Python Workshop
Getting Started with Python

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Outline

What is Python?

- Python is a high-level, general programming language (relying much on C underneath) that is interpreted at run time through a command-line interface or scripting.
- Python is free, open-source, and (generally) platform-independent.
- Python is built into many other programs and can wrap other languages like Java, C, FORTRAN, etc.
- Python has a massive user community worldwide and growing within USGS.

Guido van Rossum

Python Versions and Packages

- The two main version branches are 2.x and 3.x
- We *strongly* recommend sticking with 2.x for now–Specifically **2.7.2 or 2.7.3**
- To do almost any substantial mathematics or statistics, you also need `numpy`
- Basic 2-D graphics are possible using `matplotlib`
- More advanced statistics are also available using `scipy`
- Distributions already including many packages:
  - pythonxy: for Windows only

    `http://pythonxy.com`

    

  - EPD: Enthought Python Distribution for all Platforms

    `http://www.enthought.com`

    

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Expanding Python with Packages

Major capabilities (Numpy, Scipy, etc.) installed from a website using an installer (.msi, .exe, .dmg, .rpm)
For other packages, a couple options...

- Python Package Index `http://pypi.python.org`
  - For packages within PyPi, can use `easy_install` at command line.
  - Packages at PyPi are installed using eggs. For more than you ever wanted to know about eggs, see `http://tinyurl.com/4jd5wud`
- Here's a blog post explaining for Win 7 `http://tinyurl.com/7hf9ml6`

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Getting Help: Active and Helpful Python Community

- Stackoverflow `http://stackoverflow.com`
- A Useful Glossary `http://docs.python.org/glossary.html#glossary`
- Python Official Docs `http://www.python.org/doc/`
- Numpy and Scipy Official Docs `http://docs.scipy.org/doc/`
- Numpy and Scipy Cookbook `http://www.scipy.org/Cookbook/`
- Matplotlib `http://matplotlib.sourceforge.net/index.html`
- Matplotlib Gallery (ridiculously cool) `http://matplotlib.sourceforge.net/gallery.html`
- If you already known some MATLAB `http://www.scipy.org/NumPy_for_Matlab_Users/`

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Launching Python: Multiple Versions Issues

Three batch files available:

`python.bat`

```
path=%path%;C:\Python27
python.exe
```

`ipyth.bat`

```
path=%path%;C:\Python27
python.exe C:\Python27\scripts\ipython
```

`ipyth_w_matplotlib.bat`

```
path=%path%;C:\Python27
python.exe C:\Python27\scripts\ipython -pylab
```

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Launching Python: Multiple Versions Issues

- Double-clicking on a script name in Explorer uses the default Python version.
- The default may be hijacked by Arc, etc.
- Better to be explicit in which version you are launching

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Command Line: Launch and Enter Commands

Type “python” to launch python

```
c:\>python
Enthought Python Distribution (EPD) free version -- www.enthought.com
Version: 7.1-1 (32-bit)
(type 'upgrade' or see www.enthought.com/epd/upgrade to get the full EPD)

Python 2.7.2 |EPD_free 7.1-1 (32-bit)| (default, Jul  3 2011, 15:40:35)
[GCC 4.0.1 (Apple Inc. build 5493)] on darwin
Type "packages", "demo", "upgrade" or "enthought" for more information.
>>>
>>>print 'hello world'
hello world
```

All commands that result in output display it on the screen

```
>>> a=['this','is','a','list']
>>> a
['this', 'is', 'a', 'list']
>>> a[0]
'this'
```

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Packages, Modules, Namespaces

First, a couple definitions.

Script: A text file containing variables, functions, and definitions that can be loaded for use at command line or in another script (a.k.a. “code”)

Module: A script containing definitions for a specific purpose

Package: A group of modules

Namespace: A base name for a module used to organize and keep track of its provenance.

Packages, Modules, Namespaces at Command Line

There are several ways to import a module or package.

