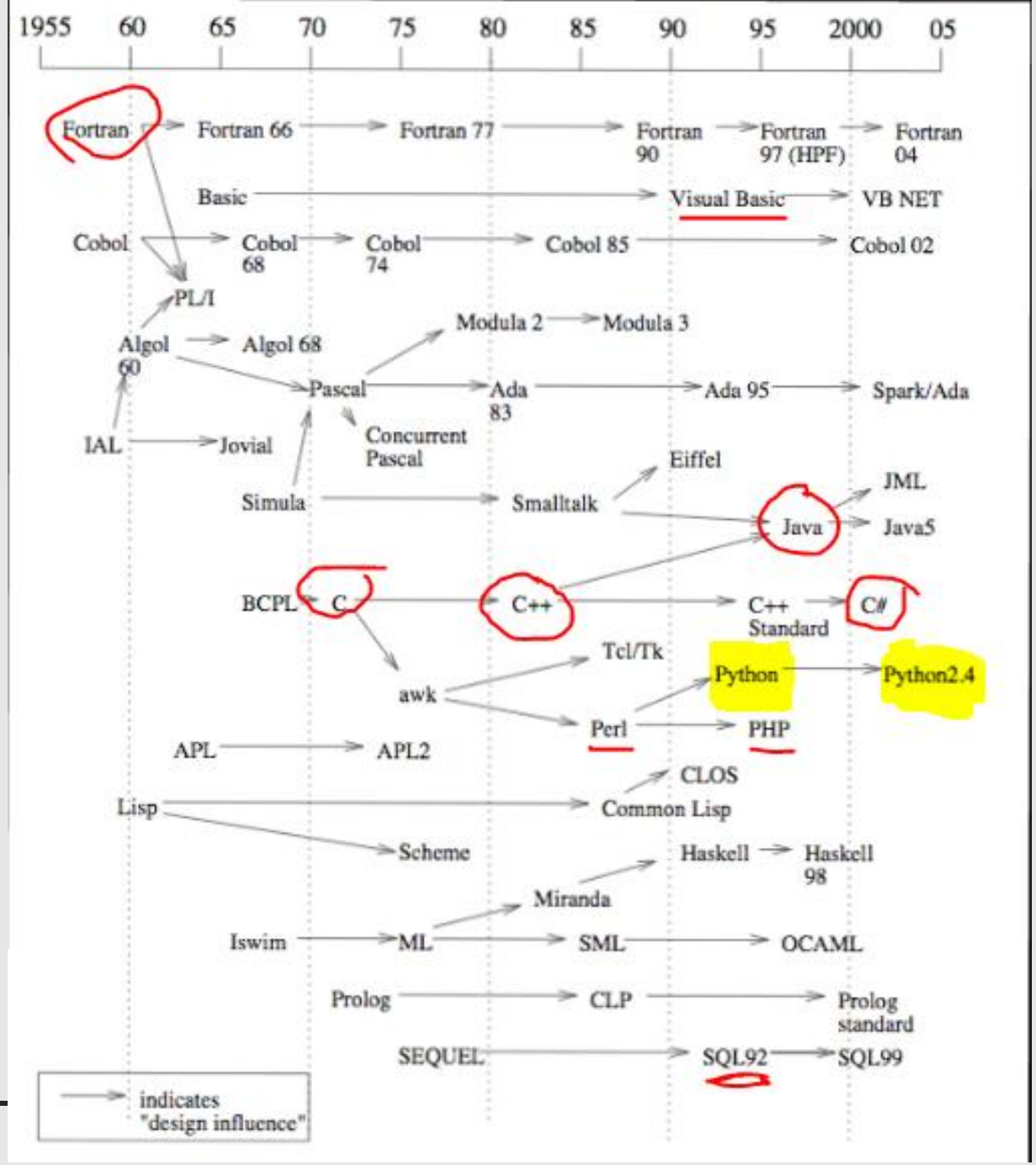
provides proof of concept for applying Boolean logic to the design of computers

1939: HP (Hewlett-Packard is founded)

David Packard and Bill Hewlett found their company in a Palo Alto, California

More computer history:
http://www.computerhistory.org/timeline/computers/#169ebbe2ad45559efbc6eb35720d57b7

