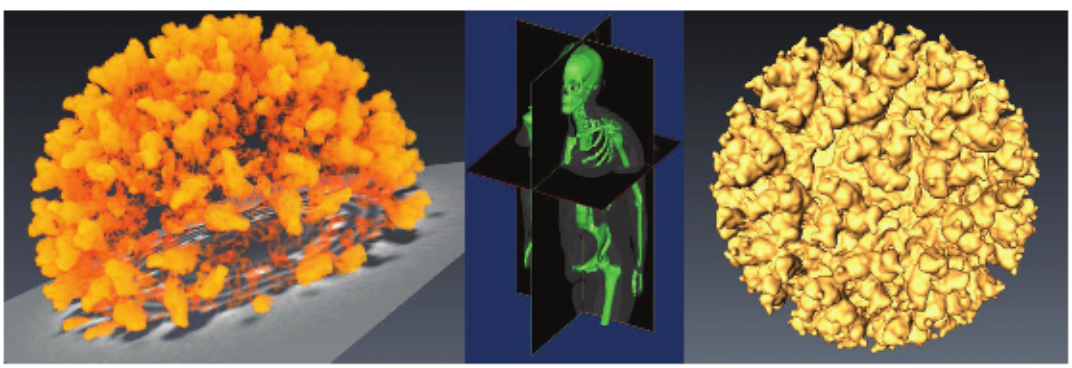
CHAPMAN & HALL/CRC
MATHEMATICAL AND COMPUTATIONAL IMAGING SCIENCES

Image Processing and Acquisition using Python



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Appendix A

Installing Python Distributions

In Chapter 1, Introduction to Python, we briefly discussed various Python distributions. Operating systems such as MacOSX and Linux come prebuilt with a Python interpreter. This Python interpreter is not ready for scientific computation as it does not have the common scientific modules such as numpy, scipy etc. Installing these modules requires knowledge of compiling complex mathematical libraries such as MKL, Boost etc. Various distributions have been created to ease the task of installing a Python distribution for scientific computation. Some of these distributions are free while others are free only for academic community users. We will discuss in detail the two most popular distributions and methods for installing them on your favorite OS. The two distributions are Enthought Python distribution (EPD) and PythonXY. The former is available for MacOSX, Windows and Linux while the latter is available only for Windows.

PythonXY also installs "Spyder", an interface for Python programming created to be similar to the MATLAB®interface. EPD does not install Spyder by default but it can be configured.

A.1 Windows

A.1.1 PythonXY

The installer can be downloaded from `http://www.pythonxy.com`. Once downloaded, double-click to begin installing. The installation pro-

cess consists of multiple pages which can be navigated by using the "Next" button. Only the most important pages will be discussed. In Figure A.1 install types are specified. In this case, the install type was chosen to be full i.e., all the plug-ins and modules will be installed. The other pages can be navigated using the "Next" button.

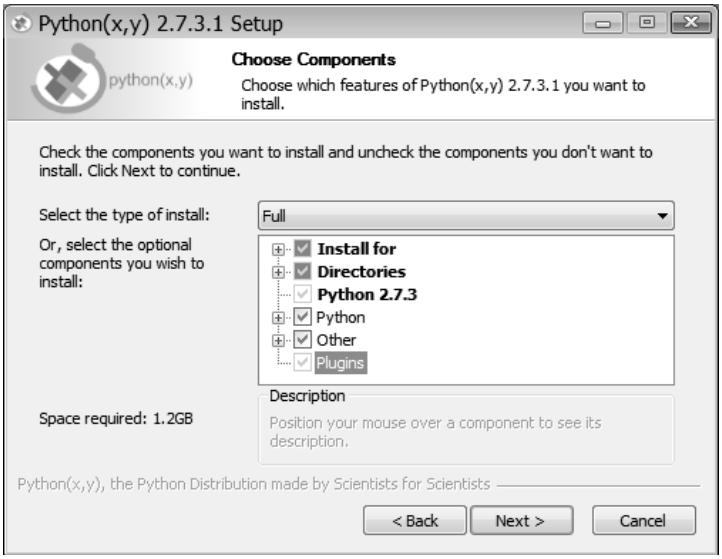

FIGURE A.1: Specifying the type of install.

The interpreter can be accessed through Spyder from the windows menu shown in Figure A.2. The Spyder interface is shown in Figure A.3. The interface is designed to look similar to MATLAB interface. The left column is the editor for creating a Python program. The right column consist of two sections. The top section contains the object inspector, variable explorer and the file explorer. The object inspector provides interactive documentation of any Python function. The variable explorer lists all the variables that are currently used in the Python interpreter. The file explorer allows easy navigation of all the files in the folder in the system. The bottom section consists of the console and history log. The console is a convenient place for testing Python functions before

they are incorporated into a program. History log consists of all the commands that were typed in the console.

