Basic python

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You can get this ppt and related files at:

`https://github.com/ryan-leung/2016-JAN_python_workshop/`

Learning Outcomes

- Know how to get a working python for your operating system.
- Define different data structures
- Make a loop with for and while
- Defining functions
- Reading files and plotting graphs

What is python

General-purpose, high-level programming language

Why python?

- Coding and debugging is a tough task
- Spend less time on it and get your work done!

Why python?

- Easy to learn.
- Increasing number of package.
- A powerful language used by sites like Google and Dropbox.
- Learn the coding in one hour.

What you need?

- A running computer, with Windows/Linux/OSX installed
- A text editor
- A python distribution

Installing / Configuration

How to install python and get it work?

Python distribution

Anaconda / Miniconda

https://store.continuum.io/cshop/anaconda/

http://conda.pydata.org/miniconda.html

Official Site

https://www.python.org/downloads/

Portable Python

http://portablepython.com/

IF you run Linux, get it from repository is faster:

```
sudo yum install python numpy scipy python-matplotlib ipython python-pandas sympy python-nose
```

```
sudo apt-get install python-numpy python-scipy python-matplotlib ipython ipython-notebook python-pandas python-sympy python-nose
```

Anaconda in Windows

Anaconda for Windows

PYTHON 2.7	PYTHON 3.5
Windows 64-bit Graphical Installer 387M	Windows 64-bit Graphical Installer 392M
Windows 32-bit Graphical Installer 321M	Windows 32-bit Graphical Installer 316M

Behind a firewall? Use these zipped Windows installers.

Windows Anaconda Installation

1. Download the installer.
2. Double-click the .exe file to install Anaconda and follow the instructions on the screen.
3. Optional: Verify data integrity with MD5.

Anaconda in Mac

Anaconda for OS X

PYTHON 2.7	PYTHON 3.5
Mac OS X 64-bit Graphical Installer 274 MB (OS X 10.7 or higher)	Mac OS X 64-bit Graphical Installer 257 MB (OS X 10.7 or higher)
Mac OS X 64-bit Command-Line installer 239 MB (OS X 10.5 or higher)	Mac OS X 64-bit Command-Line installer 233 MB (OS X 10.5 or higher)

OS X Anaconda Installation

1. Download the installer.
2. Double click the .pkg file and follow the instructions on the screen.
3. **Command-Line Installs:**
   After downloading the installer, in the shell execute for Python 2.7:

   ```
   bash Anaconda2-2.4.1-MacOSX-x86_64.sh
   ```

   Or for Python 3.5:

   ```
   bash Anaconda3-2.4.1-MacOSX-x86_64.sh
   ```

   NOTE: You should type "bash", regardless of whether or not you are actually using the bash shell.

4. Optional: Verify data integrity with MD5.

Anaconda in Linux

Anaconda for Linux

PYTHON 2.7	PYTHON 3.5
Linux 64-bit 233M	Linux 64-bit 235M
Linux 32-bit 279M	Linux 32-bit 277M

Linux Anaconda Installation

1. Download the installer.
2. After downloading the installer, in your terminal window execute for Python 2.7:

   bash Anaconda2-2.4.1-Linux-x86_64.sh

   Or for Python 3.5:

   bash Anaconda3-2.4.1-Linux-x86_64.sh

   NOTE: Type "bash" regardless of whether or not you are actually using the bash shell.

3. Optional: Verify data integrity with MD5.

Install package (Normal build)

- To search/install packages, use “pip”
- Package list: https://pypi.python.org/pypi
- Command:
  - pip search xxxxxx
  - pip install xxxxxx

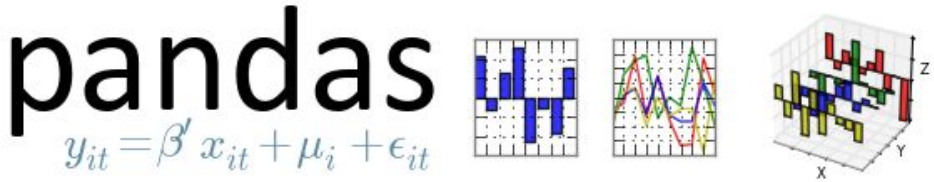
```
Full Commands:
  install       Install packages.
  uninstall     Uninstall packages.
  freeze        Output installed packages in requirements format.
  list          List installed packages.
  show          Show information about installed packages.
  search        Search PyPI for packages.
  zip           Zip individual packages.
  unzip         Unzip individual packages.
  bundle        Create pybundles.
  help          Show help for commands.
```

