CSC102
INTRO TO PROGRAMMING
WITH PYTHON

LECTURE 5
“ENGAGE WARP DRIVE MR. SULU”
MICHAEL GROSSBERG
REQUIRED READING

☐ TEXTBOOK, PUNCH AND ENBODY

☐ CHAPTER 0

☐ CHAPTERS 1

☐ CHAPTERS 2

AFTER TODAY WE COVERED MOST OF THIS
(CONTROL IN RUR-PLE)
THE PYTHON SHELL (2.6)

YOU TYPE COMMANDS

IT DOES STUFF

IT CONVERTS PYTHON TO MACHINE INSTRUCTIONS AND RUNS THEM RIGHT NOW
SHELL PLEASE! IN WINDOWS

- **HARD WAY:**
  - FIND `PYTHON.EXE`
  - OPEN CMD
  - CD TO DIR WITH `PYTHON.EXE`
  - TYPE `PYTHON.EXE`

Monday, September 20, 2010
WINDOWS: EASY WAY

☐ INSTALL ENTHOUGHT EDITION

☐ CLICK ON PYLAB

IPYTHON = BETTER SHELL

CLICK HERE
MAC EASY WAY

- AGAIN JUST INSTALL ENTHOUGHT
- CLICK PYLAB

IPYTHON = BETTER SHELL

```
Last login: Sun Sep 19 23:30:10 on ttys003
"/Applications/EP126-6.1/PyLab (IPython).app/Contents/MacOS/startup.command"
Jerusalem:~ michael$ "/Applications/EP126-6.1/PyLab (IPython).app/Contents/M
command"; exit
Enthought Python Distribution -- http://code.enthought.com

Python 2.6.4 IDE 6.1-1 (32-bit)1 (r264:75706, Dec 11 2009, 10:58:54)
Type "copyright", "credits" or "license" for more information.

IPython 0.10 -- An enhanced Interactive Python.
? -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help -> Python's own help system.
object? -> Details about 'object'. ?object also works, ?? prints more.

Welcome to pylab, a matplotlib-based Python environment.
For more information, type 'help(pylab)'.

In [1]: print "Hello World"
------> print("Hello World")
Hello World

In [2]: print 2+2
------> print(2+2)
4

In [3]: 
```
OTHER WAYS

☐ ASK JAMES

☐ ASK GOOGLE

☐ ASK ME DURING OFFICE HOURS
IDLE

- COMES WITH PYTHON
- KIND OF NICE
- BECOMES A PROBLEM FAST (VERY LIMITED)
- JUST SAY NO

![Python Shell]

IDLE 2.6.5
>>> print "Hello World!"
Hello World!
>>> print 2+5
7
>>> |
INTEGRATED DEVELOPMENT ENVIRONMENT (IDE)

- ECLIPSE, ERIC, SPE, KOMODO, WINGIDE
- PLEASE DON'T
- WHY NOT? OVERKILL

FOR SIMPLE TASK USE SIMPLE TOOL
PYTHON AS CALCULATOR

>>> 2+2  # ADD
4

>>> 2*3  # MULTIPLY
6

>>> 3**2  # POWERS
9

>>> 12 % 11  # REMAINDER
1

INTEGERS:
POSITIVE,
ZERO,
NEGATIVE
WHOLE NUMBERS
BEWARE OF INTEGER DIVISION

```python
>>> 6/2 # DIVISION
3

>>> 5/2
2

ROUNDS DOWN ALSO KNOWN AS FLOOR

>>> 11*(7/11)
0

TRUE FOR ANY TWO NUMBERS NOT JUST 7 AND 11

>>> 11*(7/11) + 7%11
7
```
>>> 6.0/2.0 # DIVISION
3.0

>>> 5.0/2 # CONVERTS TO FLOAT
2.5

>>> 7/11.0
0.63636363636363635
Python has different kinds of numbers:

- **Integers**: ..., -2, -1, 0, 1, 2, 3, ... (stored in 32 bits)
- **Floats**: 1.0, -1.5, 0.33333333333
- **Booleans**: True, False
- **Long**: Int, but can be as big (small) as you like
- **Complex Numbers**: \( 1j \times 1j = -1+0j \)
Python Variable

Variable Name: x
Variable Value: 42

x = 42
STATEMENTS AND EXPRESSIONS

>>> x = 42  # Python Statement
>>> y = 5
>>> x + y  # Python Expression
47

>>> x = x + 1
>>> x
43
>>> x = "Hello World!"

>>> print x
Hello World!

