IFAE

EXCELENCIA SEVERO OCHOA

BIST Barcelona Institute of Science and Technology

ICE CSIC

PIC port d'informació científica

The Language

A bit of history

- Python was conceived in 1980 and started being implemented in 1989 by Guido van Rossum at CWI (Netherlands), entitled BDFL (Benevolent Dictator For Life) by the community
- Focus on code readability, providing a syntax that allows more concepts in fewer lines of code
- Fully open-source with a extremely active and wide community

A bit of history – Versions

The first main community backed version:

- Python 2.0, October 16, 2000
  - Cycle-detecting garbage collector for memory management
  - Unicode support

A bit of history – Versions

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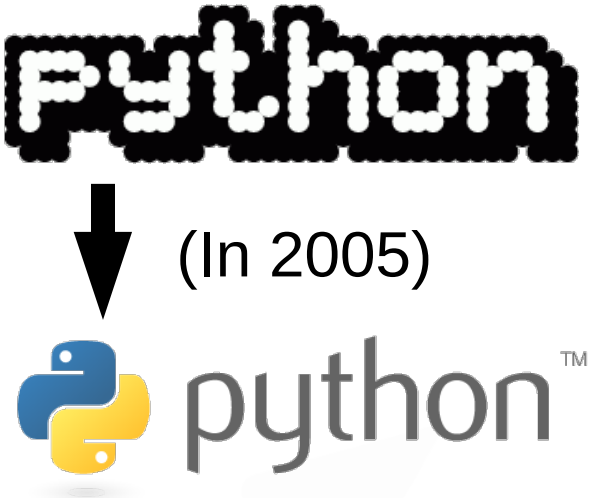
- Python 2.0, October 16, 2000
  - Cycle-detecting garbage collector for memory management
  - Unicode support
- Python 3.0, December 3, 2008
  - Backwards-**incompatible**
  - Major features backported to python 2.6 & 2.7



DISCLAIMER: This workshop will be using **python 3.0**

A bit of history – Use of python

Python is currently being used for “everything”

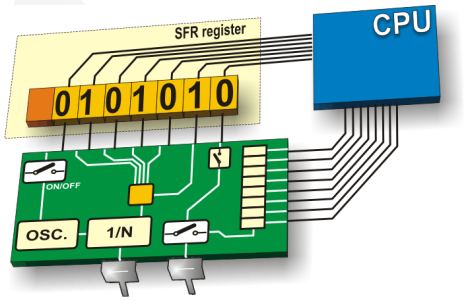
Large-scale servers working 24/7

Astronomy

Teaching Kids

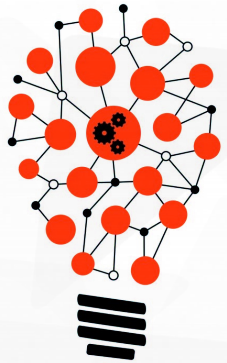
python™

Throw-away scripts



Microcontrollers

Databases



Machine learning

A bit of history – Use of python

(Some) Companies currently massively using python

A bit of history – Python 3

- Python 3 was designed to correct some fundamental design flaws (see `https://en.wikipedia.org/wiki/History_of_Python#Features`)
  - Not possible to retain full backwards compatibility