Install package (Anaconda build)

- To search/install packages, use “conda”
- Command:
  - conda search xxxxxx
  - conda install xxxxxx
- Other commands:

http://conda.pydata.org/docs/_downloads/conda-cheatsheet.pdf

Packages for Symbolic/numerical/statistical



- For symbolic
  - sympy
- For numerical
  - numpy
  - scipy
- For statistical and machine learning
  - scikit-learn
  - pandas

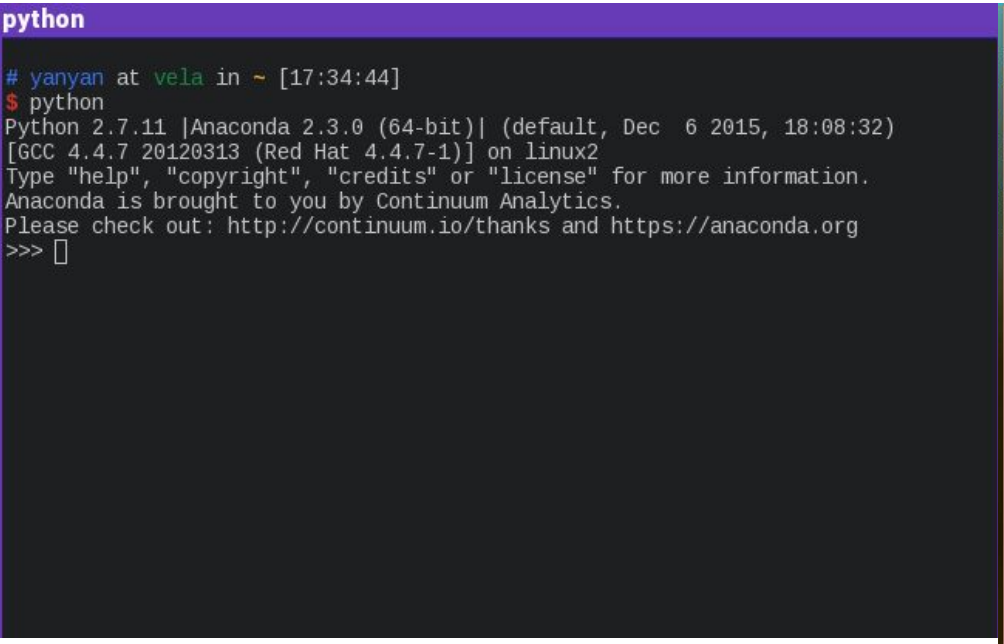
Running python

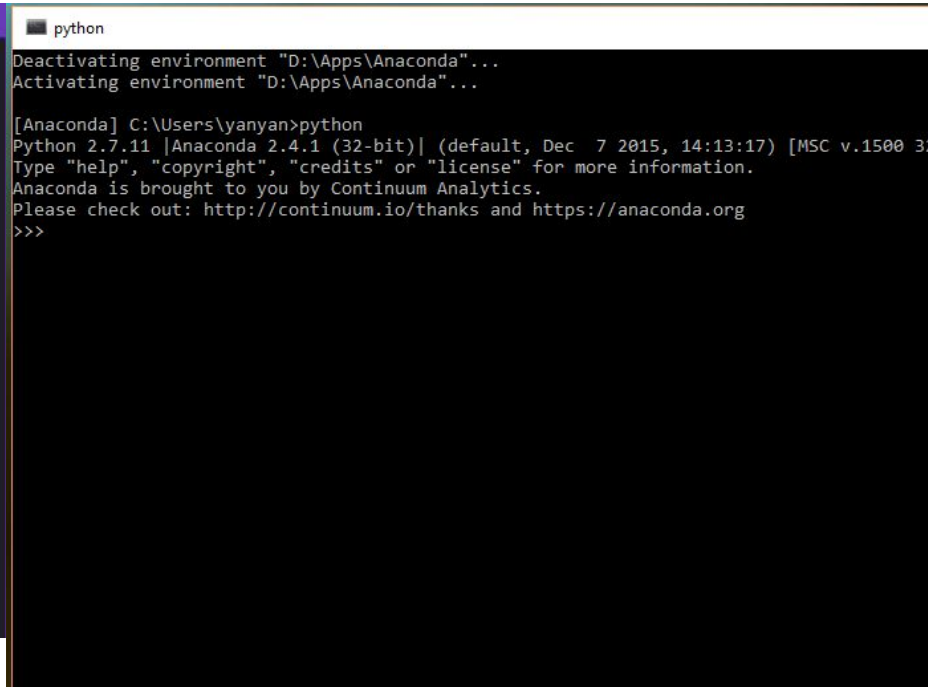
How to run your scripts?