Programming Language History



Programming Language History

History of Programming Language

1943 - ENIAC coding system
1951 - Regional Assembly Language
1952 - Autocode
1954 - IPL (forerunner to LISP)
1955 - FLOW-MATIC (forerunner to COBOL)
1957 - FORTRAN (First compiler)
1957 - COMTRAN
1958 - LISP
1958 - ALGOL 58
1959 - FACT
1959 - COBOL
1959 - RPG
1962 - APL
1962 - Simula
1962 - SNOBOL
1963 - CPL (forerunner to C)
1964 - BASIC
1964 - PL/I
1967 - BCPL (forerunner to C)
1968 - Logo
1969 - B (forerunner to C)
1970 - Pascal
1970 - Forth
1972 - C
1972 - Smalltalk
1972 - Prolog
1973 - ML
1975 - Scheme
1978 - SQL
1980 - C++
1983 - Ada
1984 - Common Lisp
1984 - MATLAB
1985 - Eiffel
1986 - Objective-C
1986 - Erlang
1987 - Perl
1988 - Tcl
1988 - Mathematica
1989 - FL (Backus);
1990 – Haskell
1991 – Python
1991 - Visual Basic
1991 - HTML
1993 - Ruby
1993 - Lua
1994 - CLOS (part of ANSI Common Lisp)
1995 - Java
1995 - Delphi (Object Pascal)
1995 - JavaScript
1995 - PHP
1996 - WebDNA
1997 - Rebol
1999 - D
2000 - ActionScript
2001 - C#
2001 - Visual Basic .NET
2002 - F#
2003 - Groovy
2003 - Scala
2003 - Factor
2007 - Clojure
2009 - Go
2011 - Dart

Before 80s:
Establishing fundamental paradigms

1980s: consolidation, modules, performance. Object oriented programming

1990s: the Internet age, functional programming

Current trends: concurrent and distributed programming, security, component-oriented software development, open source , integration with database…

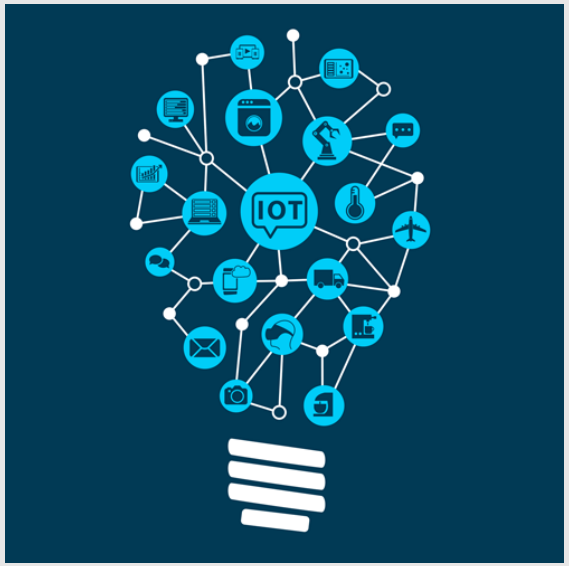
Why Python?

- Useful:
  - Data science
  - Mathematical computing
  - Web development
  - Finance and trading
  - System automation and administration
  - Computer graphics/game development
  - General and application specific scripting
  - Map and geography (GSI software)

- Easy to learn: very high level language

- Very Flexible: no hard rules, more forgiving of errors

- Python is the future of AI and Machine Learning: libraries such as scikit-learn