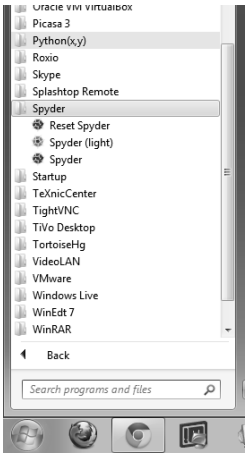

FIGURE A.2: The Windows menu item to start PythonXY under Spyder.

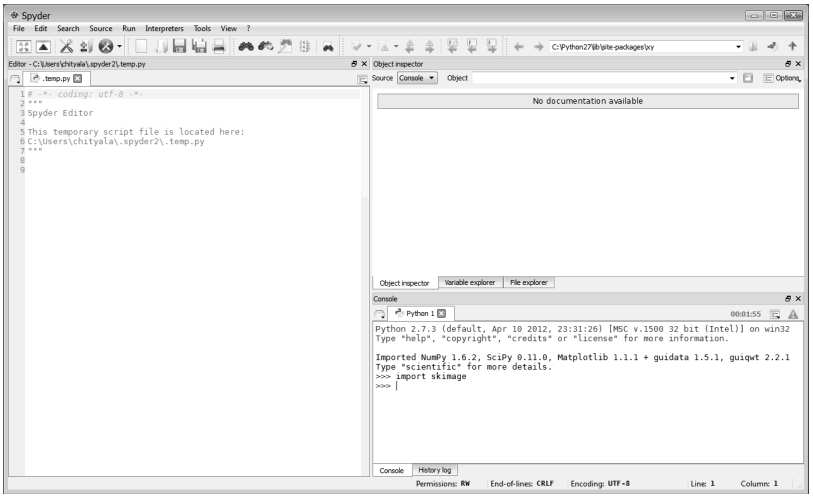

FIGURE A.3: The Spyder interface.

A.1.2 Enthought Python Distribution

The installer can be downloaded from `http://enthought.com/`. Once downloaded, double-click to begin installation. The installation process consists of multiple pages that can be navigated by using the "Next" button. In Figure A.4, the installer specifies the location of an interpreter that's already installed. In the absence of any interpreter installed previously, this page will not be displayed.

FIGURE A.4: Specifying a Python distribution for installation.

A.1.3 Updating or Installing New Modules

PythonXY and EPD are prebuilt with scientific modules. Updating to a new version of these modules is critical as a new version may contain new features, new algorithms, and bug fixes. This can be completed by downloading the appropriate installer (.exe) file from the appropriate website.

The same process can be adapted to download a module that is not

part of the Python distribution. An example of such an installation is shown in Figures A.5 and A.6. The Python module skimage is not available as part of EPD free. The appropriate module can be downloaded and installed. In Figure A.6 the installer indicates the version and the location of the interpreter to which the module will be installed.

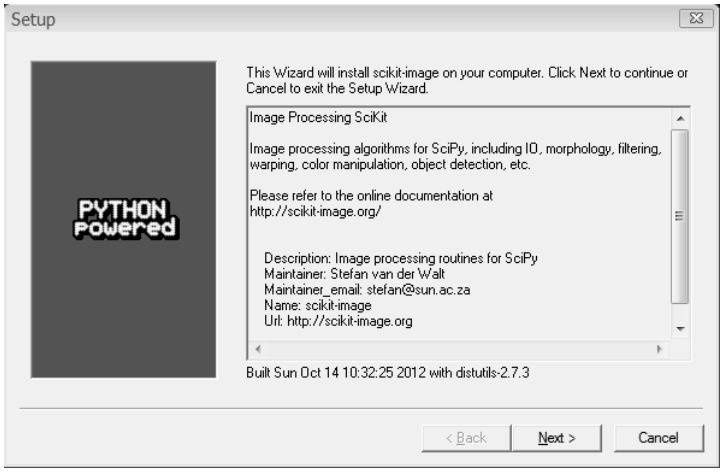

FIGURE A.5: Installation of skimage module.

