Useful libraries

July 1, 2020

```
[1]: # The following is to know when this notebook has been run and with which → python version.

import time, sys
print(time.ctime())
print(sys.version.split('|')[0])

Wed Jul 1 13:29:17 2020
3.7.6 (default, Jan 8 2020, 13:42:34)
[Clang 4.0.1 (tags/RELEASE_401/final)]

[2]: import numpy as np
```

1 F Some useful libraries that make life easier

This is part of the Python lecture given by Christophe Morisset at IA-UNAM.

This lecture will give some insights to the most useful python libraries. It is NOT exhaustive, you have to read the corresponding manual pages to find the best use you can have of them. The list of all python-included libraries is here: https://docs.python.org/2/library/

1.0.1 time, datetime and timeit

- https://docs.python.org/2/library/time.html
- https://docs.python.org/2/library/datetime.html

```
[3]: import time import datetime
```

```
[4]: print(time.ctime()) # current time, in a string format
```

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```
[5]: lt = time.localtime() print(lt)
```

time.struct_time(tm_year=2020, tm_mon=7, tm_mday=1, tm_hour=13, tm_min=29,
tm_sec=25, tm_wday=2, tm_yday=183, tm_isdst=1)

```
[6]: time.strftime("%a, %d %b %Y %H:%M:%S",lt)
 [6]: 'Wed, 01 Jul 2020 13:29:25'
 [7]: print(datetime.datetime.today())
     2020-07-01 13:29:26.085318
 [8]: today = datetime.date.today()
      philae_landing = datetime.date(2014, 11, 11)
 [9]: time_to_landing = philae_landing - today
[10]: if philae_landing > today:
          print('Philae landing in {} days.'.format(time_to_landing.days))
      else:
          print('Philae landed since {} days.'.format(-time to landing.days))
     Philae landed since 2059 days.
[11]: start = time.time()
      for i in np.arange(1000):
          t = np.math.factorial(i)
      end = time.time()
      print('1000 factorials done in {0:.3f} secs.'.format(end-start))
     1000 factorials done in 0.021 secs.
[12]: from timeit import Timer
      command = """\
      for i in np.arange(1000):
          t = np.math.factorial(i)
      t = Timer(command, setup='import numpy as np')
      print(t.timeit(number=10))
     0.1761178519999973
     in ipython, one can use the magic timeit function:
[13]: %timeit np.math.factorial(50)
     709 ns \pm 6.22 ns per loop (mean \pm std. dev. of 7 runs, 1000000 loops each)
     or for the whole cell:
[14]: %%timeit
      for i in np.arange(1000):
          t = np.math.factorial(i)
```

```
17.8 \text{ ms} \pm 576 \text{ } \mu \text{s} \text{ per loop (mean} \pm \text{ std. dev. of } 7 \text{ runs, } 100 \text{ loops each)}
```

1.0.2 os

https://docs.python.org/2/library/os.html This module provides a portable way of using operating system dependent functionality. If you just want to read or write a file see open(), if you want to manipulate paths, see the os.path module, and if you want to read all the lines in all the files on the command line see the fileinput module. For creating temporary files and directories see the tempfile module, and for high-level file and directory handling see the shutil module.

```
[15]: import os

[16]: # os.environ is a dictionnary containing the environment variables and values
    if 'HOME' in os.environ:
        print(os.environ['HOME'])
    else:
        print('This OS is too limited to understand HOME')
```

/Users/christophemorisset

```
[17]: # if variable doesn't exists, getenv returns None print(os.getenv('HOMMMMMME'))
```

None

```
[18]: # get current working directory
cwd = os.getcwd()
print(cwd)
print(cwd.split('/')[-1])
```

/Users/christophemorisset/Google Drive/Pro/Python-MySQL/Notebooks/Notebooks Notebooks

```
[19]: new_dir = '/tmp/test3456'
if not os.path.exists(new_dir):
    os.mkdir(new_dir)
    print('Dir {} created'.format(new_dir))
else:
    print('Dir {} exists'.format(new_dir))
```

Dir /tmp/test3456 created

```
[20]: # list all the files from a directory os.listdir(new_dir)
```

[20]: []

```
[21]: os.chdir(cwd) os.getcwd()
```

```
[21]: '/Users/christophemorisset/Google Drive/Pro/Python-MySQL/Notebooks/Notebooks'
```

```
[24]: # Renaming files in a directory
      cwd = os.getcwd()
      os.chdir('/tmp')
      for filename in os.listdir('./'):
          #print(filename)
          base_file, ext = os.path.splitext(filename)
          #print(base file, ext)
          if ext == '.txt':
              newname = base_file + '.exe'
              os.rename(filename, newname)
              print('file {0} renamed to {1}'.format(filename, newname))
      os.chdir(cwd)
```

file test.txt renamed to test.exe

1.0.3 glob

https://docs.python.org/2/library/glob.html

No tilde expansion is done, but *, ?, and character ranges expressed with [] will be correctly matched.