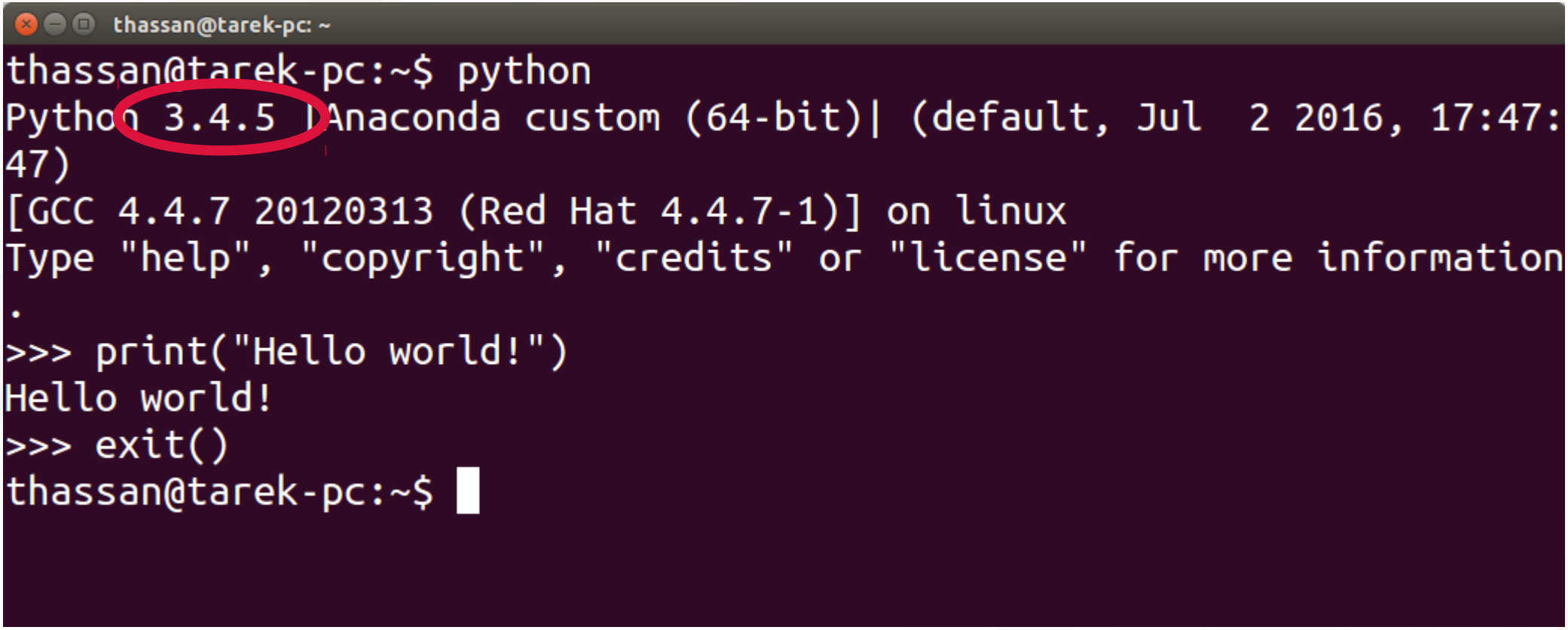
- What does this mean?
  - If you start now with python 3, you will learn the "good way"
  - Some packages may still be not fully functional in python 3 (give them some time!)
  - You can check the version of python you are using simply by:

```
import sys; print(sys.version)
```

