PYTHON OPEN LAB

INTRODUCTION TO PYTHON

About us

- Anshuma
  - Second year master student
  - Department of Statistics, Columbia University
- Kang Sun
  - First year master student
  - Department of Computer Science, Columbia University

Programming Languages

A **programming language** is a formal language, which comprises **a set of instructions** used to produce various kinds of **output**. Programming languages are used to create **programs** that implement specific **algorithms**. - wikipedia

- Python
- R
- SQL
- C
- C++
- Java
- Html, CSS, JavaScript
- ……

Why Python?

- Free and Well-Supported — open source, great community
- Easy to learn — simple and concise syntax
- Portable — compiles and runs on virtually every major platform (Linux and Unix, Microsoft Windows, Mac OS, BeOS, OS/2 ...)
- Object-Oriented — map real-world object to code
- Powerful — dynamic typing, automatically memory management, built-it object types(lists, dictionaries and strings), library utilities ...

What is python used for

- Data analytics
- Building websites
- Database programming
- GUI programming
- …

Python Installation

- For MacOS and Linux, you already have it
- For Windows,
  - Download Python 3.6 on https://www.python.org/downloads/
  - Add the installation path in your computer to your environment variable ‘Path’
  - Test: open the command line and type ‘python’, then type ‘enter’

Textbook

- No textbook
  - Different topics about different areas
- Reference:
  - Learning Python(Fifth Edition, Mark Lutz)
  - No need to read, just for reference

First program

- Hello world in python
  - python
  - print(“hello world”)
- Result
  - You will see “hello world” as the output in console
  - You can use any words to replace “hello word” to print them

Variable

- Variable is the most basic element of Python
- Functions of variable
  - To store value
    - We can directly use numbers, but even in the area of math, we need variables to store numbers and expressions, like y(x) = sin(x) + cos(x)
    - Variables can be passed between functions (in later sessions)

A scenario to explain variable

- You need to drink something
  - Tea
  - Coffee
  - Water
  - …
- Drink directly by your mouth — not elegant
- Use a cup to hold the liquid

Basic types

- Build-in types — Python is a high-level language
  - For C users, they need to implement data structures for usage
- Number 1.5, 4, 2**100, 3.1415..
  - int integers
  - float decimal numbers
- Bool True, False
- List [1,2,3,4,5,6], [‘Python’,’Open’,’Lab’]

Number

- Example:
  - A = 1
  - type(A)
    - <type ‘int’>
- Question: What is int?
  - We need to look at the memory

Bit, byte, word, int, long

- bit: 0 or 1
- byte: 8 bits, ex. 00000001, 00000010, 00000100
- int: 32 bits, to show integers, the range is -2^32, 2^32 - 1
- long: 64 bits, to show float number, ex. 5452.241324, 000.341

Operation of int

- Add
  - A = 1+1 -> A = 2
- Minus
  - B = 2 -1 -> B = 1
- Multiplication
  - C = 2 * 3 -> C = 6
- Division
  - D = 8 / 2 -> D = 4

Operation of int

- A = 2
- B = 3
- C = 9
- D = 8

- A+B
- A-B
- A*C
- C/B
- D/B

- 5
- -1
- 18
- 3
- 2, not 3!

Operation of bool

- Basic operations:
  - and
    - ‘and’ can also be expressed as ‘&’
    - The result of ‘A and B’ is also a value of bool type
      - A and B is True only when A is True and B is True
  - or
    - ‘or’ can also be expressed as ‘|’
    - The result of ‘A or B’ is also a value of bool type
    - A or B is False only when A is False and B is False

List

- List is a data structure to store elements
  - List1 = [1,2,3,4,5,6,7,8,9]
  - List2 = [“python”, “open”, “lab”]
  - List3 = [1, 0.99, “python open lab”]
- Elements in the list have orders
  - The first element of List1 is 1, the second element of List1 is 2, ……, the last element of List1 is 9
- We will talk about more details of list in the following week

Next

- Set up of Anaconda and Jupyter notebook
- Examples of basic types and operations