Python interpreter

Open by clicking “python” shortcut in start menu (Windows).

Or type “python” in terminal for Linux / OSX





ipython / jupyter

For more interaction and gun, we use *ipython* to run our python code

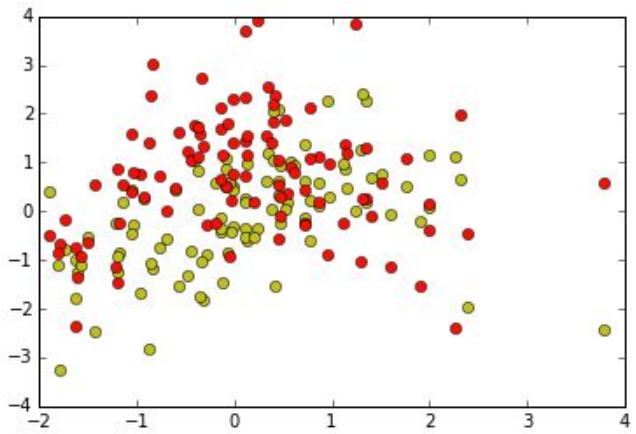
jupyter Untitled (unsaved changes)

File Edit View Insert Cell Kernel Help

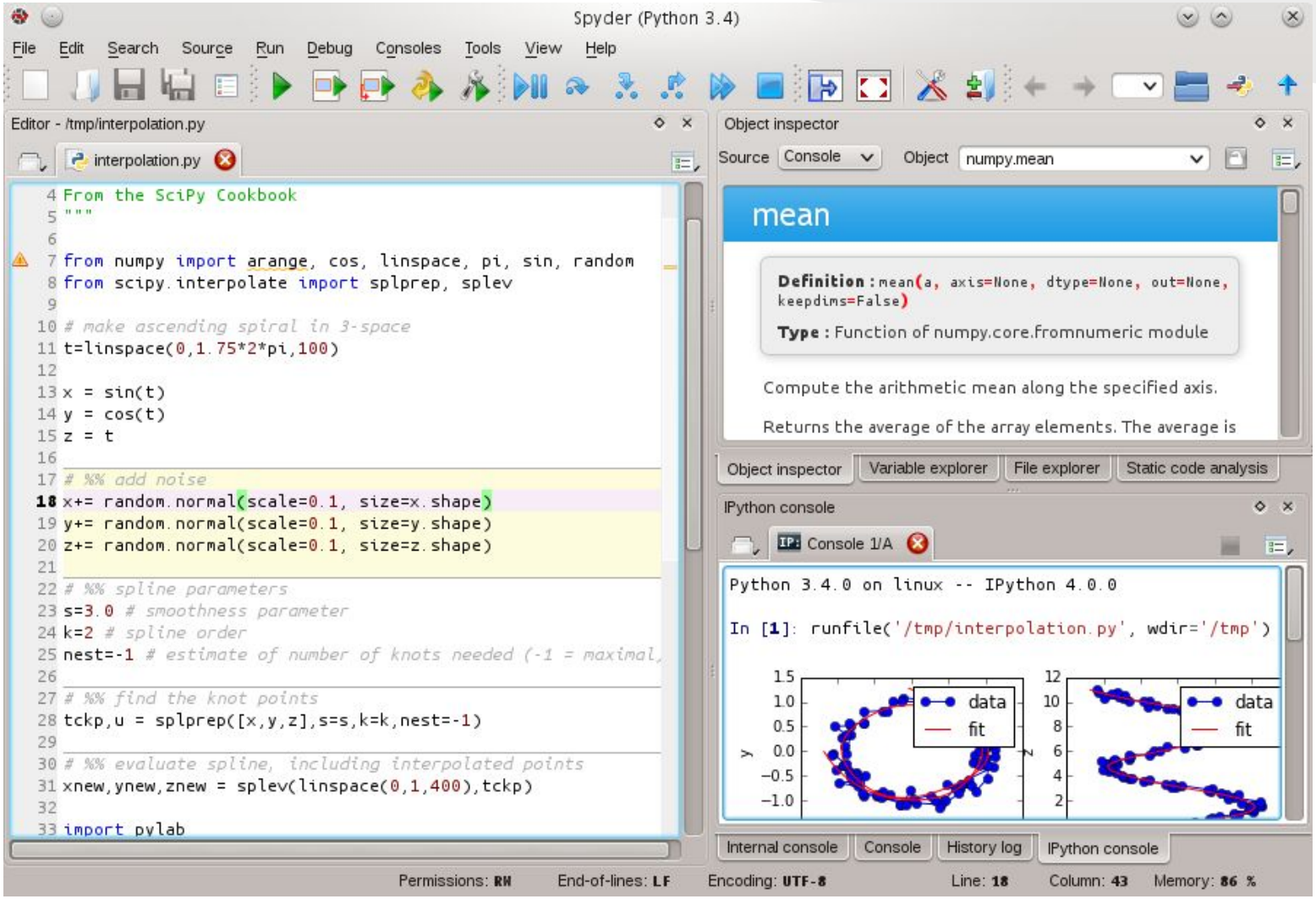
Code Cell Toolbar: None

In [4]:
```
%matplotlib inline
import numpy as np
import matplotlib
import matplotlib.pyplot as plt

x = np.random.randn(100)
y = np.sin(x) + np.random.randn(100)
plt.plot(x, y, "yo")

y = np.cos(x) + np.random.randn(100)
plt.plot(x, y, "ro")
```

Out[4]: [<matplotlib.lines.Line2D at 0x7ff193cd0e48>]



Spyder IDE


Spyder (Python 3.4)
File Edit Search Source Run Debug Consoles Tools View Help
Editor - /tmp/interpolation.py
interpolation.py
4 From the SciPy Cookbook
5 """
6
7 from numpy import arange, cos, linspace, pi, sin, random
8 from scipy.interpolate import splprep, splev
9
10 # make ascending spiral in 3-space
11 t=linspace(0,1.75*2*pi,100)
12
13 x = sin(t)
14 y = cos(t)
15 z = t
16
17 # %% add noise
18 x+= random.normal(scale=0.1, size=x.shape)
19 y+= random.normal(scale=0.1, size=y.shape)
20 z+= random.normal(scale=0.1, size=z.shape)
21
22 # %% spline parameters
23 s=3.0 # smoothness parameter
24 k=2 # spline order
25 nest=-1 # estimate of number of knots needed (-1 = maximal,
26
27 # %% find the knot points
28 tckp,u = splprep([x,y,z],s=s,k=k,nest=-1)
29
30 # %% evaluate spline, including interpolated points
31 xnew,ynew,znew = splev(linspace(0,1,400),tckp)
32
33 import pylab