>>> x = "2" + "2"  ADDING FOR STRINGS IS CONCATENATION

>>> print x
22
WHATS MY TYPE

```python
>>> x = "Hello World!"
>>> print type(x)
<type 'str'>

>>> x = 2

>>> print type(x)
<type 'int'>

>>> type(2.2)
<type 'float'>
```
OIL AND WATER

```python
>>> x = "5"; y = 5 # two statements, one line
>>> x + y
TypeError: cannot concatenate 'str' and 'int' objects

>>> y + x
TypeError: unsupported operand type(s) for +: 'int' and 'str'
```

STRONG TYPES: NO AUTOMATIC CONVERSION
MAKE ME A SANDWICH

```python
>>> x = "5"; y = 5

>>> x + str(5) # str() converts to str
55

>> int(x)+y # int() converts to int
10

>> float(y + 1)/float(y) # converts to float
1.2
```
CONTAINER TYPES

- **LISTS**
  
  ```python
  >>> x = [1, 2, 3]
  
  >>> x[0]
  1
  ```

- **SETS**
  
  ```python
  >>> print set([1,1,3])
  set([1, 3])
  ```

- **DICTIONARIES**

  ```python
  >>> d = {
  "name":"mickey",
  "num_ears":2}
  
  >>> d["num_ears"]
  2
  ```

NO REPEATS

MUCH MORE ON THESE TYPES IN FUTURE
IMPORT SUPERPOWERS

“IMPORT” TO GET EXTRA FUNCTIONS IN PYTHON

```python
>>> import math

>>> math.sqrt(4)
2

>>> math.sin(math.pi/4.0)
0.70710678118654746
```
TO GET HELP

```python
>>> import math
>>> help(math)
```

This module is always available. It provides access to the mathematical functions defined by the C standard.

- `acos(x)`
  - Return the arc cosine (measured in radians) of x.
- `acosh(x)`
  - Return the hyperbolic arc cosine (measured in radians) of x.
- `asin(x)`
  - Return the arc sine (measured in radians) of x.
YOUR NEW HOME

Python v2.6.4 documentation

Welcome! This is the documentation for Python 2.6.4, last updated

Parts of the documentation:

What's new in Python 2.6?
or all "What's new" documents since 2.0

Tutorial
start here

Using Python
how to use Python on different platforms

Library Reference
keep this under your pillow

YOU ARE EXPECTED TO KNOW THIS REALLY WELL
(BUILT-INS AND SOME LIBRARIES)
WHAT ELSE CAN YOU IMPORT?

STRING, RE, STRUCT, DIFFLIB, STRINGIO, CSTRINGIO, TEXTWRAP, CODECS, UNICODEDATA, STRINGPREP, FPFORMAT, DATETIME, CALENDAR, COLLECTIONS, HEAPQ, BISECT, ARRAY, SETS, SCHED, MUTEX, QUEUE, WEAKREF, USERDICT, USERLIST, USERSTRING, TYPES, NEW, COPY, PPRINT, REPR, NUMBERS, MATH, CMATH, DECIMAL, FRACTIONS, RANDOM, ITERTOOLS, FUNCTOOLS, OPERATOR, OS.PATH, FILEINPUT, STAT, STATVFS, FILECMP, TEMPLFILE, GLOB, FNMATCH, LINECACHE, SHUTIL, DIRCACHE, MACPATH, PICKLE, CPICKLE, COPY_REG, SHELVE, MARSHAL, ANYDBM, WHICHDB, DBM, GDBM, DBHASH, BSDDB, DUMDBB, SQLITE3, ZLIB, GZIP, BZ2, ZIPFILE, TARFILE, CSV, CONFIGPARSER, ROBOTPARSER, NETRC, XRDLIB, PLISTLIB, HASLIB, HMAC, MD5, SHA, OS, IO, TIME, OPTPARSE, GETOPT, LOGGING, GETPASS, CURSES, CURSES.TEXTPAD, CURSES.WRAPPER, CURSES.ASCII, CURSES.PANEL, PLATFORM, ERRNO, CTYPES, SELECT, THREADING, THREAD, DUMMY_THREADING, DUMMY_THREAD, MULTIPROCESSING, MAP, READLINE, RLCOMPLETER, SUBPROCESS, SOCKET, SSL, SIGNAL, POPEN2, ASYNCORE, ASYNCHAT, EMAIL, JSON, MAILCAP, MAILBOX, MHLIB, MIMETOOLS, MIMEFILES, MIMEWRITER, MIMEIFY, MULTIFILE, RFC822, BASE64, BINHEX, BINASCI, QUOPRI, URL, HTMLPARSER, SGMLLIB, HTMLLIB, HTMLENTITYDEFS, XML.PARSERS.EXPATH, XML.DOM, XML.DOM.MINIDOM, XML.DOM.PULLDOM, XML.SAX, XML.SAX.HANDLER, XML.SAX.SAXUTILS, XML.SAX.XMLREADER, XML.ETREE.ELEMENTTREE, WEBBROWSER, CGI, CGI, WSGIREF, URLLIB, URLLIB2, HTTPLIB, FTPLIB, POPLIB, IMAPLIB, NNTPLIB, SMTPLIB, SMTPD, TELNETLIB, UWD, URLPARSE, SOCKETSERVER, BASEHTTPSERVER, SIMPLEHTTPSERVER, CGIHTTPSERVER, COOKIELIB, COOKIE, XMLRPCLIB, SIMPLEXXMLRPCSERVER, DOCXMLRPCSERVER, AUDIOOP, IMAGEOP, AIFC, SUNAU, WAVE, CHUNK, COLORSYS, IMGDHDR, SNHDHDR, OSSAUDIODEV, GETTEXT, LOCALE, CMD, SHLEX, TKINTER, TIX, SCROLLEDTEXT, TURTLE, pydoc, DOCTEST, UNITTEST, 2TO3, TEST, TEST.TEST_SUPPORT, BDB, PDB, HOTSHOT, TIMEIT, TRACE, SYS, FUTURE_BUILTINS, WARNINGS, CONTEXTLIB, ABC, ATEXIT, TRACEBACK, _FUTURE_, GC, INSPECT, SITE, USER, FPECTL, CODE, CODEOP, REEXEC, BASTION, IMP, IMPUTIL, ZIPIMPORT, PKGUTIL, MODULEFINDER, RUNPY, PARSER, SYMTABLE, SYMBOL, TOKEN, KEYWORD, TOKENIZE, TABNANNY, PYCLBR, PY_COMPILE, COMPILEALL, DIS, PICKLETOOLS, DISTUTILS, FORMATTER, MSILIB, MSVCRT, _WINREG, WINSOUND, POSIX, PWD, SWPD, GRP, CRYPT, DL, TERMIOS, TTY, PTY, FONTL, PIPES, POSIXFILE, RESOURCE, NIS, SYSLOG, COMMANDS, IC, MACOS, MACOSTOOLS, FINDERTOOLS, EASYDIALGOS, FRAMEWORK, AUTOGIL, COLORPICKER, GENSUITEMODULE, AETOOLS, AEPACK, AETYPES, MINIAEFRAME, AL, AL, CD, FL, FL, FLP, FM, GL, DEVICE, GL, IMGDFILE, JPEG