```
[22]: from glob import glob
[23]: ipynb_files = glob('*.ipynb')
      print(ipynb_files)
     ['Calling Fortran.ipynb', 'intro_Scipy.ipynb', 'Ex1_with_res.ipynb',
     'Parallel.ipynb', 'OOP.ipynb', 'Using_astropy.ipynb', 'Interact with
     files.ipynb', 'Useful_libraries.ipynb', 'intro_numpy.ipynb',
     'intro_Python.ipynb', 'Ex1_done.ipynb', 'Ex1.ipynb', 'intro_Matplotlib.ipynb',
     'Optimization.ipynb', 'Using_PyMySQL.ipynb']
     1.0.4 pathlib
```

```
[25]: from pathlib import Path
[44]: new_dir = Path('/tmp/test1234')
      print(new_dir)
      print(new_dir.name)
      print(new_dir.parent)
```

```
/tmp/test1234
test1234
/tmp
```

```
[45]: new_dir = Path('/tmp') / Path('test1234')
      print(new_dir)
      print(new_dir.name)
      print(new_dir.parent)
     /tmp/test1234
     test1234
     /tmp
[46]: if not new dir.exists():
          new dir.mkdir() # may use exist ok=True
          print('Dir {} created'.format(new dir))
      else:
          print('Dir {} exists'.format(new_dir))
     Dir /tmp/test1234 exists
[47]: current = Path('.')
      for f in current.glob('*.ipynb'):
          print(f, f.stem, f.suffix)
     Calling Fortran.ipynb Calling Fortran .ipynb
     intro_Scipy.ipynb intro_Scipy .ipynb
     Ex1_with_res.ipynb Ex1_with_res .ipynb
     Parallel.ipynb Parallel .ipynb
     OOP.ipynb OOP .ipynb
     Using_astropy.ipynb Using_astropy .ipynb
     Interact with files.ipynb Interact with files .ipynb
     Useful_libraries.ipynb Useful_libraries .ipynb
     intro_numpy.ipynb intro_numpy .ipynb
     intro_Python.ipynb intro_Python .ipynb
     Ex1_done.ipynb Ex1_done .ipynb
     Ex1.ipynb Ex1 .ipynb
     intro_Matplotlib.ipynb intro_Matplotlib .ipynb
     Optimization.ipynb Optimization .ipynb
     Using PyMySQL.ipynb Using PyMySQL .ipynb
[62]: new dir = Path('/tmp') / Path('test1234')
      for f in new_dir.glob('test*.txt*'):
          f.unlink()
      f = new_dir / Path('test1234.txt')
      f.touch()
      f = new_dir / Path('test5678.txt')
      f.touch()
      print(list(new_dir.glob('test*.txt*')))
      for f in new_dir.glob('test*.txt'):
```

```
new_f = f.with_suffix('.txt2')
if not new_f.exists():
    f.rename(new_f)
else:
    print('{} exists'.format(new_f))

print(list(new_dir.glob('test*.txt*')))
```

```
[PosixPath('/tmp/test1234/test5678.txt'),
PosixPath('/tmp/test1234/test1234.txt')]
[PosixPath('/tmp/test1234/test1234.txt2'),
PosixPath('/tmp/test1234/test5678.txt2')]
```

1.0.5 sys

https://docs.python.org/2/library/sys.html This module provides access to some variables used or maintained by the interpreter and to functions that interact strongly with the interpreter. It is always available.

The sys.argv list contains the arguments passed to the script, when the interpreter was started. The first item contains the name of the script itself.

```
[37]: %%writefile sys_text.py
import sys
for arg in sys.argv:
    print(arg)
```

Overwriting sys_text.py

```
[38]: !cat sys_text.py

import sys
for arg in sys.argv:
    print(arg)
```

```
[39]: yython sys_text.py tralala
```

```
sys_text.py
tralala
```

```
[40]: %%writefile fact.py
import sys
import numpy
print numpy.math.factorial(int(sys.argv[1]))
```

Overwriting fact.py

```
[41]: | python fact.py 6
```

A more complete management of the argument (especially those like -v) is available using the argparse library. https://docs.python.org/2/library/argparse.html

1.0.6 Talking to the OS subprocess

The os.popen method is deprecated, subprocess is prefered. A good tutorial is here: http://pymotw.com/2/subprocess/

[1]: import subprocess

[2]: ls -1

total 74656		
-rwxr-xr-x 1 christophemorisset staff	89353 Oct 26	2016
0040000_6.00_33_50_02_15.bin_0.1.gz*		
-rw 1 christophemorisset staff	85600 Jun 30	2017
0050000_6.00_33_50_02_15.bin_0.1.gz		
-rw 1 christophemorisset staff	86018 Jun 30	2017
0050000_7.00_33_50_02_15.bin_0.1.gz		
-rw 1 christophemorisset staff	86741 Jun 30	2017
0060000_6.00_33_50_02_15.bin_0.1.gz		
-rw 1 christophemorisset staff	88843 Jun 30	2017
0070000_6.00_33_50_02_15.bin_0.1.gz		
-rw 1 christophemorisset staff	89360 Jun 30	2017
0080000_6.00_33_50_02_15.bin_0.1.gz		
-rwxr-xr-x 1 christophemorisset staff	89971 Oct 26	2016
0090000_6.00_33_50_02_15.bin_0.1.gz*		
-rw 1 christophemorisset staff	89722 Jun 30	2017
0100000_5.00_33_50_02_15.bin_0.1.gz		
-rwxr-xr-x 1 christophemorisset staff	90544 Oct 26	2016
0100000_6.00_33_50_02_15.bin_0.1.gz*		
-rw 1 christophemorisset staff	91192 Jun 30	2017
0100000_7.00_33_50_02_15.bin_0.1.gz		
-rw 1 christophemorisset staff	91475 Jun 30	2017
0100000_8.00_33_50_02_15.bin_0.1.gz		
-rw 1 christophemorisset staff	90430 Jun 30	2017
0110000_6.00_33_50_02_15.bin_0.1.gz		
-rw 1 christophemorisset staff	90960 Jun 30	2017
0110000_7.00_33_50_02_15.bin_0.1.gz		
-rw 1 christophemorisset staff	89525 Jun 30	2017
0120000_6.00_33_50_02_15.bin_0.1.gz		
-rw 1 christophemorisset staff	89899 Jun 30	2017
0130000_6.00_33_50_02_15.bin_0.1.gz		
-rwxr-xr-x 1 christophemorisset staff	89170 Oct 26	2016
0140000_6.00_33_50_02_15.bin_0.1.gz*		
-rw 1 christophemorisset staff	89263 Jun 30	2017
0150000_6.00_33_50_02_15.bin_0.1.gz		