- Preserving the namespace as the module name

```
>>>import numpy
```

To use the function `sqrt` must type

```
>>>s9 = numpy.sqrt(9)
>>>s9
3.0
```

- You can also provide an alias...

...for the namespace

```
>>>import numpy as np
>>>s9 = np.sqrt(9)
>>>s9
3.0
```

...or for the function

```
>>>from numpy import sqrt as pow_to_minus_pfive
>>>s9 = pow_to_minus_pfive(9)
>>>s9
3.0
```

- Or import the function without the namespace *(danger!)*

```
>>>from numpy import *
>>>s9 = sqrt(9)
>>>s9
3.0
```

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Module Example

```
import this
import antigravity
```

- These are kind of humorous but (especially) the antigravity example raises an important issue:
  modules not only contain a listing of code and definitions, but can also *execute*!
- So, use caution and only load modules from trustworthy sources.

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Using Scripts

- Scripts allow you to save the logic and definitions of a program much in the way compiled source code does for FORTRAN, C, and other languages.
- The basic idea is to contain all code, in the same way you would type it into an interactive command window, in a file with the extension `.py`
- You can then execute the script by typing
  `python <scriptname>.py`
  at the command line.
- Make a textfile called “hw.py” with the following code in it:

```
print ``Hello World!"
```

- Now, type `python hw.py` at the command line.

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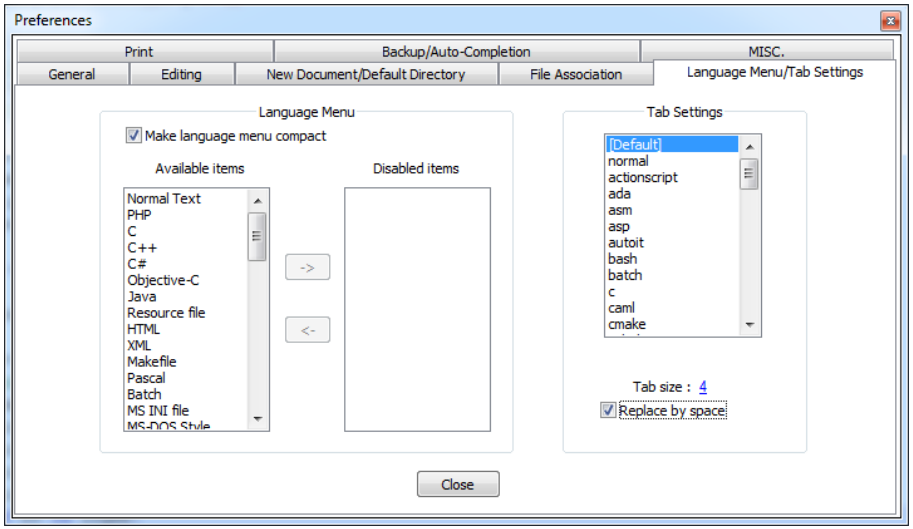
Composing scripts in a text editor

There are a couple important Python idiosyncrasies that influence text editor choice.

1. You don't close loops in python, so indentation is paramount!

```
for i in stuff:
    print i
```

2. Tabs aren't consistent from editor to editor so change them to spaces
   - They must be consistent within a script though.



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2. Tabs aren't consistent from editor to editor so change them to spaces
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3. Code highlighting and code folding can be nice
4. An IDE lets you run the code in context and sometimes includes autocomplete and other features.

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Some Suggested Environments/Editors

This list is neither exhaustive nor fully endorsed!

- Editors

  Notepad++, TextPad, TextWrangler, VIM, Emacs,
  Ultra Edit, Komodo Edit

- Integrated Development Environments (IDEs)

  Wing IDE, Komodo IDE, IDLE,
  Python Tools for Visual Studio10, NetBeans, Eclipse

And a brief aside on version control...

- Git and Github.com allow you to keep track of and collaborate on code. Worth a look!

OK, that was kind of an endorsement