Technical University of Lodz
Institute of Electronics

Algorithms and Data Structures

IPython

Łódź 2012

IPython – ipython.org

IP[y]: IPython
Interactive Computing

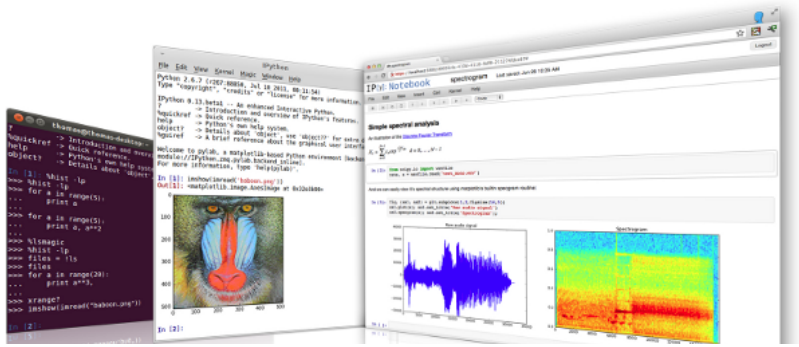
Home · Download · Documentation · Videos · Wiki · News · Citation

IPython provides a rich toolkit to help you make the most out of using Python, with:

- Powerful Python shells (terminal and Qt-based).
- A web-based notebook with the same core features but support for code, text, mathematical expressions, inline plots and other rich media.
- Support for interactive data visualization and use of GUI toolkits.
- Flexible, embeddable interpreters to load into your own projects.
- Easy to use, high performance tools for parallel computing.

To learn more about IPython, you can watch our *videos and screencasts*, download our talks and presentations, or read our extensive documentation. IPython is open source (BSD license), and is used by a range of other projects; add your project to that list if it uses IPython as a library, and please don't forget to *cite the project*.

IPython supports Python 2.6 to 2.7 and 3.1 or newer. Our older 0.10 series supports Python 2.5, and can be used with Python 2.4.



Google™ Custom Search Search

MEMORIAL

John Hunter
1968–2012
J. Hunter Memorial Fund

VERSIONS

Stable
0.13 – June 2012
Download

Development
pre-0.14
Github

I USE IT +1

LINKS

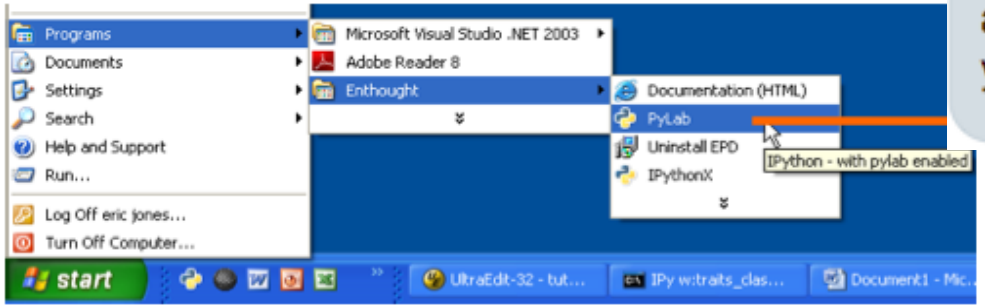
Issue tracker
Mailing lists:
User · Dev
IRC channel
(Freenode, #ipython)
Try IPython online