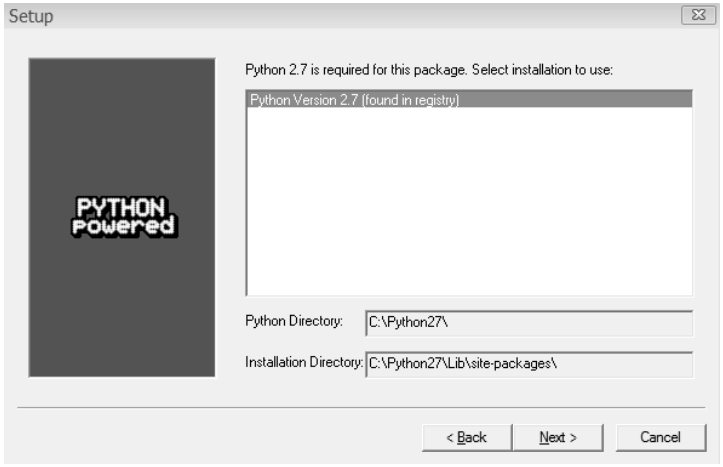

FIGURE A.6: Specifying the interpreter version and location.

A.2 Mac or Linux

Python is pre-installed in Linux and MacOSX. However, the version of Python may not contain scientific modules that are of interest to readers of this book. In this section, we will discuss installing Enthought Python distribution on a Mac. In the case of Linux, the installer is a .sh file instead of the .dmg file used in MacOSX. We will also discuss instructions for updating any Python module, using scikits-image as an example. The instructions for installing or updating any Python module is same for both Linux and Mac.

A.2.1 Enthought Python Distribution

The installer (.dmg file) can be downloaded from `http://enthought.com/`. Once downloaded, double-click to begin installing. The installation process consists of multiple pages that can be navigated by using the "Next" button. The installation process begins with the screen shot shown in Figure A.7. This figure indicates that version 7.3.2 of EPD free will be installed in the location `/Library/Frameworks/Python.framework/Versions/7.3`. This location is immutable and hence the files cannot be moved without breaking the installation.

Once the installation of EPD is complete, the Python interpreter can be invoked by typing "python" at the Mac command prompt (Figure A.8). Notice that when scikits-image module is loaded using "import skimage" command, it fails as skimage is not part of EPD free distribution.

A.2.2 Installing New Modules

New modules can be installed by using "easy_install" that comes with EPD free distribution. EasyInstall, [48] is a package manager for Python. It allows a standard method for packaging and distributing

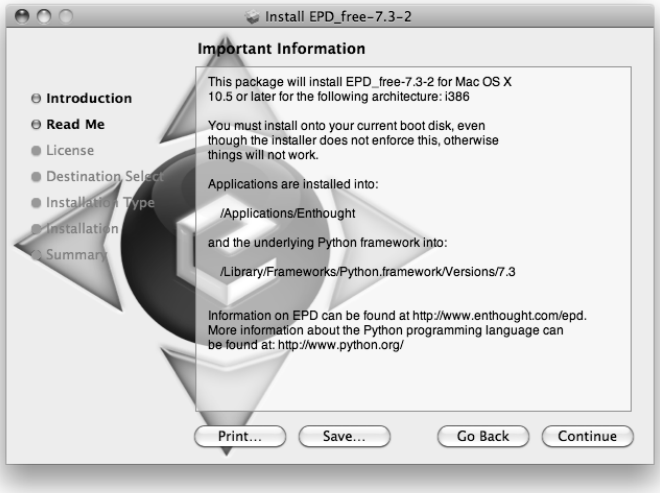

FIGURE A.7: Installing Enthought Python distribution on Mac.

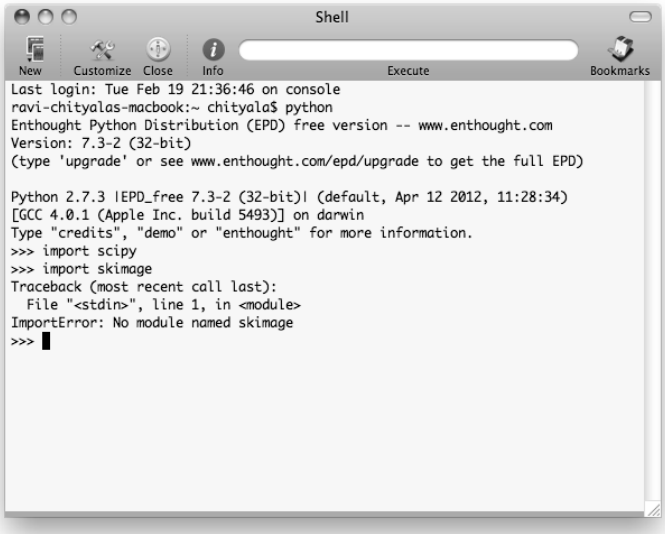

FIGURE A.8: Loading Enthought Python distribution on Mac and skimage module.