AND THATS JUST THE STANDARD LIBRARIES!!!
PYTHON PACKAGE INDEX: PYPI

- OVER 11,000 LIBRARIES
- JUST ABOUT ANYTHING

PyPI

The Python Package Index is a repository of software for the programming language. There are currently 11382 packages contact the PyPI admins, please use the Get help or Bug rep;

To submit a package use "python setup.py upload" and to use from this index either "pip install package" or download, unpack setup.py install* it.

- Browse the tree of packages
- Submit package information (note that you must register

PyPI now provides a Mirror infrastructure to allow users to contact unavailable.

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<td>flimp 0.6</td>
<td>FLuiddb</td>
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SUPERPOWERS INDEED

I LEARNED IT LAST NIGHT! EVERYTHING IS SO SIMPLE!
HELLO WORLD IS JUST PRINT "HELLO, WORLD!"

I DUNNO...
DYNAMIC TYPING?
WHITESPACE?

COME JOIN US!
PROGRAMMING IS FUN AGAIN!
IT'S A WHOLE NEW WORLD UP HERE!

BUT HOW ARE YOU FLYING?

I JUST TYPED
import antigravity
THAT'S IT?

... I ALSO SAMPLED EVERYTHING IN THE MEDICINE CABINET FOR COMPARISON.

BUT I THINK THIS IS THE PYTHON.
WHERE TO START

- STANDARD LIBRARY
- RTFM = “READ THE FINE DOCUMENTATION”
- DOUG HELLMAN, “PYTHON MODULE OF THE WEEK”
  - http://www.doughellmann.com/PyMOTW/
- PYTHON WIKI

GOOD PYTHON DOCUMENTATION IS EASY TO FIND, READ AND PRACTICE
WE WILL USE MAPLOTLIB

- Not a standard library
- For 2D plotting (some 3D)
- Uses other libraries (numpy/scipy)
- Amazingly cool
- RTFM

Monday, September 20, 2010
FILE (DOCUMENT) OF PYTHON INSTRUCTIONS

EXAMPLE: hello.py

```python
# This is a python program
print "Hello World!"
```

FROM SHELL (CMD): python.exe hello.py

FROM IPYTHON: run hello

OUTPUT:

Hello World!
EDITOR

- FOR WRITING PROGRAMS
- LOTS OF GOOD ONES
- WINDOWS: EG. NOTEPAD++
- MAC: EG. TEXTWRANGLER
- LINUX: EG. KATE
- EVERYTHING: EMACS, VIM

MORE DETAILS

http://wiki.python.org/moin/PythonEditors
USER INPUT

- TALKING TO OUR PROGRAM
- EXAMPLE: hello_you.py

```python
# hello_you.py
name = raw_input("What's your name? ")
print "Hello " + name + "."
```

- SESSION:

  What's your name? **Michael**

  Hello Michael.