```
-rw----- 1 christophemorisset staff
                                         88929 Jun 30
                                                       2017
0160000_6.00_33_50_02_15.bin_0.1.gz
-rw----- 1 christophemorisset staff
                                         88991 Jun 30
                                                       2017
0170000_6.00_33_50_02_15.bin_0.1.gz
-rw----- 1 christophemorisset staff
                                         88780 Jun 30
                                                       2017
0180000_6.00_33_50_02_15.bin_0.1.gz
-rw----- 1 christophemorisset staff
                                         89075 Jun 30
                                                      2017
0180000_7.00_33_50_02_15.bin_0.1.gz
-rwxr-xr-x 1 christophemorisset staff
                                         88591 Oct 26
                                                       2016
0190000_6.00_33_50_02_15.bin_0.1.gz*
-rwxr-xr-x 1 christophemorisset staff
                                        466800 Sep 18
                                                       2015
BPT1.pdf*
                                         45181 Sep 18
-rwxr-xr-x 1 christophemorisset staff
                                                       2015
BPT1.png*
-rwxr-xr-x 1 christophemorisset
                                staff 4229587 Sep 9
                                                       2015
CALIFA_ah7.dat.gz*
-rwxr-xr-x 1 christophemorisset
                                staff
                                         19376 Nov 9
                                                       2016 Calling
Fortran.ipynb*
-rwxr-xr-x 1 christophemorisset
                                staff
                                         86815 Jun 1
                                                       2016 Calling
Fortran.pdf*
-rw----- 1 christophemorisset
                                staff
                                           226 Jun 28
                                                       2017 Demo.pickle
-rw----- 1 christophemorisset
                                           198 Jun 29
                                                       2017 Demo.pklz
                                staff
-rwxr-xr-x 1 christophemorisset staff 2220144 Aug 31
                                                       2016
Demo2.pickle*
-rwxr-xr-x 1 christophemorisset staff
                                       2220109 Aug 31
                                                       2016
Demo3.pickle*
-rwxr-xr-x 1 christophemorisset staff
                                          7717 Sep 9
                                                       2015
Ex1.ipynb*
-rwxr-xr-x 1 christophemorisset
                                staff
                                        381664 Sep 22
                                                       2015
Ex1_done.ipynb*
-rwxr-xr-x 1 christophemorisset
                                 staff
                                        315341 Sep 14
                                                       2015
Ex1_with_res.ipynb*
-rwxr-xr-x@ 1 christophemorisset
                                        352680 Oct 16
                                                       2015
                                staff
Fig1.eps*
-rw----- 1 christophemorisset
                                staff
                                        127137 Jun 29
                                                       2017 Fig1.pdf
-rwxr-xr-x0 1 christophemorisset
                                staff
                                        838576 Aug 17
                                                       2016
InstallPython.key*
-rw----- 1 christophemorisset
                                          2113 Jun 30 2017 Interact with
                                 staff
files.aux
                                        519777 Jun 30 2017 Interact with
-rw----- 1 christophemorisset staff
files.ipynb
                                         50000 Jun 30 2017 Interact with
-rw----- 1 christophemorisset staff
files.log
-rw----- 1 christophemorisset staff
                                          1006 Jun 30 2017 Interact with
files.out
-rw----- 1 christophemorisset staff
                                        388118 Jun 30 2017 Interact with
```

```
files.pdf
-rw----- 1 christophemorisset staff
                                        101747 Jun 30 2017 Interact with
files.tex
drwxr-xr-x 6 christophemorisset staff
                                           204 Jun 30 2017 Interact with
files_files/
-rwxr-xr-x 1 christophemorisset
                                         131497 Aug 12
                                 staff
Intro_1.odp*
-rw----- 1 christophemorisset
                                         174202 Aug 12
                                                       2015 Intro_1.pdf
                                 staff
                                         130234 Aug 12
-rwxr-xr-x 1 christophemorisset
                                 staff
                                                       2015
Intro_2014.odp*
-rw-r--r-- 1 christophemorisset
                                         110524 Nov 22
                                                       2017 MySQL.pdf
                                 staff
-rwxr-xr-x 1 christophemorisset
                                 staff
                                        1270918 Sep 21
                                                       2015
MySQL.pdf.gz*
-rw----- 1 christophemorisset
                                        707465 Jun 30
                                staff
                                                       2017 OOP.ipynb
-rw----- 1 christophemorisset
                                 staff
                                         568413 Jun 30
                                                       2017 OOP.pdf
-rw----- 1 christophemorisset
                                         849205 Jun 30
                                                       2017 Optimization.ipynb
                                 staff
-rwxr-xr-x 1 christophemorisset staff
                                         481656 Jun 5
                                                       2016
Optimization.pdf*
-rwxr-xr-x 1 christophemorisset staff
                                           2537 Nov 9 2016
Parallel.ipynb*
-rw----- 1 christophemorisset
                                 staff
                                           4252 Nov 23 2016 Tarea1.py
-rw----- 1 christophemorisset
                                 staff
                                         57614 Oct 3 18:08
Useful_libraries.ipynb
-rw----- 1 christophemorisset
                                         129908 Jun 30
                                 staff
                                                       2017
Useful_libraries.pdf
-rwxr-xr-x 1 christophemorisset
                                         262324 Nov 22
                                 staff
                                                       2017
Using_PyMySQL.ipynb*
-rw-r--r-@ 1 christophemorisset
                                 staff
                                         221936 Nov 16
                                                       2016 Using_PyMySQL.pdf
-rw----- 1 christophemorisset
                                 staff
                                         161715 Oct 19
                                                       2017
Using astropy.ipynb
-rw----- 1 christophemorisset
                                         206058 Jun 30
                                                       2017 Using_astropy.pdf
                                 staff
drwxr-xr-x 3 christophemorisset
                                            102 Jun 29
                                                       2017
                                 staff
__pycache__/
                                            64 Aug 31
-rwxr-xr-x 1 christophemorisset
                                 staff
                                                       2016
data1.dat*
                                            14 Aug 31
-rwxr-xr-x 1 christophemorisset
                                 staff
                                                       2016
data10.dat*
-rwxr-xr-x 1 christophemorisset
                                            32 Aug 31
                                 staff
                                                       2016
data11.dat*
-rwxr-xr-x 1 christophemorisset
                                            64 Sep 22
                                                       2016
                                 staff
data14.dat*
-rwxr-xr-x 1 christophemorisset
                                           147 Aug 31
                                staff
                                                       2016
data2.dat*
-rwxr-xr-x 1 christophemorisset staff
                                            169 Aug 31
                                                       2016
data3.dat*
-rwxr-xr-x 1 christophemorisset staff
                                           1189 Sep 28
                                                       2016
data4.dat*
```