IPython

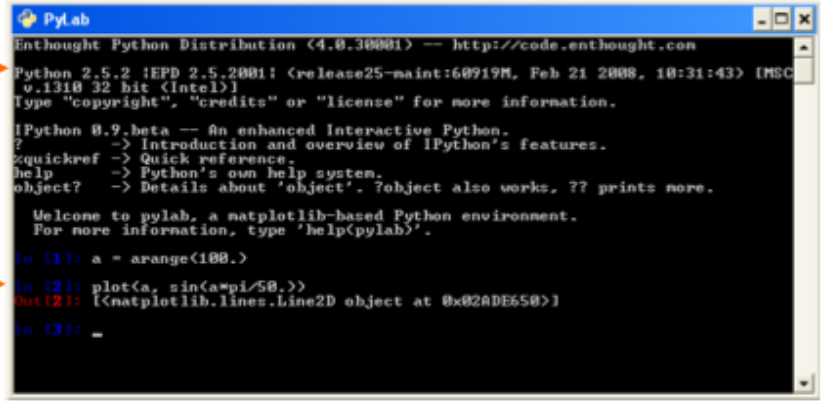
ENTHOUGHT

Starting PyLab

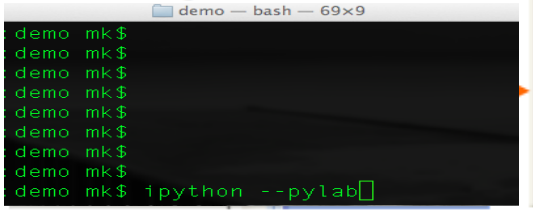
IPython has a 'pylab' mode where it imports all of NumPy, Matplotlib, and SciPy into the namespace for you as a convenience. It also enable threading for showing plots.



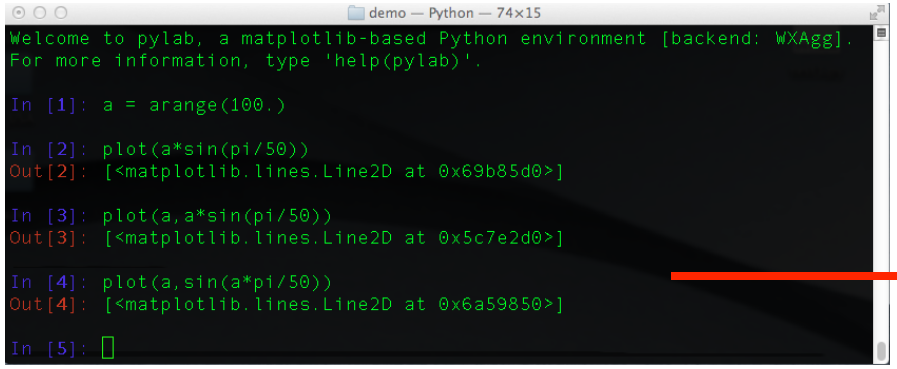
or...

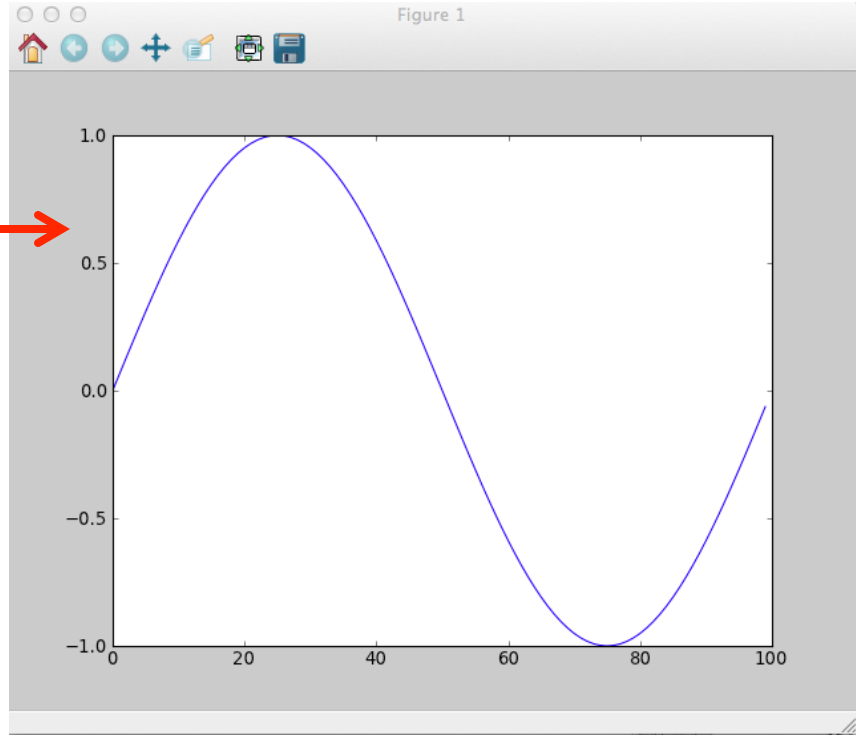


or... Mac OS



PyLab – Interactive Python Enviroment






```
x = arange(100.)

plot(x,sin(x*pi/50))
#Now change display option
hold(False)
plot(x,cos(x*pi/50))
# and
hold(True)
plot(x,sin(x*pi/50))
plot(x,cos(x*pi/50))
```