Python programs, libraries and modules. It searches the web for the packages that are requested. It begins the search with the Python Pack-

age Index (also know as pypi) and looks up metadata of locations from which the package can be downloaded. In this case, the installation of the "skimage" module requires the "cython" module, [17]. This module can be installed using "easy_install cython". The output during this process is shown in Figure A.9. As can be seen in the screenshot, the index pypi.python.org is used to obtain the location of the installer. In this case, it is `http://www.cython.org/release/Cython-0.18.zip`. EasyInstall downloads, compiles and installs the package.

```
yalas-macbook:~ chityala$ easy_install cython
Searching for cython
Reading http://pypi.python.org/simple/cython/
Reading http://www.cython.org
Reading http://cython.org
Best match: Cython 0.18
Downloading http://www.cython.org/release/Cython-0.18.zip
Processing Cython-0.18.zip
Writing /var/folders/h0/h0-Syz3bEq8hHxNsF4Ar3U+++TI/-Tmp-/easy_install-0q3aQd/Cython-0.18
/setup.cfg
Running Cython-0.18/setup.py -q bdist_egg --dist-dir /var/folders/h0/h0-Syz3bEq8hHxNsF4Ar
3U+++TI/-Tmp-/easy_install-0q3aQd/Cython-0.18/egg-dist-tmp-wPzWrg
Compiling module Cython.Plex.Scanners ...
Compiling module Cython.Plex.Actions ...
```

FIGURE A.9: Installing cython module using easy_install. This module is required to use skimage module.

After the installation of cython, skimage can be installed using "easy_install scikits-image" as shown in Figure A.10.

```
ravi-chityalas-macbook:~ chityala$ easy_install scikits-image
Searching for scikits-image
Reading http://pypi.python.org/simple/scikits-image/
Reading http://scikits-image.org
Reading http://github.com/scikits-image/scikits-image
Best match: scikits-image 0.7.1
Downloading http://pypi.python.org/packages/source/s/scikits-image/scikits-image-0.7.1.ta
r.gz#md5=d1108974cdf3eeeda0b48aafbada9c1e
Processing scikits-image-0.7.1.tar.gz
Writing /var/folders/h0/h0-Syz3bEq8hHxNsF4Ar3U+++TI/-Tmp-/easy_install-tCeb61/scikits-ima
ge-0.7.1/setup.cfg
```

FIGURE A.10: Installing skimage module using easy_install.

Finally, we can verify the installation of skimage by invoking "import skimage" in the Python interpreter (Figure A.11).

pydicom module

One of the modules that is not included in the two distributions but will be needed for reading medical images is the pydicom module.

```
Enthought Python Distribution (EPD) free version -- www.enthought.com
Version: 7.3-2 (32-bit)
(type 'upgrade' or see www.enthought.com/epd/upgrade to get the full EPD)

Python 2.7.3 |EPD_free 7.3-2 (32-bit)| (default, Apr 12 2012, 11:28:34)
[GCC 4.0.1 (Apple Inc. build 5493)] on darwin
Type "credits", "demo" or "enthought" for more information.
>>> import skimage
>>>
```

FIGURE A.11: Loading skimage module.

This module allows reading and writing dicom files. You can find more details and the link for downloading and installing pydicom at `http://code.google.com/p/pydicom/`.

The pydicom module can be installed on Linux and on Mac using the command "easy_install pydicom" If you do not have the required permission for pydicom on the Python installation, use virtualenv [3].

Installation in Windows can be performed by downloading the executable file. During the installation process make sure that the correct "Python directory" is provided as shown in Figure A.12.

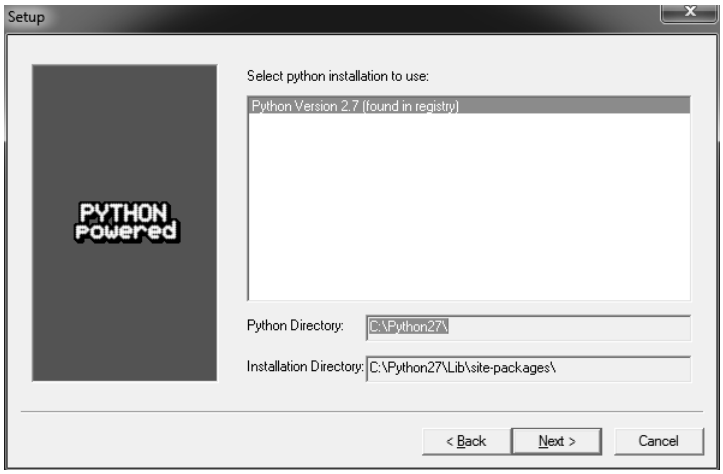

FIGURE A.12: Steps for installing pydicom on Windows.