CPSC 128 INTRODUCTION TO PROGRAMMING USING PYTHON

Sinan Bulut, Dr.

About me

Physics (Condensed Matter)

Research: Trent, Augsburg, YRC

Scientific Programming

Supercomputers (HPC): ICHEC & GSC

Teaching: Trent, ICHEC

Course Philosophy

1. fundamentals of computer science & programming
2. good programming:

- easy to read (commenting & documentation)
- easy to maintain & modify (version control, modular etc)
- efficient (python libs and data structures, algorithms etc)
- reliable (testing!)

Course Schedule

0. Course start-up.

Part I: Procedural programming

1. Introduction to computer science.

2. SIPO (sequence, input, processing and output) programming.

3. Selection control structures.

4. Repetition control structures.

Part II: Object-based programming

5. Aggregate data types 1: Lists and strings.

6. Functions.

7. Aggregate data types 2: Dictionaries.

8. Text files.

Part III: Object-oriented programming (OOP)

9. (OOP) 1: Encapsulation.

10. Object-oriented design (OOD).

11. (OOP) 2: Polymorphism and inheritance. Nov 24

??12. Unified modeling language (UML).

Final Examination (Open “book”)

- May 2 – June 27: 8.5 weeks
- 1.5 modules / week
- Assignments: 65%
- Final: 35%

What language?

Java

```
class myfirstjavaprog
{
        public static void main(String args[])
        {
           System.out.println("Hi!");
        }
}
```

VS

Python

```
print "Hi!"
```

C++

```
#include <iostream>
int main()
{
    std::cout << "Hi!\n";
}
```

Python

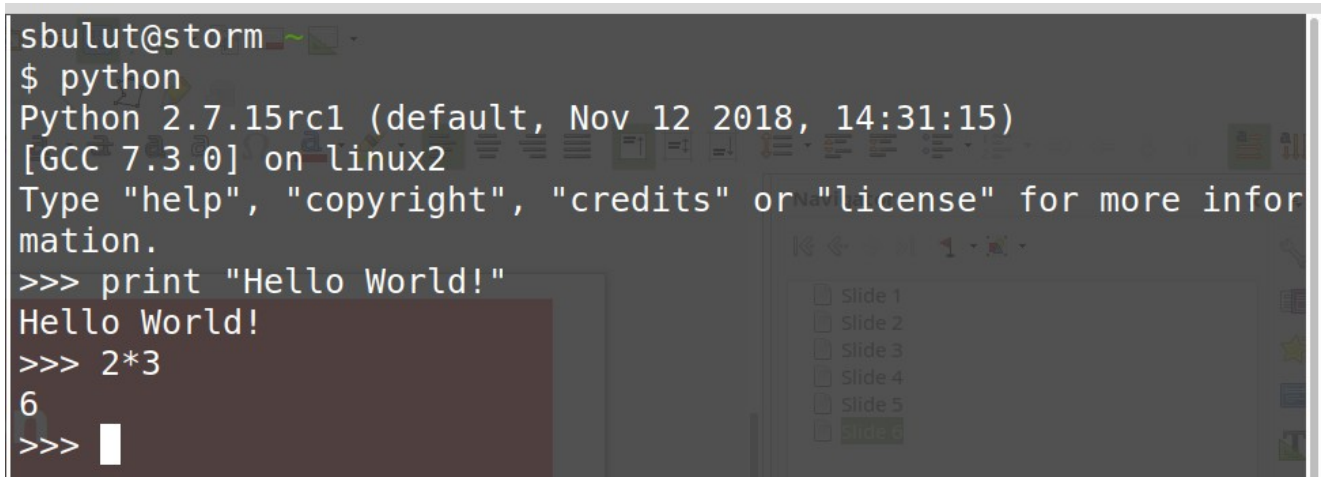
- simple to learn & code
- general & wide application
- high level (not assembly)
- portable (runs on all OSs)
- extensive support libraries

Disadvantages:

- interpreted & slow (like Matlab, Ruby etc) and high mem usage compared to C, Fortran, C++