```
1185 Jun 28
                                                        2017 data5.dat
-rw----- 1 christophemorisset
                                 staff
-rwxr-xr-x 1 christophemorisset
                                 staff
                                            1186 Oct 18
                                                        2017
data6.dat*
-rwxr-xr-x 1 christophemorisset
                                             136 Sep 14
                                 staff
                                                        2015
data ex1.dat*
-rwxr-xr-x 1 christophemorisset
                                  staff
                                            298 Nov
                                                     9
                                                        2016
dcumsum.f*
-rwxr-xr-x 1 christophemorisset
                                 staff
                                          30716 Nov 9
                                                        2016
dcumsum.so*
-rw----- 1 christophemorisset
                                 staff
                                            1379 Jun 15
                                                        2017 ex1.html
-rw----- 1 christophemorisset
                                  staff
                                             154 Jun 1
                                                        2016 ex1.py
                                            288 Jun 29
-rw----- 1 christophemorisset
                                  staff
                                                        2017 ex1.pyc
-rwxr-xr-x 1 christophemorisset
                                 staff
                                               8 Sep 18
                                                        2014
ex1.txt*
-rwxr-xr-x 1 christophemorisset
                                 staff
                                             69 Oct 4
                                                        2017
fact.py*
-rwxr-xr-x 1 christophemorisset
                                            4214 May 31
                                 staff
                                                        2016
grep.py*
-rwxr-xr-x 1 christophemorisset
                                            4995 Nov 10
                                                        2015
                                 staff
grep2.py*
-rwxr-xr-x 1 christophemorisset
                                 staff
                                            6319 Nov 10
                                                        2015
grep3.py*
-rw----- 1 christophemorisset
                                 staff
                                            5575 Dec
                                                     9
                                                        2016 grep3.pyc
-rwxr-xr-x 1 christophemorisset
                                  staff
                                              49 Oct
                                                     8
                                                        2014
hello.py*
                                                        2014
-rwxr-xr-x 1 christophemorisset
                                 staff
                                            1090 Oct
                                                    8
hellofortran.c*
-rwxr-xr-x 1 christophemorisset
                                 staff
                                             178 Oct
                                                     8
                                                        2014
hellofortran.f*
-rwxr-xr-x 1 christophemorisset
                                                        2014
                                 staff
                                          33976 Oct
                                                     8
hellofortran.so*
-rwxr-xr-x 1 christophemorisset
                                             150 Feb 3
                                                        2016
                                 staff
index.html*
-rw----- 1 christophemorisset
                                        2479460 Jun 30
                                                        2017
                                 staff
intro Matplotlib.ipynb
-rw----- 1 christophemorisset
                                 staff
                                         1643810 Jun 30
                                                        2017
intro_Matplotlib.pdf
-rwxr-xr-x 1 christophemorisset
                                          326924 Aug 28
                                 staff
                                                        2014
intro_Python.html*
-rw----- 1 christophemorisset
                                 staff
                                          77673 Jun 30
                                                        2017 intro_Python.ipynb
                                          143102 Jun 30
-rw----- 1 christophemorisset
                                                        2017 intro_Python.pdf
                                 staff
-rwxr-xr-x 1 christophemorisset
                                          179449 Aug 28
                                                        2014
                                  staff
intro_Python_2.pdf*
-rwxr-xr-x 1 christophemorisset
                                 staff
                                          103229 Aug 28
                                                        2014
intro_Python_3.pdf*
-rw----- 1 christophemorisset
                                 staff
                                          759052 Oct 3 17:31 intro_Scipy.ipynb
-rw----- 1 christophemorisset
                                  staff
                                          570062 Jun 30
                                                        2017 intro_Scipy.pdf
-rw----- 1 christophemorisset
                                  staff
                                          93510 Jun 30
                                                        2017 intro_numpy.ipynb
```

