CS2044 - Advanced Unix Tools & Scripting

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Python

An open source programming language conceived in the late 1980s. it is both compiled and interpreted (compilation step hidden).

Since Python is interpreted it is slower than C/C++ but is fast enough for most applications.

Why Python?

In Python we can do a variety of things

- Work with an interactive interpreter that makes it easy to experiment and try code
- Write object-oriented programming... but you do not need to use classes for everything like in java
- Work with built in modules for text processing and regular expressions
- Automatically convert variable types
- Work with scipy and numpy and do scientific computation like in matlab

But most of all...

Python is easy to read as white space is part of the syntax! Instead of enclosing blocks of code in brackets, we simply indent instead.

Python may be the easiest language to pick up and learn because although there may not be 10 ways (cough Perl) to do something, the way you expect to do it works.

Data types

- int : 3
- float: 2.5
- str: 'abc', "abc"
- list: [0,1,2], [0,1,'the']
- tuple: (0,1,2),(0,1,'the')
- dict: {'a': 1, 'Ohio': 'Columbus' 2: 'b'}

strings and tuples cannot be changed once they are created.

The interactive interpretor

Lets go play with the interpretor. To start the basic interpretor type python. If you have ipython installed, type ipython to get python with syntax highlighting, word completition and more!

Becareful with ints

Becareful with ints!

```
>> 1/2
0
>> 1./2
.5
```

Integer division truncates... :(

Working with strings

```
"hello"+"world" "helloworld" # concatenation

"hello"*3  "hellohellohello" # reptition

"hello"[0] "h"  # indexing

"hello"[-1]  "o" # (from end)

"hello"[1:4] "ello"  # slicing

len("hello") 5 # size

"hello" < "jello"  True # comparison

"e" in "hello"  True # search
```

Working with lists

```
somelist = [1, "abc", "5", 2, [3,5,"wewt"]]
somelist[0]
1
somelist[2]
'5'
somelist[4][2]
'wewt'
somelist[1:3]
['abc', '5']   <---- [a:b] starts at a and
     goes up to 1 before b
somelist[:2]
[1,'abc']
del(somelist[2]) <--- remove an element
```

More on Lists

- list.reverse() - reverses a list
- list.append(obj) - appends obj to a list
- list.sort() - sort a list
- list.index(obj) - finds the first occurence of a value in a list
- list.pop() - pop off last element
- help(list) - get documentation
- Everything is an object

Working with Dictionaries

- d = {'a': 1, 'b':2}
- d.keys() - returns list of keys
- d.values() - returns a list of values
- d.items() - returns a list of pairs of keys and values
- `d.has_key(arg)` - is arg a key in d?

```
d = {"duck" : 3 , "geese" : "are pretty"}
d["duck"]
3
d["duck"] = "i like ducks"
```

On Punctuation

- parentheses ( ): defining tuples, calling funtions, grouping expressions
  - t = ('a','b','c')
  - z = func(x,y)
  - z = 2.*(x+3) + 4./(y-1.)
- square brackets []: indexing and slicing (lists, dictionaries, arrays
  - element = lst[i]
  - val = dct['k']
  - y = a[i,j] (numpy array)
  - sublist = list[i:j]
- curly braces {}: dictionary creation
  - dct = {'a': 'apple', 'b': 'bear', 'c': 'cat'}

On variables

- no need to declare
- need to assign
- not strongly typed
- the variable _ in interactive mode stores the most recent output value (good for arithematic)
- **everything** is a "variable" (functions, classes, modules)

Assigment = reference!

When we do
x = y
we are making x reference the object y refers to. So

```
a = [1, 2, 3]
b = a
a.append(4)
print b
[1, 2, 3, 4]
```