Computing Setup: Python

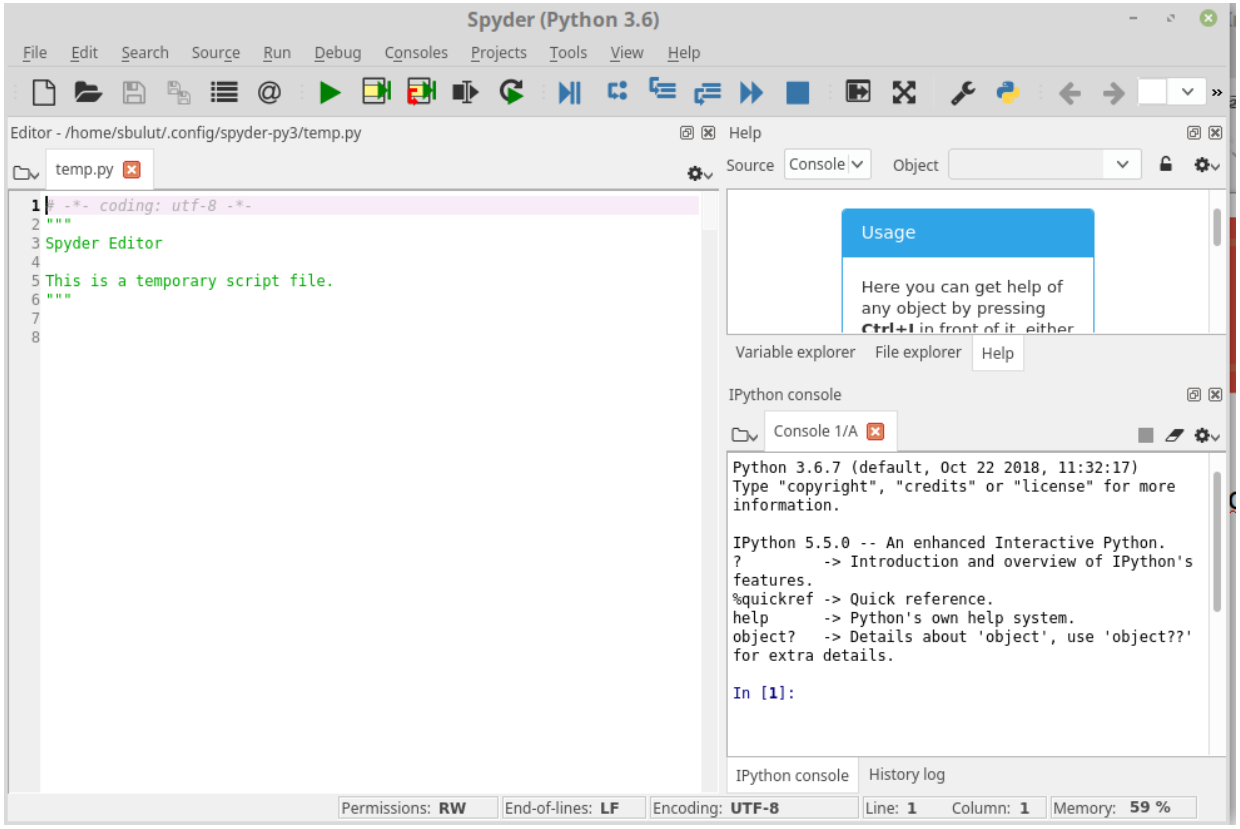
REPL (Read, execute, print, loop) interface (also IDLE)



- getting help: help()
- exiting: exit()
- Also: run a script from command line: python hello.py
(in python3, parenthesis are required for print)

