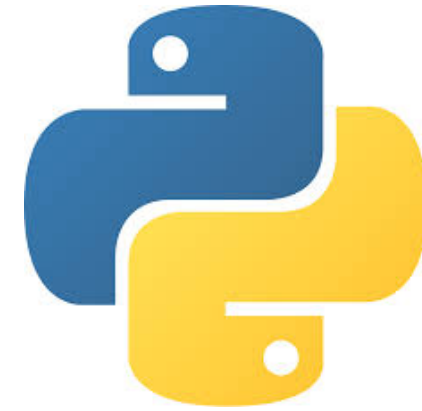


Computational Astrophysics

Python



- A powerful, general purpose programming language, yet easy to learn.
- Very large user and developer community, very extensive and broad library base
- Extensible with C, C++, or Fortran
- Free; non-restrictive license; open source
- Fast becoming the standard scripting language for data analysis
- Very powerful array processing capabilities (numpy)
- Extensive documentation - Many books and on-line documentation resources available (for the language and its libraries and modules)

Any complaints?

- Easier to write / understand. Code may be slower (longer execution time than c / c++ / f90, as python is an interpreted language, not a compiled language). But for small codes, it does not matter as implementation time gets reduced
 - Short code, fewer bugs, easy maintenance
 - Time-critical parts can be done through a compiled code
 - numpy uses pre-compiled BLAS / LAPACK libraries

Most important skill you need to acquire is debugging

outline

- Basics
- Control flow
- Input/Output
- Numpy/Scipy
- Plotting

Basics

- Data types
 - integer, long integer, float
 - complex
- Sequences (an ordered set)
 - string, list, tuple

- Variables

- `x=0.5` (python creates an object 0.5 and assigns the name x to it. x is a reference to the object)

You can work in
either interactive
or in script mode

#To add a
comment

String operations

<code>a[i]</code>	returns i -th element of <code>a</code>
<code>a[i:j]</code>	returns elements i up to $j - 1$
<code>len(a)</code>	returns number of elements in sequence
<code>min(a)</code>	returns smallest value in sequence
<code>max(a)</code>	returns largest value in sequence
<code>x in a</code>	returns <code>True</code> if <code>x</code> is element in <code>a</code>
<code>a + b</code>	concatenates <code>a</code> and <code>b</code>
<code>n * a</code>	creates <code>n</code> copies of sequence <code>a</code>

`split, join, replace, upper, lower...`

f l o c c i n a u c i n i h i l i p i l i f i c a t i o n
0 1 2 3 4 5 28

b[9:13]



9,10,11,12

List & Tuples

- List operations
 - append, remove
 - create list using range
- Tuple is immutable (i.e., you can't modify it), unlike list
- list `a = [1, 'dog', 3.5]`
- tuple `b = (5, 'cat', 7.8)`
- Using tuple to swap numbers
- Indexing sequences: 1 to n, -1 to -n