DISCLAIMER: This workshop will be using **python 3.0**

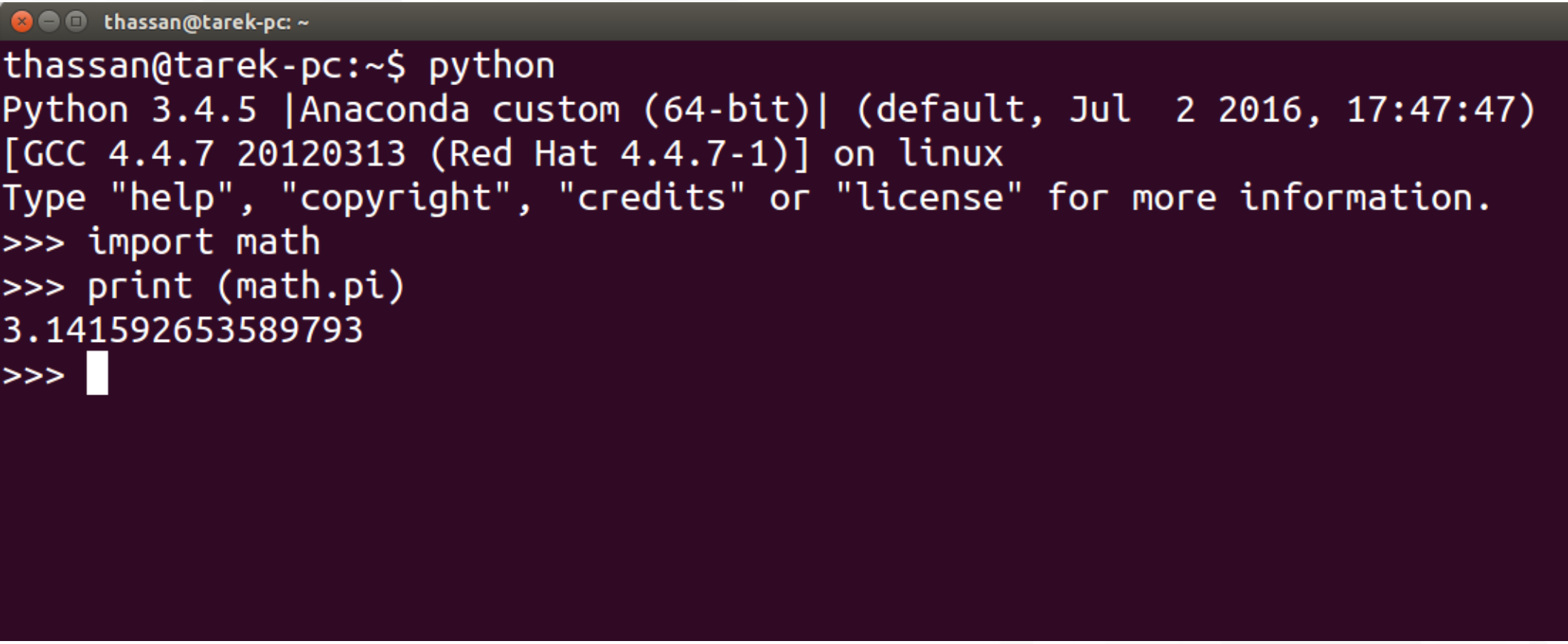
Getting started with python

- Open a terminal and type “python”



Getting started with python

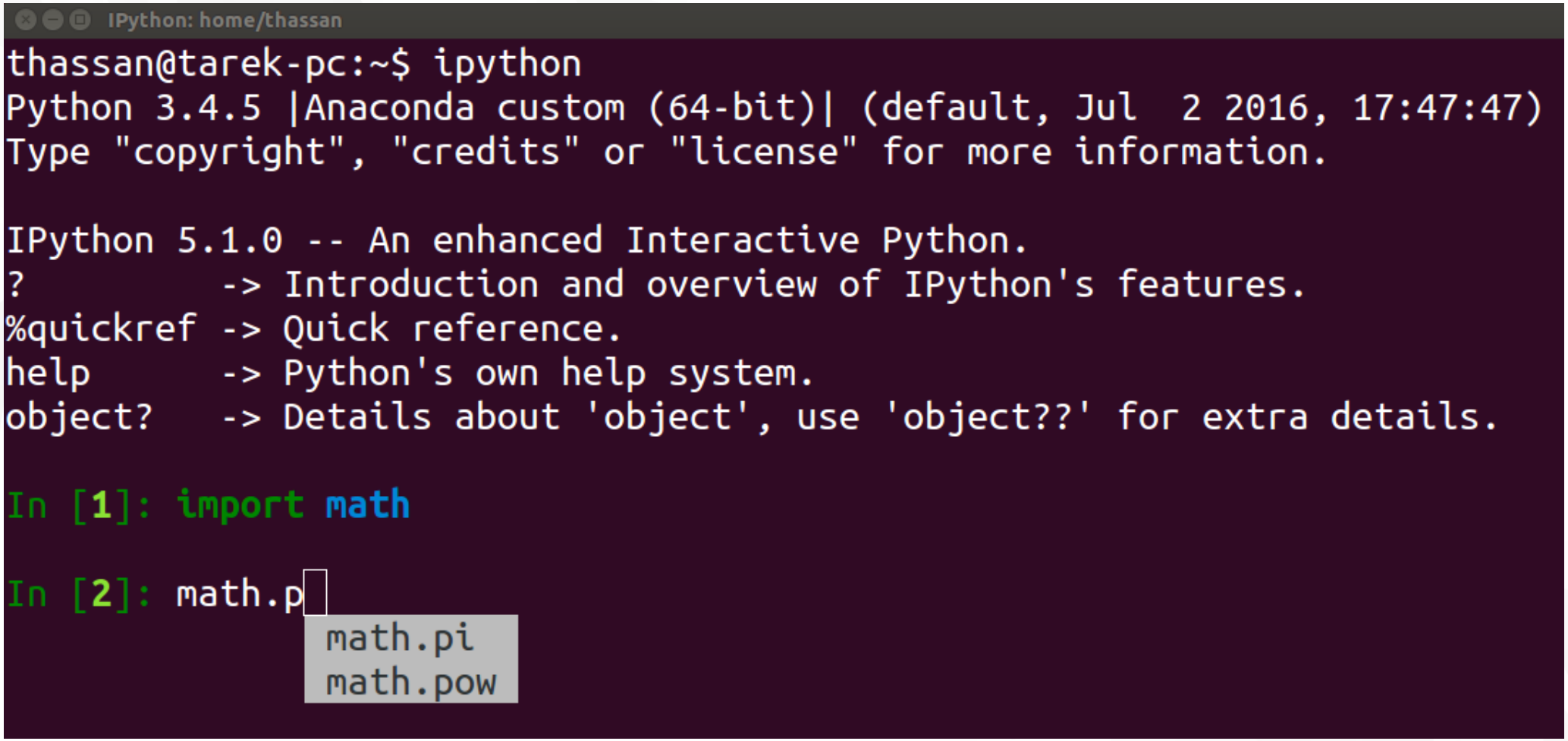
- To use an external library, you need to “import” it:



- Python standard library: `https://docs.python.org/3/library/index.html`

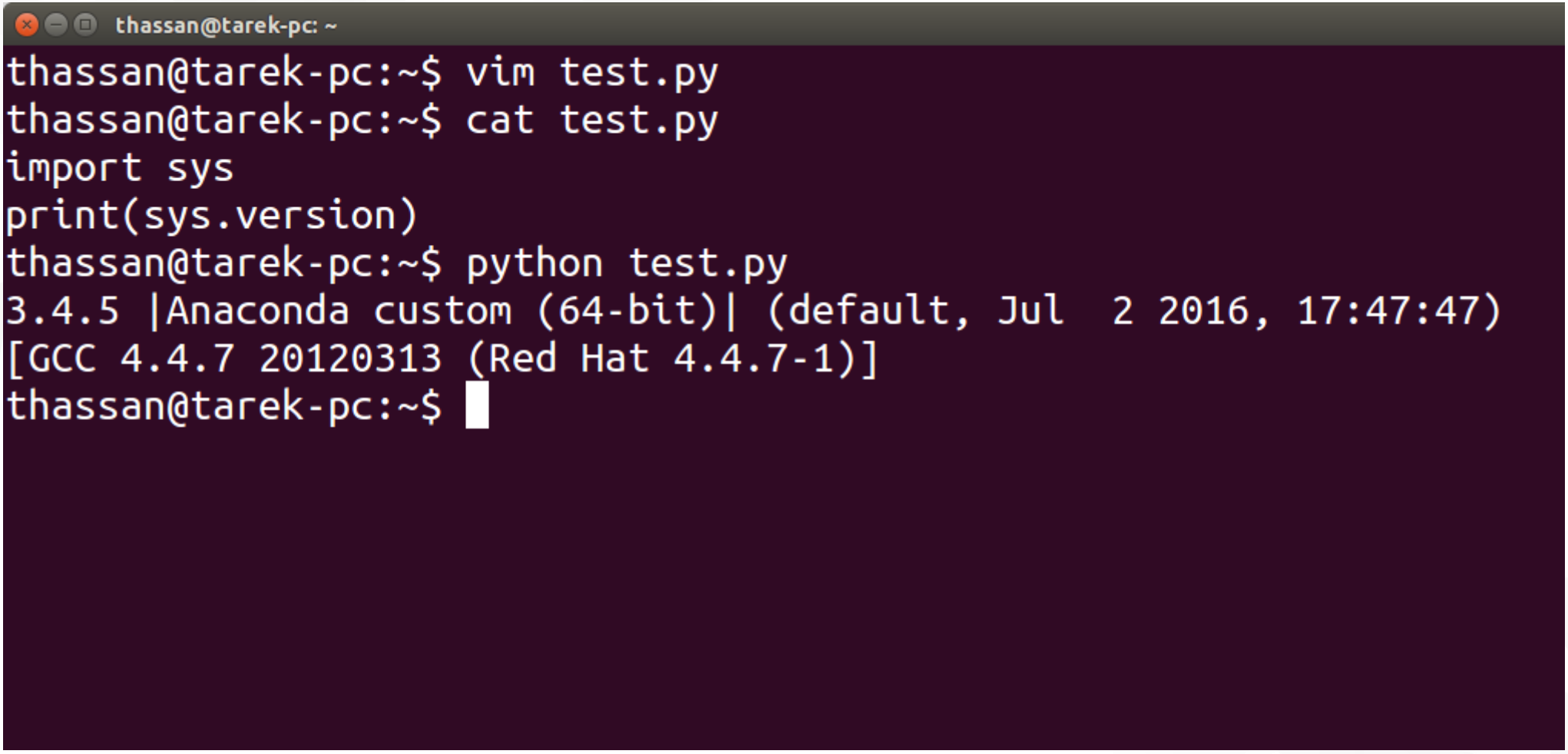
Getting started with python

- You have more interactive options, like “ipython”:



Getting started with python

- For writing scripts, you can use any “plain” text editor:



Getting started with python

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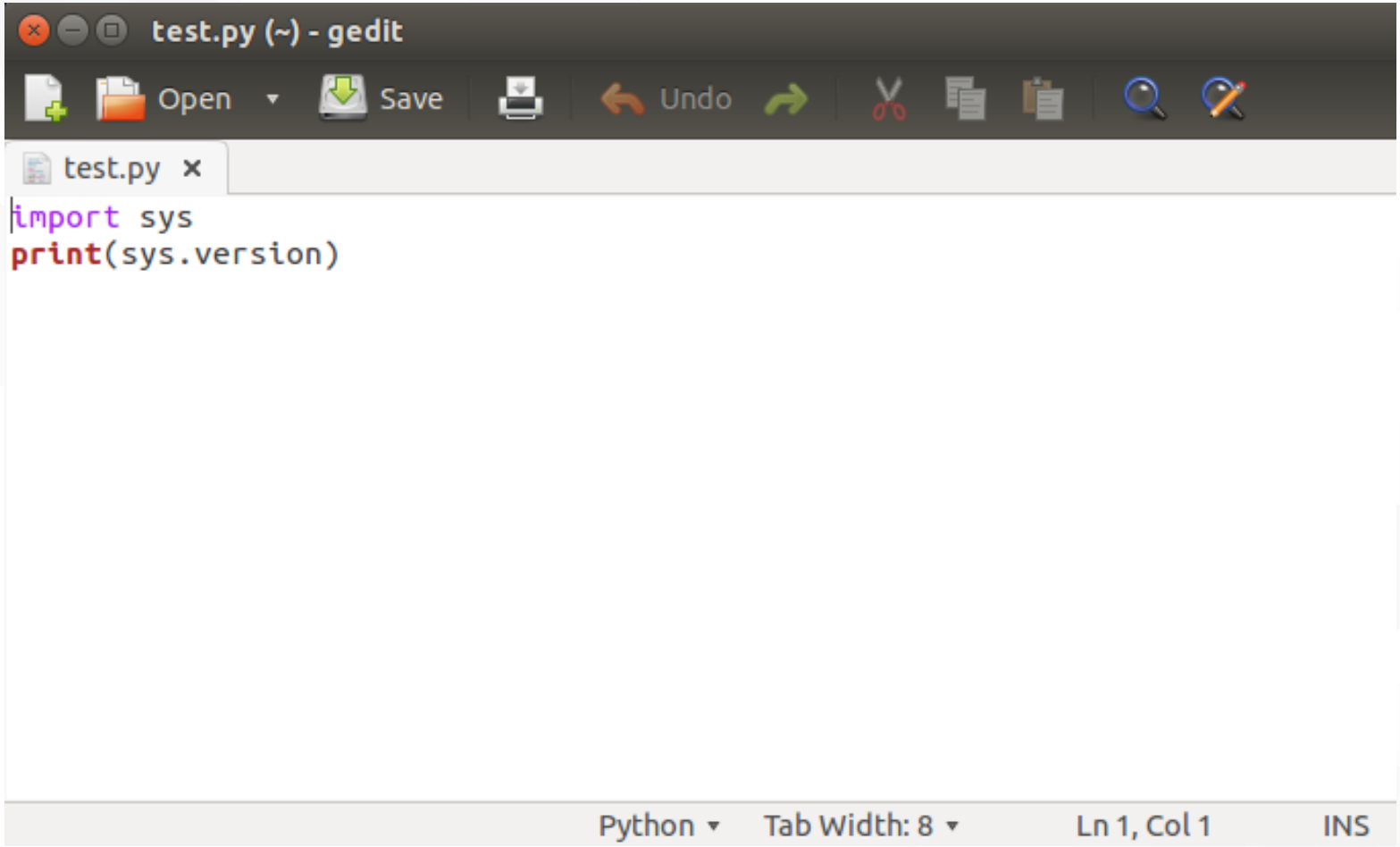
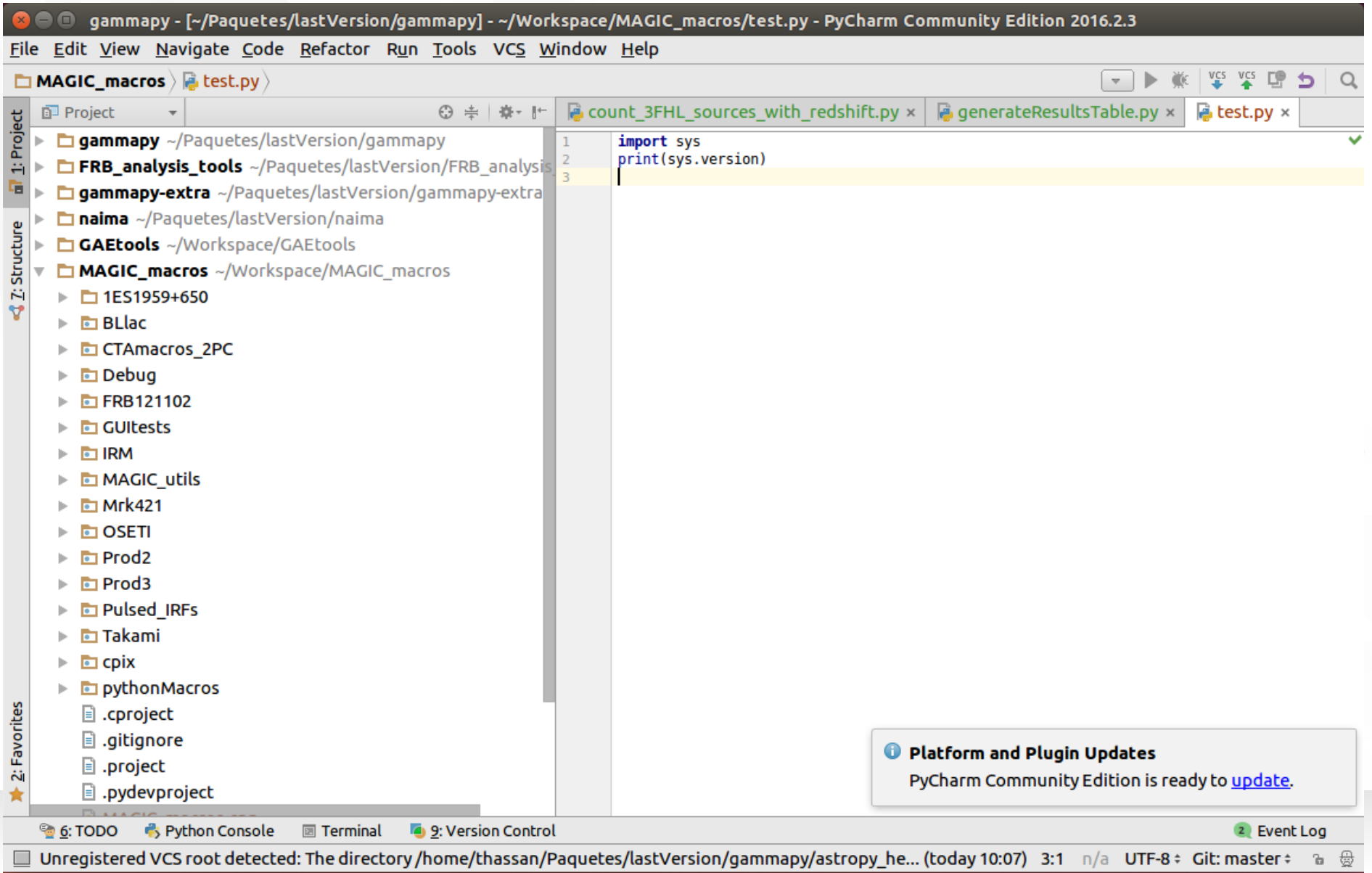