Computing Setup: Python

Integrated Development environment (IDE): Spyder



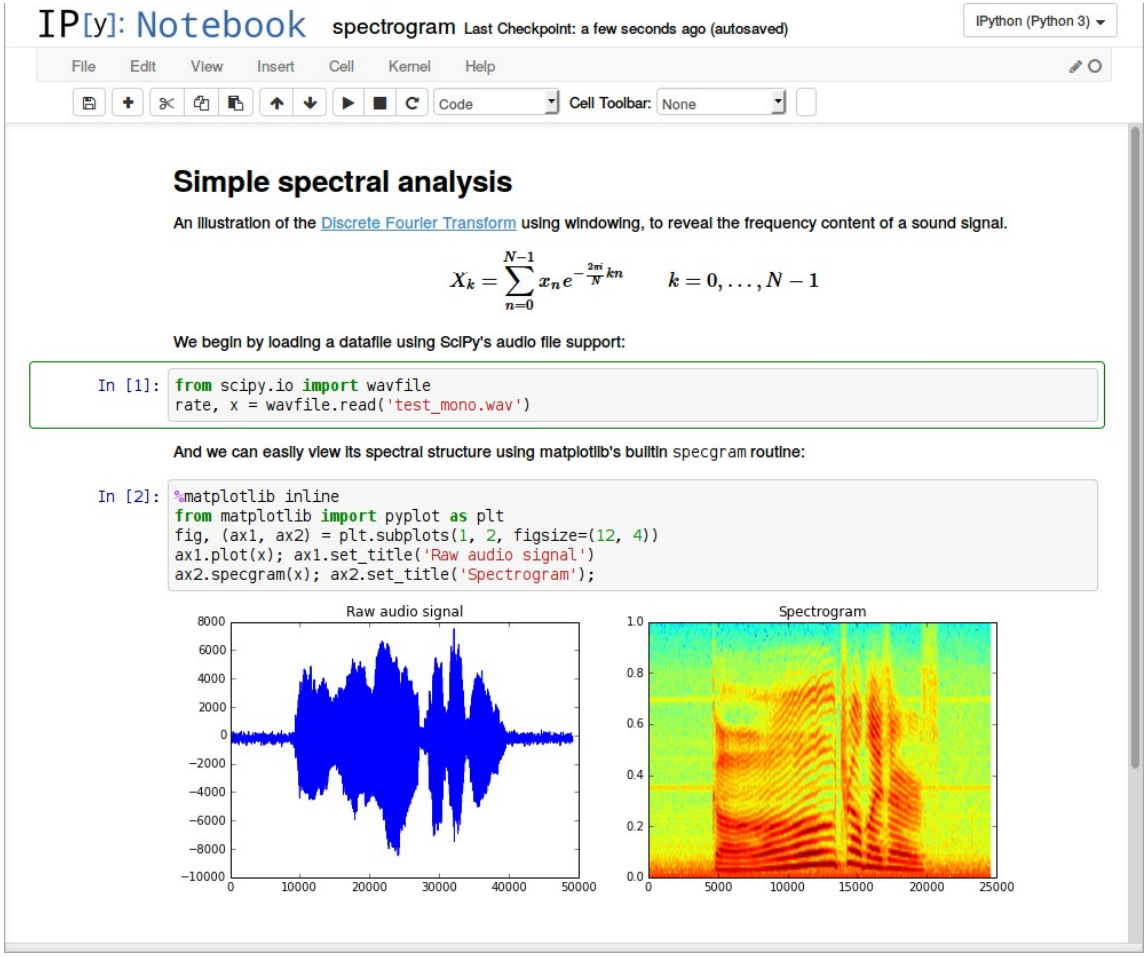
Computing Setup: Python

Jupyter Notebook: (optional)

...allows you to create and share documents that contain live code, equations, visualizations and narrative text.

https://jupyter.org/

jupyter



Computing Setup: Git

- **enables version control**
- **synchronize codes on multiple computers**
- **experiment with code without fear**
- **best practice for software development**

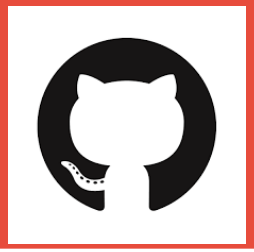
Basic steps:

- **“git init .” (create a local repo: do only once)**
- **“git add somefile”**
- **“git commit -m “corrected typo, etc” somefile**

Computing Setup: Git

```
File  Edit  View  Search  Terminal  Help
sbulut@storm ~/Downloads/test_repo
$ git init .
Initialized empty Git repository in /home/sbulut/Downlo
sbulut@storm ~/Downloads/test_repo
$ git config user.email "Sinan81@earth.com"
sbulut@storm ~/Downloads/test_repo
$ git config user.name "Sinan81"
sbulut@storm ~/Downloads/test_repo
$ echo "Hello World" > file.txt
sbulut@storm ~/Downloads/test_repo
$ git add file.txt
sbulut@storm ~/Downloads/test_repo
$ git commit -m 'created a dummy file' file.txt
[master (root-commit) 9f612c5] created a dummy file
 1 file changed, 1 insertion(+)
 create mode 100644 file.txt
sbulut@storm ~/Downloads/test_repo (master)
$
```

Computing Setup: Github



- remote git repos are commonly used by devs to collaborate
- synchronize files from computer lab to home
- it is free!
- (will use ‘issues’ section for discussions)

Steps:

- create account (use a simple passwd for now)
- create repo: “CPSC128”
- clone repo
- modify, commit changes, and push!

Computing Setup: Github

```
File  Edit  View  Search  Terminal  Help
sbulut@storm ~/Downloads
$ git clone https://github.com/Sinan81/cpsc128
Cloning into 'cpsc128'...
remote: Enumerating objects: 9, done.
remote: Counting objects: 100% (9/9), done.
remote: Compressing objects: 100% (5/5), done.
remote: Total 9 (delta 0), reused 6 (delta 0), pack-reused 0
Unpacking objects: 100% (9/9), done.
sbulut@storm ~/Downloads
$ cd cpsc128/
sbulut@storm ~/Downloads/cpsc128 (master)
$ git config user.email "Sinan81@earth.com"
sbulut@storm ~/Downloads/cpsc128 (master)
$ git config user.name "Sinan81"
sbulut@storm ~/Downloads/cpsc128 (master)
$ echo "Hello World!" > README.md
sbulut@storm ~/Downloads/cpsc128 (master)
$ git commit -m "a silly modification" README.md
[master f33217a] a silly modification
 1 file changed, 1 insertion(+), 2 deletions(-)
sbulut@storm ~/Downloads/cpsc128 (master)
$ git push
Username for 'https://github.com': Sinan81
Password for 'https://Sinan81@github.com':
Counting objects: 3, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (1/1), done.
Writing objects: 100% (3/3), 255 bytes | 255.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://github.com/Sinan81/cpsc128
   5af4346..f33217a  master -> master
sbulut@storm ~/Downloads/cpsc128 (master)
$
```

Questions?