Supplementary Material:

iPython environment for learning SimpleITK

Biomedical Imaging & Analysis (ECE J1-791) - Fall 2014

Sun Yat-sen University – Carnegie Mellon University (SYSU-CMU)
SYSU-CMU Joint Institute of Engineering
Instructor: Prahlad G Menon, PhD

---

1. **For general information** about what SimpleITK is please see the SimpleITK wiki: http://www.itk.org/Wiki/ITK/Release_4/SimpleITK/GettingStarted Also, for general information on iPython Notebooks and what they are, the following video is recommended, starting from 2:05 minutes onwards: https://www.youtube.com/watch?v=HaS4NXxL5Qc#t=133

2. **Setting Up a Virtual Ubuntu Environment**

For Windows and Mac OS users, it is recommended to first create a virtual Ubuntu 12.04 desktop using VMWare Player (free, for Windows) or VirtualBox (free, for Mac OS). Tutorials to set up each of these virtual linux environments is provided in the following well-illustrated tutorials:

1) VMWare for Windows:

- Download VMWare Player: https://my.vmware.com/web/vmware/free#desktop_end_user_computing/vmware_player/6_0
- Download an Ubuntu 12.04 ISO:
  The Ubuntu 12.04 ISO file required for each of the above methods of setting up the a virtual linux environment, is available for download here: http://www.ubuntu.com/download/desktop
- Follow instructions in VMWare Player (including prompts to download relevant extensions) to create a new virtual machine, and point to the downloaded ISO file. You will have opportunity to give the virtual machine a name and adjust the amount of RAM and number of cores allocated to the virtual machine, using the settings. This step should be straightforward.
- Once set up, start your virtual machine by clicking on the new virtual machine's name (as you named it) listed on the left-hand panel (underneath the "Home" icon) of your VMWare player home screen.

2) VirtualBox for Mac OS: http://www.tuaw.com/2009/09/07/how-to-set-up-ubuntu-linux-on-a-mac-its-easy-and-free/

3. Setting Up a Virtual Python Environment

It is recommended to setup a separate Python virtual environment within which to run the iPython Notebooks which will follow in this assignment as well as the subsequent assignment(s).

- Open up a new Terminal window in your newly created Linux Virtual Machine.
- Run the following commands, in the terminal, in sequence (Note: "~" refers to /home/<your-user-name> or /home/ubuntu (if you left it as a default):

```
 i.   sudo passwd
      <enter new UNIX password when prompted>
 ii.  sudo pip install virtualenv
 iii. virtualenv ~/sitkpy --no-site-packages
 iv.  ~/sitkpy/bin/pip install ipython[all]
 v.   ~/sitkpy/bin/pip install numpy
 vi.  ~/sitkpy/bin/pip install matplotlib
```

Note: If you were to try to install the aforementioned packages into Window platforms directly without a virtual environment for Ubuntu set up, some of these packages should be obtained as binary downloads and installed; they can be found by individually Google searching for them (not recommended!).

4. Install SimpleITK

A built distribution of SimpleITK is available as an Python egg. This can be downloading and installed with the following command in the terminal window:

- `~/sitkpy/bin/easy_install SimpleITK`
- The package will also be available or download on SourceForge. Although you won't require to access it from here, you can check it out: http://sourceforge.net/projects/simpleitk/files/SimpleITK/0.6.rc1/Python/

5. Install ImageJ – Note that SimpleITK doesn't support Visualization!

SimpleITK does not do visualization, although it does contain a built method to show an image. This function writes the image out to disk (by default written to the "/tmp" directory) and then launches a program for visualization. By default it is configured to use ImageJ, because it is readily supports all the image types which SimpleITK has and load very quickly. However, it's easily customizable by setting environment variables. So, let's install ImageJ since we don't have this already:

- `apt-get -y install imagej`
- Note "Nifti" is the default file format used to export images. If your ImageJ doesn't support this, you will need to find a plugin that does! Or, you can change this default using an environment variable set at the terminal:

  - Eg: Try the following at the terminal to export PNG files as the default:
    - export SITK_SHOW_EXTENSION=".png"
- Note, similarly, the user can specify an application other than ImageJ to view images via the SITK_SHOW_COMMAND environment variable.

---

6. Run the iPython Notebook Environment

To launch, in the terminal enter:

- `mkdir ~/my-miia-iPython-notebooks`
  - Download the following iPython Notebook into this folder using the GUI, using Firefox (default web-browser in Ubuntu 12.04):
    - Filename: `ImageLoadingAndViewing_Basics-PGM.ipynb`
    - Location: https://themedcave1.tonidoid.com/urlft14qm
  - Once downloaded, continue…
- `cd ~/my-miia-iPython-notebooks`
- `~/sitkpy/bin/ipython notebook --pylab=inline`
  Note: This will start the iPython Notebook Dashboard in the default web browser (i.e. Firefox).
- Click on the **ImageLoadingAndViewing_Basics-PGM** in the list which appears on the Dashboard window, automatically populated based on the .ipynb files in the folder from which the iPython Notebook was launched.