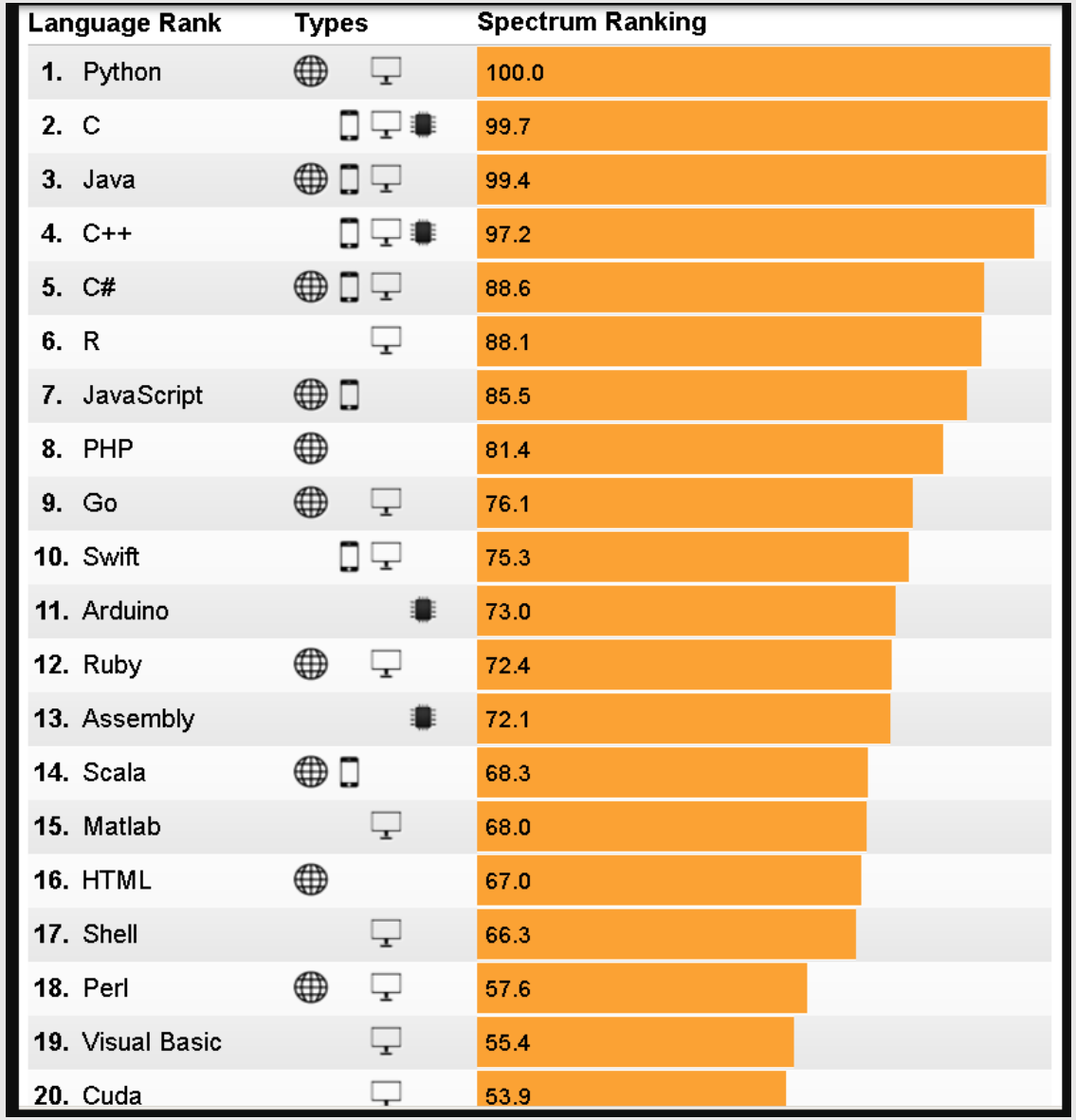
Programming Language ranking

Source:
IEEE Spectrum

IEEE: Institute of Electrical and Electronics Engineers; world's largest technical professional organization.

https://spectrum.ieee.org/computing/software/the-2017-top-programming-languages

A comparison of Programming Languages:
https://fusion809.github.io/comparison-of-programming-languages/



Who is using Python?

Google

YAHOO!

Walt Disney
ANIMATION STUDIOS

Yale University
LUX ET VERITAS

NASA

TOYOTA

redhat

LEGO

Nasdaq

citi

History of Python

- Conceived in late 1980s
- Implementation was started in Dec. 1989
- Principal author: Guido van Rossum

Releases:

Python 1.0 - January 1994

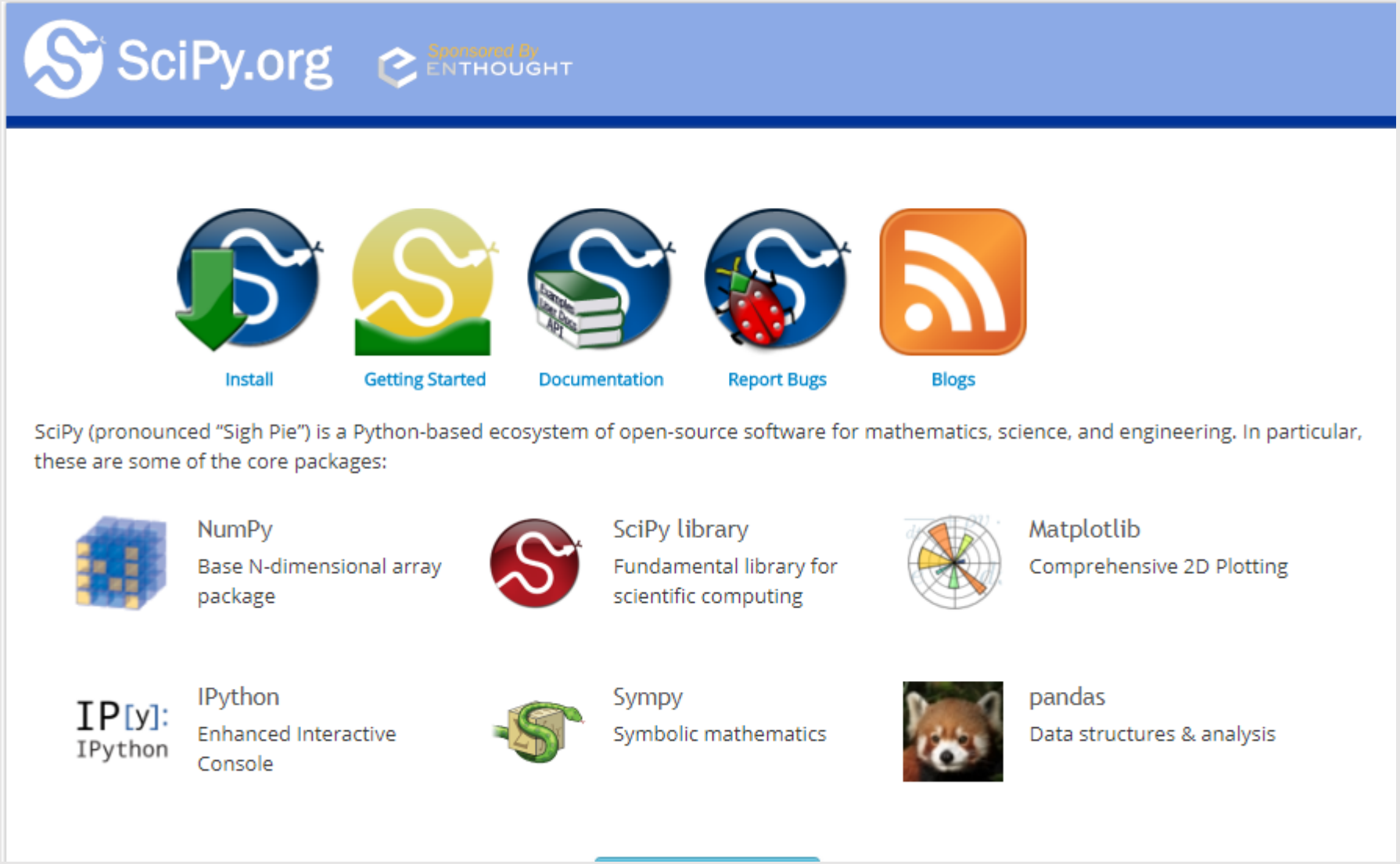
Python 2.0 - October 16, 2000