```
-rw----- 1 christophemorisset staff
                                             148857 Jun 30 2017 intro_numpy.pdf
    -rwxr-xr-x 1 christophemorisset staff 8830080 Sep 3
                                                            2014
    n10017o.fits*
    -rwxr-xr-x 1 christophemorisset staff
                                                5760 Aug 31
                                                            2016
    new.fits*
    -rwxr-xr-x 1 christophemorisset
                                     staff
                                              435801 Jun 1
                                                            2016
    query res.dat*
    -rwxr-xr-x 1 christophemorisset staff
                                            1059840 Sep 3
                                                            2014
    swp04345.mxhi*
    -rw----- 1 christophemorisset
                                     staff
                                                  47 Oct 4
                                                            2017 sys_text.py
    -rwxr-xr-x 1 christophemorisset
                                                353 Oct 18
                                                            2017
                                      staff
    tab1.dat*
    -rw----- 1 christophemorisset
                                                668 Jun 30
                                                            2017 tab_cds1.ascii
                                     staff
    -rwxr-xr-x 1 christophemorisset
                                               43200 Sep 25
                                     staff
                                                            2014
    tab_cds1.fits*
    -rw----- 1 christophemorisset
                                                1350 Jun 30
                                                            2017 tab_cds1.tex
                                     staff
    -rw----- 1 christophemorisset
                                     staff
                                                1826 Jun 30
                                                            2017 tab_cds2.ascii
    -rwxr-xr-x 1 christophemorisset staff
                                               7033 Nov 2
                                                            2015
    test1.pdf*
    -rwxr-xr-x 1 christophemorisset
                                                  72 Sep 27
                                     staff
                                                            2015
    test1.test*
    -rwxr-xr-x 1 christophemorisset
                                     staff
                                                  45 Sep 27
                                                            2015
    test2.test*
    -rwxr-xr-x 1 christophemorisset
                                              176673 Oct 16
                                                            2014
                                     staff
    test_1-po*
    -rwxr-xr-x@ 1 christophemorisset
                                              561026 Oct 26
                                                            2016
                                     staff
    test_1-prof.png*
    -rw----- 1 christophemorisset
                                     staff
                                                   0 Oct 4
                                                            2017 test_13_prof.py
    -rwxr-xr-x 1 christophemorisset
                                     staff
                                              353203 Oct 26
                                                            2016
    test_1_prof.prof*
    -rwxr-xr-x 1 christophemorisset
                                                6805 Oct 26
                                                            2016
                                      staff
    test_1_prof.py*
    -rwxr-xr-x 1 christophemorisset
                                     staff
                                                6833 Oct 26
                                                            2016
    test_2_prof.py*
    -rwxr-xr-x 1 christophemorisset
                                                580 Oct 26
                                                            2016
                                     staff
    test_2_prof.py.lprof*
    -rwxr-xr-x 1 christophemorisset
                                     staff
                                                6579 Oct 26
                                                            2016
    test_3_prof.py*
    -rwxr-xr-x 1 christophemorisset
                                     staff
                                                6524 Oct 26
                                                            2016
    test_5_pdb.py*
    -rwxr-xr-x 1 christophemorisset
                                                6444 Oct 26
                                                            2016
                                     staff
    test_6_pdb.py*
    drwxr-xr-x0 5 christophemorisset staff
                                                            2016 tt/
                                                170 Nov 15
[3]: subprocess.call(['ls -l'], shell=True)
     # The results is not visible in Notebook. In command line, the files are listed
```

[3]: 0

[5]: output = subprocess.check_output(['ls', '-l']) print(type(output)) print(output.decode()) <class 'bytes'> total 74656 -rwxr-xr-x 1 christophemorisset staff 89353 Oct 26 2016 0040000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 85600 Jun 30 2017 0050000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 86018 Jun 30 2017 0050000_7.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 86741 Jun 30 2017 0060000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 88843 Jun 30 2017 0070000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 89360 Jun 30 2017 0080000_6.00_33_50_02_15.bin_0.1.gz -rwxr-xr-x 1 christophemorisset staff 89971 Oct 26 2016 0090000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 89722 Jun 30 2017 0100000_5.00_33_50_02_15.bin_0.1.gz -rwxr-xr-x 1 christophemorisset staff 90544 Oct 26 2016 0100000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 91192 Jun 30 2017 0100000_7.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 91475 Jun 30 2017 0100000_8.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 90430 Jun 30 2017 0110000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 90960 Jun 30 2017 0110000_7.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 89525 Jun 30 2017 0120000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 89899 Jun 30 2017 0130000_6.00_33_50_02_15.bin_0.1.gz -rwxr-xr-x 1 christophemorisset staff 89170 Oct 26 2016 0140000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 89263 Jun 30 2017 0150000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 88929 Jun 30 2017 0160000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff 88991 Jun 30 2017

0170000_6.00_33_50_02_15.bin_0.1.gz -rw----- 1 christophemorisset staff

88780 Jun 30

2017

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0180000_6.00_33_50_02_15.bin_0.1.gz
-rw----- 1 christophemorisset staff
                                          89075 Jun 30
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0180000_7.00_33_50_02_15.bin_0.1.gz
-rwxr-xr-x 1 christophemorisset staff
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-rwxr-xr-x 1 christophemorisset staff
                                         466800 Sep 18
                                                        2015 BPT1.pdf
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-rwxr-xr-x 1 christophemorisset
                                 staff
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-rwxr-xr-x 1 christophemorisset
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                                          19376 Nov 9
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-rwxr-xr-x 1 christophemorisset
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-rw----- 1 christophemorisset
                                            226 Jun 28
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                                        2220144 Aug 31
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                                         127137 Jun 29
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-rw-----
           1 christophemorisset
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                                          50000 Jun 30
                                                        2017 Interact with
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-rw-----
          1 christophemorisset
                                           1006 Jun 30
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                                         388118 Jun 30
-rw-----
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-rw----- 1 christophemorisset
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files.tex
drwxr-xr-x 6 christophemorisset
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-rwxr-xr-x 1 christophemorisset
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-rw----- 1 christophemorisset
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-rw----- 1 christophemorisset
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                                         568413 Jun 30
-rw----- 1 christophemorisset
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                                         481656 Jun 5
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-rwxr-xr-x 1 christophemorisset
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-rw----- 1 christophemorisset
                                 staff
                                           4252 Nov 23
                                                        2016 Tarea1.py
-rw----- 1 christophemorisset
                                          57672 Oct 17 16:19
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```

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Useful_libraries.ipynb
-rw----- 1 christophemorisset
                                  staff
                                          129908 Jun 30
                                                         2017
Useful_libraries.pdf
-rwxr-xr-x 1 christophemorisset
                                          262324 Nov 22
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                                  staff
Using PyMySQL.ipynb
-rw-r--r-0 1 christophemorisset
                                  staff
                                          221936 Nov 16
                                                         2016 Using_PyMySQL.pdf
-rw----- 1 christophemorisset
                                  staff
                                          161715 Oct 19
Using_astropy.ipynb
-rw----- 1 christophemorisset
                                  staff
                                          206058 Jun 30
                                                         2017 Using_astropy.pdf
drwxr-xr-x 3 christophemorisset
                                  staff
                                             102 Jun 29
                                                         2017 __pycache__
-rwxr-xr-x 1 christophemorisset
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                                  staff
                                              64 Aug 31
-rwxr-xr-x 1 christophemorisset
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                                              14 Aug 31
                                                         2016 data10.dat
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                                  staff
                                              32 Aug 31
                                                         2016 data11.dat
-rwxr-xr-x 1 christophemorisset
                                  staff
                                              64 Sep 22
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-rwxr-xr-x 1 christophemorisset
                                  staff
                                             147 Aug 31
                                                         2016 data2.dat
-rwxr-xr-x 1 christophemorisset
                                  staff
                                             169 Aug 31
                                                         2016 data3.dat
-rwxr-xr-x 1 christophemorisset
                                  staff
                                            1189 Sep 28
                                                         2016 data4.dat
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-rw----- 1 christophemorisset
                                  staff
                                            1185 Jun 28
-rwxr-xr-x 1 christophemorisset
                                            1186 Oct 18
                                                         2017 data6.dat
                                  staff
-rwxr-xr-x 1 christophemorisset
                                             136 Sep 14
                                                         2015 data ex1.dat
                                  staff
-rwxr-xr-x 1 christophemorisset
                                  staff
                                             298 Nov
                                                         2016 dcumsum.f
-rwxr-xr-x 1 christophemorisset
                                  staff
                                           30716 Nov 9
                                                         2016 dcumsum.so
-rw----- 1 christophemorisset
                                  staff
                                            1379 Jun 15
                                                         2017 ex1.html
-rw----- 1 christophemorisset
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-rw----- 1 christophemorisset
                                             288 Jun 29
                                  staff
                                                         2017 ex1.pyc
-rwxr-xr-x 1 christophemorisset
                                               8 Sep 18
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                                  staff
-rwxr-xr-x 1 christophemorisset
                                              69 Oct 4
                                                         2017 fact.py
                                  staff
-rwxr-xr-x 1 christophemorisset
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                                            4214 May 31
                                                         2016 grep.py
-rwxr-xr-x 1 christophemorisset
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-rwxr-xr-x 1 christophemorisset
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                                                         2015 grep3.py
                                  staff
-rw----- 1 christophemorisset
                                  staff
                                            5575 Dec 9
                                                         2016 grep3.pyc
                                                         2014 hello.py
-rwxr-xr-x 1 christophemorisset
                                              49 Oct 8
                                  staff
-rwxr-xr-x 1 christophemorisset
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-rwxr-xr-x 1 christophemorisset
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                                             178 Oct
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-rwxr-xr-x 1 christophemorisset
                                  staff
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-rwxr-xr-x 1 christophemorisset
                                  staff
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-rw-----
            1 christophemorisset
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                                         2479460 Jun 30
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intro_Matplotlib.ipynb
-rw----- 1 christophemorisset
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                                         1643810 Jun 30
intro_Matplotlib.pdf
                                          326924 Aug 28
-rwxr-xr-x 1 christophemorisset
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-rw----- 1 christophemorisset
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                                           77673 Jun 30
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-rw----- 1 christophemorisset
                                          143102 Jun 30
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-rwxr-xr-x 1 christophemorisset
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-rw----- 1 christophemorisset
                                  staff
                                          759052 Oct
-rw-----
            1 christophemorisset
                                  staff
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                                                         2017 intro_Scipy.pdf
-rw----- 1 christophemorisset
                                                         2017 intro_numpy.ipynb
                                  staff
                                           93510 Jun 30
```