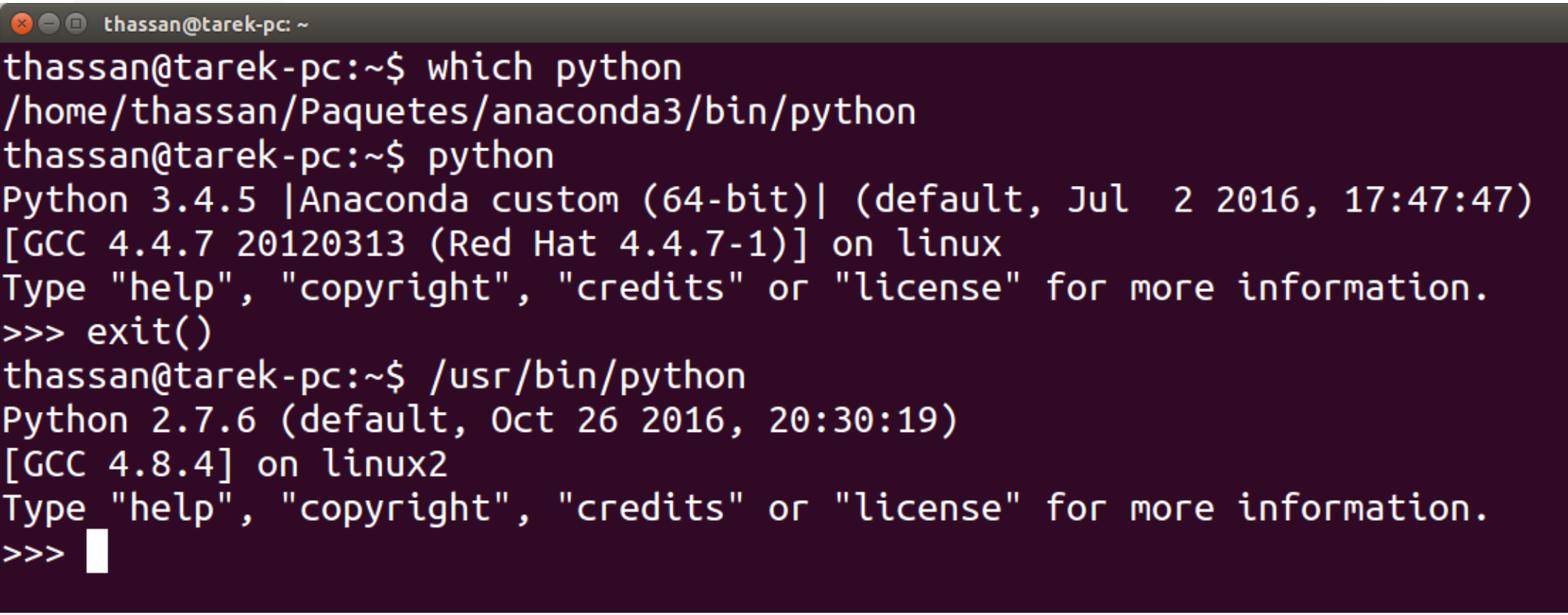
Getting started with python

- Or use an IDE: (e. g. pyCharm, eclipse, vim, wing, spyder...)



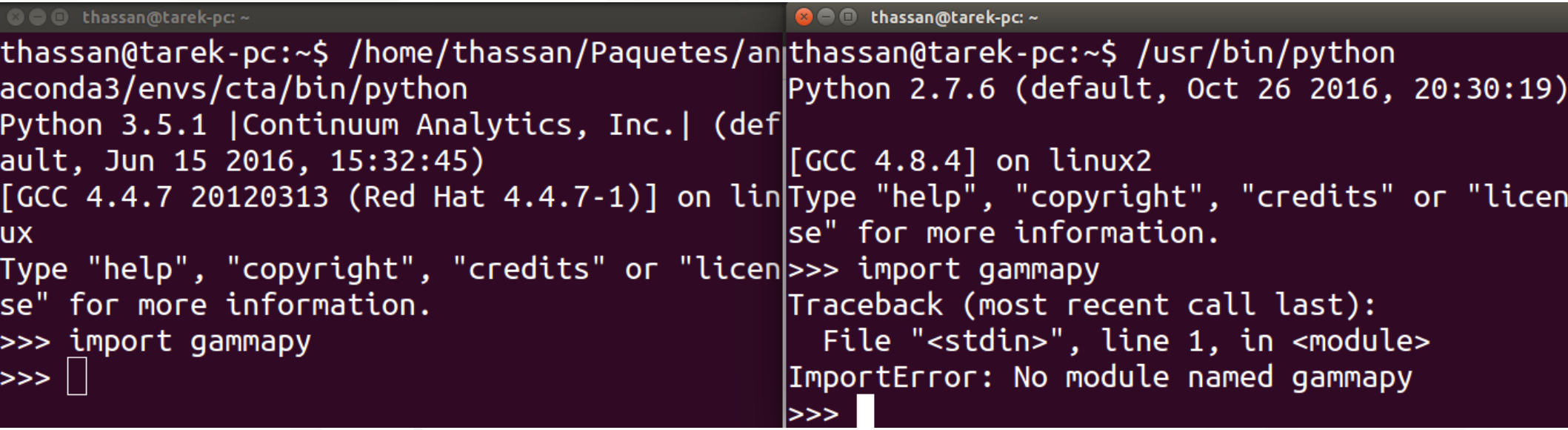
How python works: binaries

- As it is possible (and usual) to have several “pythons” installed, some clarifications are useful
  - When you enter the python console, you execute a python binary (you may have several installed!)