Python 3.0 - December 3, 2008

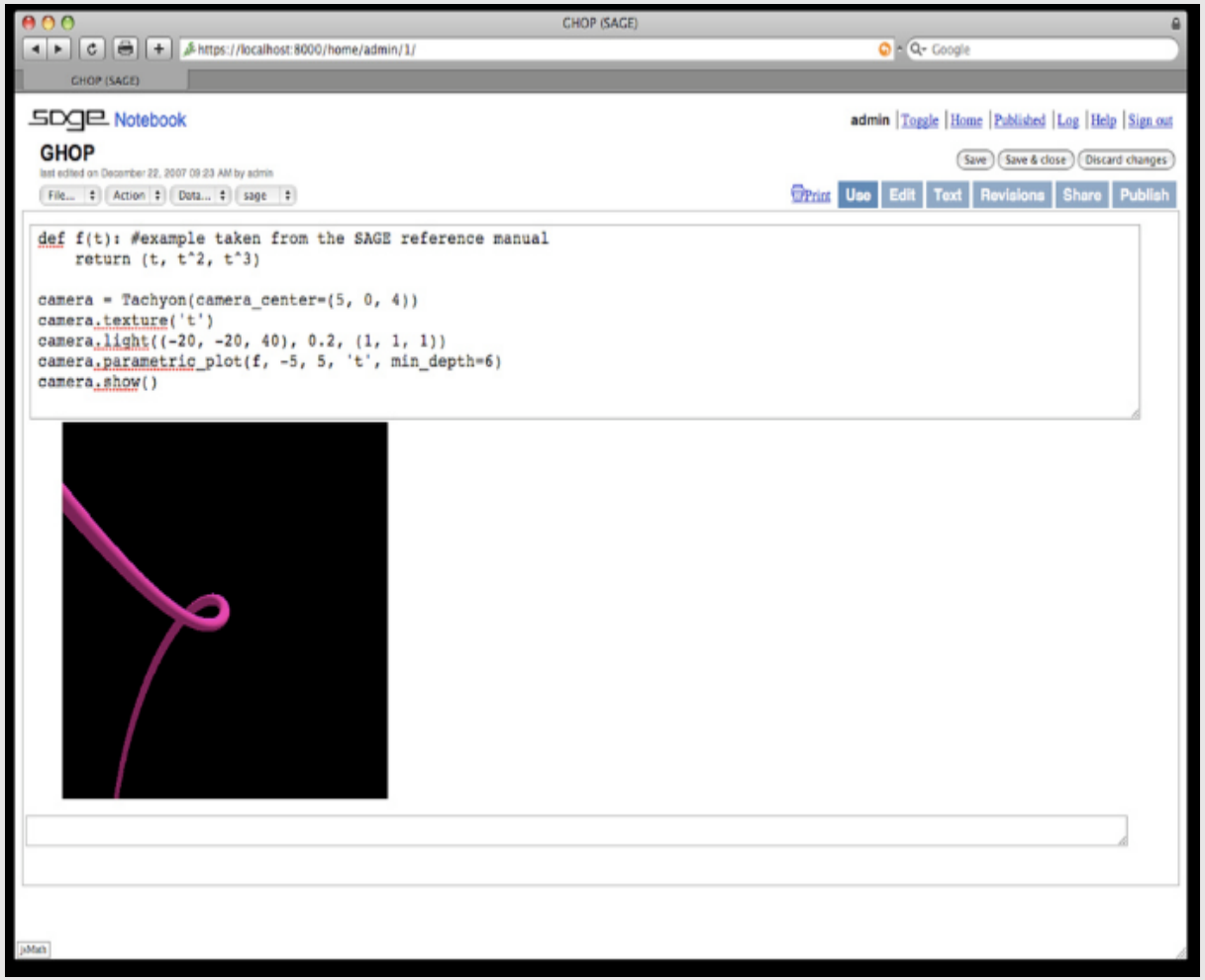
Latest Python Version: 3.6.4 - December 19, 2017