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staff
    -rw----- 1 christophemorisset
                                             148857 Jun 30
                                                           2017 intro_numpy.pdf
    -rwxr-xr-x 1 christophemorisset
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                                     staff
    -rwxr-xr-x 1 christophemorisset
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    -rwxr-xr-x 1 christophemorisset staff
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    -rwxr-xr-x 1 christophemorisset staff 1059840 Sep 3
                                                            2014 swp04345.mxhi
    -rw----- 1 christophemorisset staff
                                                            2017 sys text.py
                                                 47 Oct 4
    -rwxr-xr-x 1 christophemorisset staff
                                                353 Oct 18
                                                           2017 tab1.dat
    -rw----- 1 christophemorisset staff
                                                668 Jun 30
                                                           2017 tab cds1.ascii
    -rwxr-xr-x 1 christophemorisset staff
                                              43200 Sep 25
                                                           2014 tab cds1.fits
    -rw----- 1 christophemorisset staff
                                               1350 Jun 30
                                                            2017 tab_cds1.tex
    -rw----- 1 christophemorisset staff
                                               1826 Jun 30
                                                            2017 tab_cds2.ascii
    -rwxr-xr-x 1 christophemorisset
                                               7033 Nov 2
                                                           2015 test1.pdf
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    -rwxr-xr-x 1 christophemorisset
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    -rw----- 1 christophemorisset
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    -rwxr-xr-x 1 christophemorisset
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                                                            2016 test_1_prof.prof
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    -rwxr-xr-x 1 christophemorisset
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    -rwxr-xr-x 1 christophemorisset
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                                                            2016 test_6_pdb.py
                                                           2016 tt
    drwxr-xr-x@ 5 christophemorisset
                                     staff
                                                170 Nov 15
[6]: command = 'ls -l'
    popen = subprocess.Popen(command, shell=True)
     # The same apply here, no output in Notebook
    print(popen)
    <subprocess.Popen object at 0x103a5d2e8>
[7]: popen = subprocess.Popen(command, stdout=subprocess.PIPE, shell=True)
    res = popen.communicate()[0]
    print(type(res))
    print(res.decode())
    <class 'bytes'>
    total 74656
    -rwxr-xr-x 1 christophemorisset staff
                                              89353 Oct 26
                                                            2016
    0040000_6.00_33_50_02_15.bin_0.1.gz
    -rw----- 1 christophemorisset staff
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                                                            2017
    0050000_6.00_33_50_02_15.bin_0.1.gz
    -rw----- 1 christophemorisset staff
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    0050000_7.00_33_50_02_15.bin_0.1.gz
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86741 Jun 30
-rw----- 1 christophemorisset staff
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0060000_6.00_33_50_02_15.bin_0.1.gz
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-rw----- 1 christophemorisset staff
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0070000_6.00_33_50_02_15.bin_0.1.gz
-rw----- 1 christophemorisset staff
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0080000_6.00_33_50_02_15.bin_0.1.gz
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0170000_6.00_33_50_02_15.bin_0.1.gz
-rw----- 1 christophemorisset staff
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0180000_6.00_33_50_02_15.bin_0.1.gz
-rw----- 1 christophemorisset staff
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                                         381664 Sep 22
-rwxr-xr-x 1 christophemorisset
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-rwxr-xr-x0 1 christophemorisset
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-rwxr-xr-x0 1 christophemorisset
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                                           1006 Jun 30
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-rw----- 1 christophemorisset
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-rwxr-xr-x 1 christophemorisset
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-rw----- 1 christophemorisset
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Useful_libraries.pdf
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Using_PyMySQL.ipynb
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Using_astropy.ipynb
-rw----- 1 christophemorisset
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drwxr-xr-x 3 christophemorisset
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                                                       2016 data14.dat
-rwxr-xr-x 1 christophemorisset
                                            147 Aug 31
                                 staff
                                                       2016 data2.dat
```