How python works: binaries & libraries

- Certain libraries may be installed only in some python environments:



How python works: binaries & libraries

- To install a library:
  - You may do it manually (usually not encouraged):
    - Download package, “compile” and install

```
thassan@tarek-pc:~$ cd Paquetes/lastVersion/naima/
thassan@tarek-pc:~/Paquetes/lastVersion/naima$ python setup.py install
Initializing astropy_helpers submodule with: `git submodule update --init -- ast
ropy_helpers`
/home/thassan/Paquetes/anaconda3/lib/python3.4/site-packages/Cython/Distutils/ol
d_build_ext.py:30: UserWarning: Cython.Distutils.old_build_ext does not properly
 handle dependencies and is deprecated.
  "Cython.Distutils.old_build_ext does not properly handle dependencies "
Freezing version number to naima/version.py
running install
running bdist_egg
running egg_info
creating naima.egg-info
writing pbr to naima.egg-info/pbr.json
writing top-level names to naima.egg-info/top_level.txt
writing requirements to naima.egg-info/requires.txt
writing naima.egg-info/PKG-INFO
writing dependency_links to naima.egg-info/dependency_links.txt
writing manifest file 'naima.egg-info/SOURCES.txt'
```

How python works: binaries & libraries

- To install a library:
  - You may do it manually (usually not encouraged):
    - Download package, “compile” and install
  - You may use a package manager such as “pip”:
    - “pip install <package_name>”
    - This will install all dependencies, in the version required by the package
    - Unless if you are a developer of a specific package, you will probably always use this method (or analog ones)

How python works: binaries & libraries

- Working with environments:
  - If you followed the tutorial we sent to install python, you installed **anaconda** and created an environment named “py36”
  - These virtual environments allow to have a clean installation of python where all third-party packages are in the required version
    - Different python project may (and probably will) require different dependencies (either different libraries, or same libraries with different versions)
    - Usually, you will just need to activate the desired environments: “source activate py36”

https://conda.io/docs/user-guide/tasks/manage-environments.html

Using Jupyter notebooks

- For simplicity, to follow the tutorials of this course we will be using Jupyter notebooks
  - Open-source web application that allows to edit and execute code
  - All code is executed locally within your python environment (even if it is shown within your browser)

- To begin the course, clone the gitHub repository of the course and execute the jupyter notebook "`02_01_TheLanguage.ipynb`"

Using Jupyter notebooks

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```
thassan@tarek-pc:~$ cd /tmp/
thassan@tarek-pc:/tmp$ git clone https://github.com/Python4AstronomersAndParticleP
hysicists/PythonWorkshop-ICE.git
Cloning into 'PythonWorkshop-ICE'...
remote: Counting objects: 503, done.
remote: Compressing objects: 100% (20/20), done.
remote: Total 503 (delta 13), reused 23 (delta 9), pack-reused 474
Receiving objects: 100% (503/503), 113.19 MiB | 2.72 MiB/s, done.
Resolving deltas: 100% (281/281), done.
Checking connectivity... done.
thassan@tarek-pc:/tmp$ cd PythonWorkshop-ICE/
thassan@tarek-pc:/tmp/PythonWorkshop-ICE$ jupyter notebooks/02_01_TheLanguage.ipynb
```

Using Jupyter notebooks

- To begin the course (if you did not do it already), clone the gitHub repository of the course and execute the jupyter notebook "`02_01_TheLanguage.ipynb`"

- If you already cloned it, make sure that you have the latest version by typing within your project "`git pull`":

```
thassan@tarek-pc:~/Paquetes/lastVersion/PythonWorkshop-ICE$ git pull
remote: Counting objects: 16, done.
remote: Compressing objects: 100% (10/10), done.
remote: Total 16 (delta 8), reused 10 (delta 5), pack-reused 0
Unpacking objects: 100% (16/16), done.
From https://github.com/Python4AstronomersAndParticlePhysicists/PythonWorkshop-I
CE
   2b24994..bfd2b69  master     -> origin/master
Updating 2b24994..bfd2b69
Fast-forward
 README.md                                  |  11 +-
 examples/use_system_latex/plot.py          |   7 +-
 examples/use_system_latex/proceeding.tex   |   4 +-
 notebooks/05_01_matplotlib.ipynb           | 719 +++++++++-----------------------
 4 files changed, 179 insertions(+), 562 deletions(-)
thassan@tarek-pc:~/Paquetes/lastVersion/PythonWorkshop-ICE$
```

Using Jupyter notebooks

- To begin the course (if you did not do it already), clone the gitHub repository of the course and execute the jupyter notebook "`02_01_TheLanguage.ipynb`"
- If you already cloned it, make sure that you have the latest version by typing within your project "`git pull`":
- If conflicts appear while updating (probably caused by local modifications you did to the notebooks), you may "stash" your changes and try to update again:

```
> git stash
> git pull
```

Using Jupyter notebooks

- From now on, the tutorial (and whole workshop) continues through notebooks (in your browser, similar to this):