Website: https://www.python.org/

Python Based ecosystems - science



Python Based ecosystems - Math



Python Based ecosystems – Physics

pymunk

Star 170

build canceled

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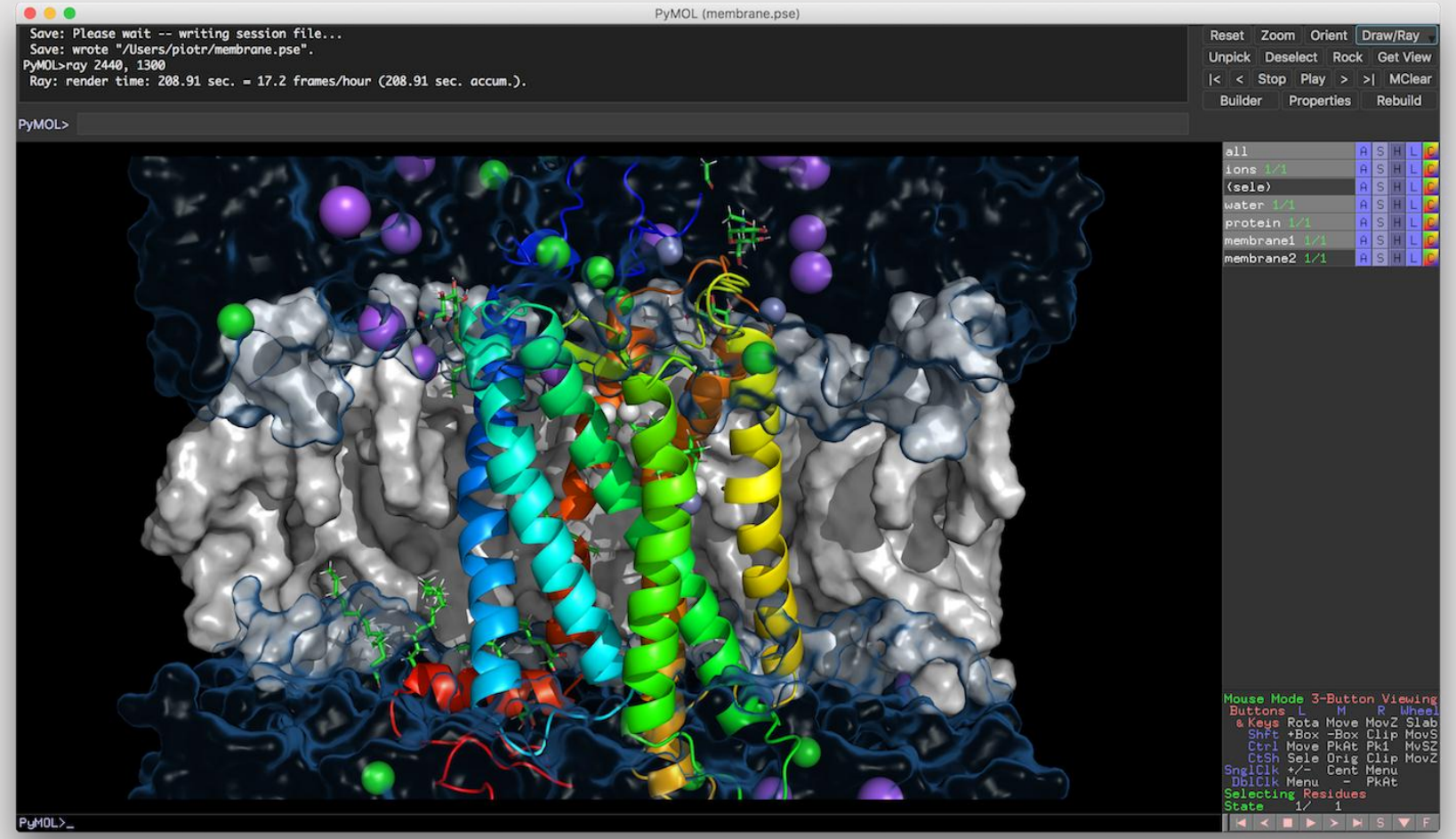
Pymunk

Pymunk is a easy-to-use pythonic 2d physics library that can be used whenever you need 2d rigid body physics from Python. Perfect when you need 2d physics in your game, demo or other application! It is built on top of the very capable 2d physics library Chipmunk.

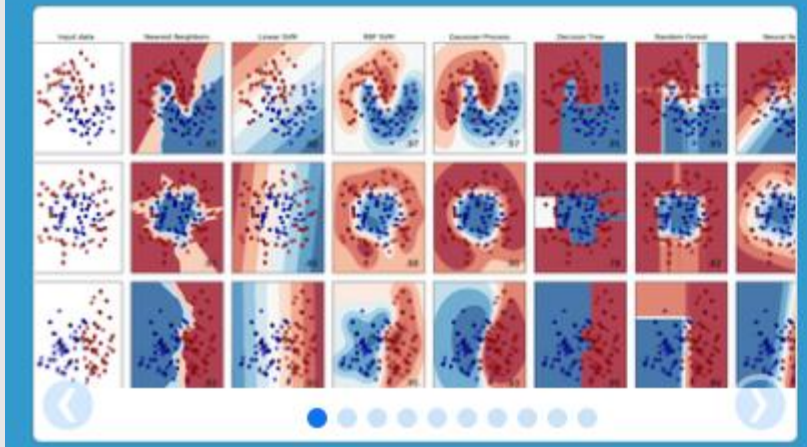
The first version was released in 2007 and Pymunk is still actively developed and maintained today.