```
-rwxr-xr-x 1 christophemorisset
                                  staff
                                             169 Aug 31
                                                          2016 data3.dat
-rwxr-xr-x 1 christophemorisset
                                  staff
                                             1189 Sep 28
                                                          2016 data4.dat
-rw-----
            1 christophemorisset
                                  staff
                                             1185 Jun 28
                                                          2017 data5.dat
-rwxr-xr-x 1 christophemorisset
                                  staff
                                             1186 Oct 18
                                                          2017 data6.dat
-rwxr-xr-x 1 christophemorisset
                                  staff
                                              136 Sep 14
                                                          2015 data ex1.dat
-rwxr-xr-x 1 christophemorisset
                                  staff
                                              298 Nov
                                                          2016 dcumsum.f
-rwxr-xr-x 1 christophemorisset
                                  staff
                                           30716 Nov
                                                          2016 dcumsum.so
-rw----- 1 christophemorisset
                                  staff
                                             1379 Jun 15
                                                          2017 ex1.html
            1 christophemorisset
                                  staff
                                             154 Jun
                                                      1
                                                          2016 ex1.py
-rw-----
                                             288 Jun 29
-rw----- 1 christophemorisset
                                  staff
                                                          2017 ex1.pyc
-rwxr-xr-x 1 christophemorisset
                                  staff
                                               8 Sep 18
                                                          2014 ex1.txt
-rwxr-xr-x 1 christophemorisset
                                  staff
                                               69 Oct
                                                          2017 fact.py
-rwxr-xr-x 1 christophemorisset
                                  staff
                                             4214 May 31
                                                          2016 grep.py
-rwxr-xr-x 1 christophemorisset
                                  staff
                                             4995 Nov 10
                                                          2015 grep2.py
-rwxr-xr-x 1 christophemorisset
                                  staff
                                             6319 Nov 10
                                                          2015 grep3.py
-rw----- 1 christophemorisset
                                  staff
                                             5575 Dec
                                                          2016 grep3.pyc
-rwxr-xr-x 1 christophemorisset
                                  staff
                                               49 Oct
                                                       8
                                                          2014 hello.py
                                                          2014 hellofortran.c
-rwxr-xr-x 1 christophemorisset
                                  staff
                                             1090 Oct
                                                       8
-rwxr-xr-x 1 christophemorisset
                                                          2014 hellofortran.f
                                  staff
                                              178 Oct
-rwxr-xr-x 1 christophemorisset
                                           33976 Oct
                                                          2014 hellofortran.so
                                  staff
                                                       8
            1 christophemorisset
                                  staff
                                              150 Feb
                                                          2016 index.html
            1 christophemorisset
                                  staff
                                         2479460 Jun 30
                                                          2017
intro_Matplotlib.ipynb
-rw----
                                         1643810 Jun 30
            1 christophemorisset
                                  staff
                                                          2017
intro_Matplotlib.pdf
-rwxr-xr-x 1 christophemorisset
                                                          2014 intro_Python.html
                                  staff
                                          326924 Aug 28
            1 christophemorisset
                                  staff
                                           77673 Jun 30
                                                          2017 intro_Python.ipynb
-rw-----
-rw----- 1 christophemorisset
                                  staff
                                          143102 Jun 30
                                                          2017 intro_Python.pdf
-rwxr-xr-x 1 christophemorisset
                                  staff
                                           179449 Aug 28
                                                          2014 intro_Python_2.pdf
-rwxr-xr-x 1 christophemorisset
                                          103229 Aug 28
                                                          2014 intro_Python_3.pdf
                                  staff
-rw-----
          1 christophemorisset
                                  staff
                                          759052 Oct
                                                       3 17:31 intro_Scipy.ipynb
-rw----- 1 christophemorisset
                                          570062 Jun 30
                                                          2017 intro_Scipy.pdf
                                  staff
-rw-----
            1 christophemorisset
                                  staff
                                           93510 Jun 30
                                                          2017 intro_numpy.ipynb
-rw-----
            1 christophemorisset
                                  staff
                                          148857 Jun 30
                                                          2017 intro_numpy.pdf
-rwxr-xr-x 1 christophemorisset
                                                          2014 n10017o.fits
                                  staff
                                         8830080 Sep
-rwxr-xr-x
            1 christophemorisset
                                  staff
                                             5760 Aug 31
                                                          2016 new.fits
-rwxr-xr-x 1 christophemorisset
                                  staff
                                           435801 Jun
                                                          2016 query res.dat
-rwxr-xr-x 1 christophemorisset
                                                          2014 swp04345.mxhi
                                  staff
                                         1059840 Sep
-rw-----
            1 christophemorisset
                                  staff
                                              47 Oct
                                                      4
                                                          2017 sys_text.py
-rwxr-xr-x 1 christophemorisset
                                  staff
                                             353 Oct 18
                                                          2017 tab1.dat
-rw-----
            1 christophemorisset
                                  staff
                                             668 Jun 30
                                                          2017 tab_cds1.ascii
-rwxr-xr-x 1 christophemorisset
                                  staff
                                           43200 Sep 25
                                                          2014 tab_cds1.fits
-rw-----
            1 christophemorisset
                                  staff
                                             1350 Jun 30
                                                          2017 tab_cds1.tex
-rw-----
            1 christophemorisset
                                  staff
                                             1826 Jun 30
                                                          2017 tab_cds2.ascii
-rwxr-xr-x 1 christophemorisset
                                             7033 Nov
                                                          2015 test1.pdf
                                  staff
           1 christophemorisset
                                  staff
                                              72 Sep 27
                                                          2015 test1.test
-rwxr-xr-x
            1 christophemorisset
                                  staff
                                               45 Sep 27
                                                          2015 test2.test
-rwxr-xr-x
-rwxr-xr-x 1 christophemorisset
                                  staff
                                           176673 Oct 16
                                                          2014 test_1-po
```