Object inspector
Source Console Object numpy.mean
mean
Definition : mean(a, axis=None, dtype=None, out=None, keepdims=False)
Type : Function of numpy.core.fromnumeric module
Compute the arithmetic mean along the specified axis.
Returns the average of the array elements. The average is
Object inspector Variable explorer File explorer Static code analysis
IPython console
Console 1/A
Python 3.4.0 on linux -- IPython 4.0.0
In [1]: runfile('/tmp/interpolation.py', wdir='/tmp')
data
fit
data
fit
Internal console Console History log IPython console
Permissions: RW End-of-lines: LF Encoding: UTF-8 Line: 18 Column: 43 Memory: 86 %

1. Syntax

https://github.com/ryan-leung/2016-JAN_python_workshop/blob/master/Syntax.ipynb

2. Data Structures and Loops

https://github.com/ryan-leung/2016-JAN_python_workshop/blob/master/Data%20Structures%20and%20Loops.ipynb

3. Functions

https://github.com/ryan-leung/2016-JAN_python_workshop/blob/master/Functions.ipynb

4. Files and Plots

https://github.com/ryan-leung/2016-JAN_python_workshop/blob/master/Files%20and%20Plot.ipynb

Practise and exercise session

Factorial

Write a program which can compute the factorial of a given numbers.

Suppose the input is:

8

Then, the output should be:

40320

Even Fibonacci numbers

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

By considering the terms in the Fibonacci sequence whose values **do not exceed four million**, find the **sum of the even-valued terms**.

10001st prime

By listing the first six prime numbers: 2, 3, 5, 7, 11, and 13, we can see that the 6th prime is 13.

What is the 10 001st prime number?