Python Based ecosystems – Biology

PyMOL:
a molecular visualization system created by Warren Lyford DeLano. It is user-sponsored, open-source software, released under the Python License.



Python Based ecosystems – AI



scikit-learn

Machine Learning in Python

- Simple and efficient tools for data mining and data analysis
- Accessible to everybody, and reusable in various contexts
- Built on NumPy, SciPy, and matplotlib
- Open source, commercially usable - BSD license

PyBrain

The Python Machine Learning Library

neurolab

Natural Language Toolkit

Computer program

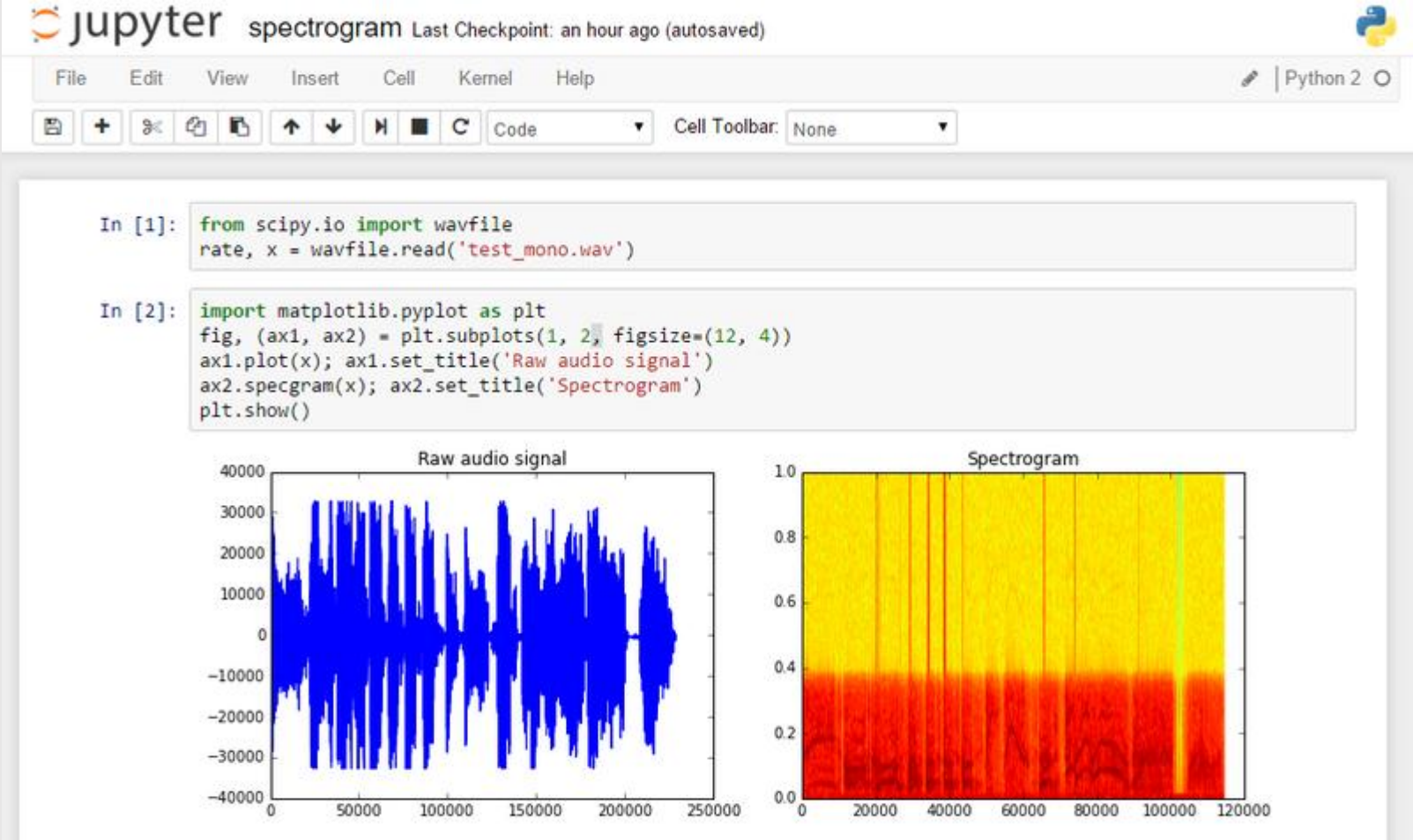
Natural Language Toolkit python

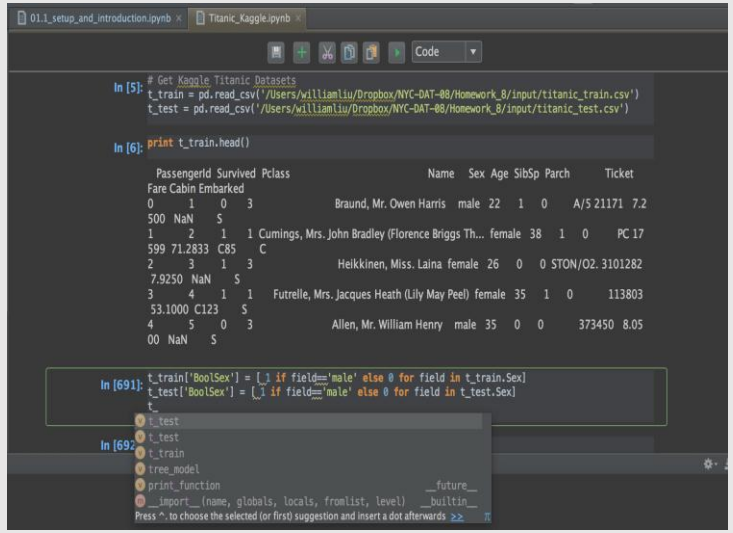
Scrapy

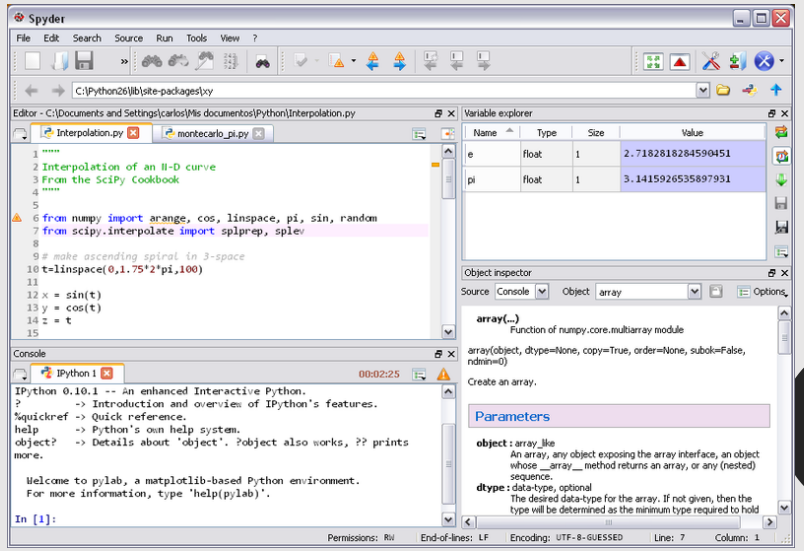
An open source and collaborative framework
for extracting the data you need from websites.
In a fast, simple, yet extensible way.

Python Hands on - IDE

IDE stands for Integrated Development Environment.







Python Hands on - Anaconda

install anaconda:

Download Anaconda 4.2.0 for Python 3.5:

For Windows 64bit
https://repo.continuum.io/archive/Anaconda3-4.2.0-Windows-x86_64.exe

For MacOSx 64bit
https://repo.continuum.io/archive/Anaconda3-4.2.0-MacOSX-x86_64.pkg

For Linux 64bit
https://repo.continuum.io/archive/Anaconda3-4.2.0-Linux-x86_64.sh

install OpenCV:
conda install --channel https://conda.anaconda.org/menpo opencv3

Python Face Detection Demo code:
https://gtscnc.org/download/python-face-detection-demo

Class 1 Homework

1. Reading:
   Python for Kids: chapter 2 "Calculations and Variables"

   History of Programming Languages:
https://en.wikipedia.org/wiki/History_of_programming_languages

   History of Computer:
http://www.computerhistory.org/timeline/computers/#169ebbe2ad45559efbc6eb35720d57b7

2. Explore:
   Python website: https://www.python.org/

3. Run Python code on Jupyter Notebook