```
-rwxr-xr-x@ 1 christophemorisset staff
                                             561026 Oct 26 2016 test_1-prof.png
    -rw----- 1 christophemorisset staff
                                                  0 Oct 4 2017 test_13_prof.py
    -rwxr-xr-x 1 christophemorisset staff
                                             353203 Oct 26 2016 test_1_prof.prof
    -rwxr-xr-x 1 christophemorisset staff
                                               6805 Oct 26 2016 test_1_prof.py
    -rwxr-xr-x 1 christophemorisset staff
                                               6833 Oct 26 2016 test 2 prof.py
    -rwxr-xr-x 1 christophemorisset staff
                                                580 Oct 26 2016
    test_2_prof.py.lprof
    -rwxr-xr-x 1 christophemorisset staff
                                               6579 Oct 26 2016 test_3_prof.py
    -rwxr-xr-x 1 christophemorisset staff
                                               6524 Oct 26 2016 test_5_pdb.py
    -rwxr-xr-x 1 christophemorisset staff
                                               6444 Oct 26 2016 test_6_pdb.py
    drwxr-xr-x0 5 christophemorisset staff
                                                170 Nov 15 2016 tt
[8]: popen = subprocess.Popen(command, stdout=subprocess.PIPE, shell=True)
    for line in iter(popen.stdout.readline, ""):
        lspl = line.split()
        if len(lspl)> 4:
            if int(lspl[4]) > 1000000:
                print(lspl[8])
    b'CALIFA_ah7.dat.gz'
    b'Demo2.pickle'
    b'Demo3.pickle'
    b'MySQL.pdf.gz'
    b'intro Matplotlib.ipynb'
    b'intro_Matplotlib.pdf'
    b'n10017o.fits'
    b'swp04345.mxhi'
           KeyboardInterrupt
                                                     Traceback (most recent call,
     →last)
            <ipython-input-8-2eb0e8604ca5> in <module>()
              1 popen = subprocess.Popen(command, stdout=subprocess.PIPE, shell=True)
              2 for line in iter(popen.stdout.readline, ""):
                   lspl = line.split()
        ---> 3
              4
                   if len(lspl)> 4:
                       if int(lspl[4]) > 1000000:
```

KeyboardInterrupt:

1.0.7 re

The re module provides regular expression tools for advanced string processing. For complex matching and manipulation, regular expressions offer succinct, optimized solutions:

```
[1]: import re
      # Search the words starting with "f"
      re.findall(r'\bf[a-z]*', 'whifch foOt or hand fell fastest')
 [1]: ['fo', 'fell', 'fastest']
[32]: # Remove duplicate words
      re.sub(r'(b[a-z]+) \1', r'\1', 'cat in the the hat')
[32]: 'cat in the hat'
     More in https://docs.python.org/2/library/re.html
     1.0.8 urllib2
[34]: # from urllib2 import urlopen # python 2
      from urllib.request import urlopen
[35]: for line in urlopen('http://dev.on-rev.com/myip.irev'):
          print(line)
          if 'IP' in str(line):
              IP = str(line).split(':')[1][:-7]
      print('----')
      print(IP)
     b'<html>\n'
     b'<body>\n'
     b'\n'
     b'Remote IP Address:132.248.3.201
     b'</body>\n'
     b'</html>'
     -----
     132.248.3.201
```