

In order to be able to follow the Inverse Ray Shooting tutorial, the following tools are needed. You are expected to have them installed on your laptop.

I) Saoimage DS9

<http://hea-www.harvard.edu/RD/ds9/>

Saoimage DS9 is an astronomical imaging and data visualization standalone application. If you work in astronomy, you almost certainly know it already.

II) Python (Versions 2.6 or 2.7 recommended.)

<http://www.python.org/>

Python provides a very convenient programming environment for this tutorial because:

- It is free !!
- It is very easy to write/read code.
- Although it may look not be very efficient at first, it can be made efficient enough with little effort.
- When combined with some external libraries, it is extremely powerful and versatile.

Installation is usually quite straightforward.

Some hints for installation on different platforms can be found at at the end of this document(**):

<http://www.python.org/download/>

(Windows users should download and install a 32 bit version or be ready to face a tougher path to install the needed libraries afterwards).

III) The following python libraries are also needed:

1)Numpy/Scipy: Powerful library for scientific computing. Provides powerful array manipulation

<http://numpy.scipy.org/>

<http://www.scipy.org/SciPy>

Can be found at (check that you download the right file for your python distribution):

<http://sourceforge.net/projects/scipy/files/>

<http://sourceforge.net/projects/numpy/files/>

2)Matplotlib: Plotting library for python

<http://matplotlib.sourceforge.net/>

Can be found at (check that you download the right file for your python distribution):

<http://sourceforge.net/projects/matplotlib/files/matplotlib/matplotlib-1.1.0/>

3)Pyfits: Library to read/write/manipulate fits files.

http://www.stsci.edu/institute/software_hardware/pyfits

Can be found at (check that you download the right file for your python distribution)

http://www.stsci.edu/institute/software_hardware/pyfits/Download

Although all the necessary stuff to follow the tutorial will be introduced during the sessions, you may find useful to have a look to some short intros on python and the libraries we will use, to get some flavour in advance. There's plenty of them on the web. I can recommend you as a starting point:

<http://www.korokithakis.net/tutorials/python/>

<http://packages.python.org/tabular/html/reference/numpy-quickstart.html>

http://scipy.org/Getting_Started

<http://www.loria.fr/~rougier/teaching/matplotlib/>

Installing Python and libraries:

(**) For linux and windows users installing python and the above libraries is quite straightforward.

Linux:

For debian/ubuntu users installing the above libraries is as simple as executing the "(sudo) apt-get install" command for packages "python-numpy" "python-scipy" "python-matplotlib" and "python-pyfits"

Most other distributions also provide binaries for these packages.

Windows:

Binaries for Python and the needed libraries can be downloaded/installed from the above links. Hopefully it will just work out of the box.

Mac/OSX:

Mac users may find it a bit harder to set everything up and running (particularly OSX Lion users). Apparently the python version that comes with OSX does not allow installation of the libraries as easily as for Linux/Windows users. Projects like Fink (<http://www.finkproject.org/>) or Macports (<http://www.macports.org/>) are supposed to make your life easier. As I am not a Mac user myself, I cannot help much with this. I recommend to take a look at: <http://www.astrobetter.com/wiki/tiki-index.php?page=Python+Setup+for+Astronomy>

Good luck!