IPython Introducion

STANDARD PYTHON

In [1]: a=1

In [2]: a

Out [2]: 1

AVALIABLE VARIABLES

In [3]: b = [1,2,3]

Comments # (to the end of the line)

List available variables

In [4]: %whos

Variable Type Data/Info

---

a int 1

b list n=3

RESET & RELOAD

Reset user defined variables

In [5]: %reset

Once deleted, variables cannot be recovered. Proceed (y/[n])? y

Let's check our namespace

In [6]: %whos

Interactive namespace is empty.

WARNING: %reset also removes the names imported by PyLab.

In [7]: plot

NameError: name 'plot' is not defined

Reload

In [8]: %pylab

Welcome to pylab, a matplotlib-based Python environment…

Directory navigation in IPython

Get path to current working directory

In [9]: *pwd*

Out[9]: u'/Users/mk'

Change directory (note Unix style forward slashes)

In [10]: cd Desktop/

 # Tab completition helps you find and type directory and file names

Check the following commands (with *pwd* command):

- cd ..
- cd

List directory contents (Unix style, not “dir”)

In [11]: ls

Desktop/	Library/ Music/	Public/ mipav/	Documents/ Dropbox/	Movies/ Pictures/	Sites/ mySoft/	Downloads/

Directory navigation in IPython

#Check following commands:

- *ls -1*
- *ls –a*
- *ls –l*

Go to the D: drive and create folder:
#python_lecture_1_tests

cd d://

mkdir python_lecture_1_test

#Go inside this directory and list its content

cd python_lecture_1_test

ls

edit and run (if exists) or create new script

edit test_file_1.py

fill the script with commands (the detailed
explanation will appear during next lectures)

```
import pylab as pl
import numpy as np

x = np.arange(100)
y = np.sin(x*np.pi/50.)
pl.plot(x,y)

pl.show()
```

in the IPython terminal write:

*plot(x,cos(x*pi/50.))*

 # IPython is interactive!!!

Directory navigation in IPython

```
# Run script insight IPython(without editing it)
# Interactive mode
%run test_file_1.py

# To quit IPython use command
In [12]: quit()

# Run script from the sysetm level (Windos, Unix, Mac OS)
# Batch mode
# Run system console and write
python test_file_1.py
```

Directory Bookmarks

Bookmark the python_lecture_1_test directory

cd python_lecture_1_test

#bookmark as some name (alias)

%bookmark lect1

bookmark 2 more folders

lists bookmarked directories

%bookmark –l

go easily to bookmarked directory

go to home directory *cd*

go to lect1 directory

cd lect1

Function Info and Help

```
# Follow the command '?' to  print its documentation
>>> squeeze?

Remove single-dimensional entries from the shape of an array.
Parameters
----------
a : array_like
    Input data.
Returns
-------
squeezed : ndarray
    The input array, but with with all dimensions of length 1
    removed.  Whenever possible, a view on `a` is returned.
```

Function Info and Help

```
# Follow a command with '??' to print its source code
# compare: squeeze? And squeeze??
>>> squeeze??
def squeeze(a):
    """    Remove single-dimensional entries from the shape of an array.
 Examples
    >>> x = np.array([[[0], [1], [2]]])
    >>> x.shape
    (1, 3, 1)
    >>> np.squeeze(x).shape
    (3,)    """
    try:
        squeeze = a.squeeze
    except AttributeError:
        return _wrapit(a, 'squeeze')
    return squeeze()
```

Function Info and Help

History command

list previous commands. Use ‘magic’ % because ‘hist’ is histogram function in pylab

%hist

Input Hitory

list stringfrom prompt [2]

In[15] a = 5

…

>>> _i15

>>> u'a = 5’

The up and down arrows scroll through your ipython input history

IPython magic functions

http://ipython.org/ipython-doc/dev/interactive/tutorial.html#magic-functions

>>> %lsmagic

Available magic functions:

%alias %autocall %autoindent %automagic %bookmark %cd %colors %config %cpaste %debug %dhist %dirs %doctest_mode %ed %edit %env %fread %fwrite %gui %hist %history %inplace %install_default_config %install_profiles %load_ext %loadpy %logoff %logon %logstart %logstate %logstop %lsmagic %macro %magic %notebook %page %paste %pastebin %pdb %pdef %pdoc %pfile %pinfo %pinfo2 %pm %pop_err %pop_print %popd %pprint %precision %print_methods %print_traits %profile %prun %psearch %psource %pt %push_err %push_print %pushd %pwd %pycat %pylab %quickref %recall %rehashx %reload_ext %rep %replace_context %rerun %reset %reset_selective %run %run_examples %save %sc %store %sx %sym %tb %time %timeit %unalias %unload_ext %who %who_ls %whos %xdel %xmode

Read simple Tracebacks

```
>>> 100 + "Hello world!"
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
/Users/mk/<ipython-input-7-3d139ed9b46e> in <module>()
----> 1 100 + "Hello world!”
TypeError: unsupported operand type(s) for +: 'int' and 'str’
```

```
>>> undevined_variable + 1
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
/Users/mk/<ipython-input-8-8514a074ce6b> in <module>()
----> 1 undevined_variable + 1
NameError: name 'undevined_variable' is not defined
```

Interactive Calculator

```
# adding two values
>>> 5 + 10
15

# setting a variable
>>> a = 5
>>> a
5

# checking the variable's type
>>> type(a)
int

# an arbitrary long integer
>>> a = 12345678901234567890
>>> a
12345678901234567890L
>>> type(a)
long

# remove 'a' from the 'namespace'
>>> del a
>>> a

NameError  Traceback (most recent call last)
/Users/mk/<ipython-input-27-60b725f10c9c>
in <module>()
----> 1 a

NameError: name 'a' is not defined
```

Interactive Calculator

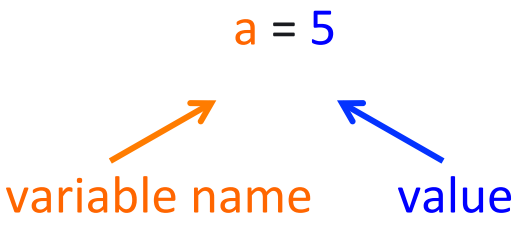
```
# real numbers
>>> b = 1.4 + 2.3
>>> b
3.6999999999999997

# “prettier” version
>>> print b
3.7
>>> type(b)
float

# colplex  numbers
 c = 5+5.5j
>>> c
(5+5.5j)
```

Variable declaration and initalization

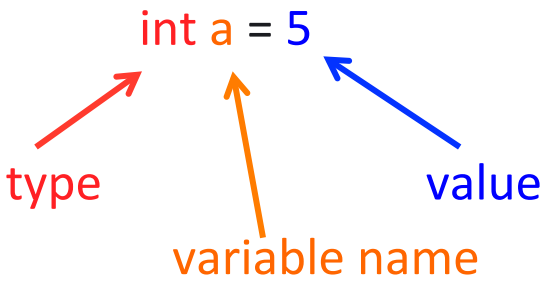
Matlab/Python



a = ‘hello world’

a = 5.56

C/C++/Java



~~a = “hello world”~~

~~a = 5.5~~

float b = 5.5

std::string text= “Hello world” (C++)

Interactive Calculator

```
# arithmetic operations
>>> 1+2-(3*4/6)**5+(7%2)
-27

# simple math functions
>>> abs(-6e3)
6000.0

>>> max(0, min(10, -1, 4, 3))
0

>>> round(2.71235897456)
3.0
```

Python math functions:

http://docs.python.org/library/math.html

```
# casting
>>> int(2.718281828)
2
>>> float(2)
2.0
>>> 1 + 2.
3.0
>>> int('456')
456
>>> str(65)
'65'
```

string

```
# in place operations +=, -=, *=, /=, etc.
>>> b = 2.5
>>> b+=0.5              # b = b+5
>>> b
3.0
```