Introduction to Scientific Programming, Data Analysis, and Visualization for Physicists

PHYS 2001
Spring 2020

Instructor Contact

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Meeting Time and Room

This course is a mixture of traditional face-2-face lectures plus online project-based activities. During the first phase of the course (usually first 2-3 weeks), we will meet at Room 303 during the regular class hours (Tue/Thu 12:30-1:45PM). During the 2nd phase (mini-projects), about a handful of mini-projects will be assigned every (or two weeks) week. Example scripts (or code snippets) will be provided relevant to each mini-project. You need to examine these example codes and figure out by yourself on how to do the mini-project.

All relevant course material should be accessible from eLC.

Course Description

A hands-on introduction to practical computer programming, data analysis, and data visualization for physics/astronomy majors. Students learn the fundamentals of developing, debugging, and running programs in Python or another similar high-level programming language in a server environment as well as in a personal computer. Students will be exposed to multiple example problems of particular importance to scientific programming and data visualization. No prior programming experience is assumed (but preferred).

Course Goals
Start using Python as your daily tool
Installation of Python on "my computer"
Exposure to the Python language
Basic data I/O in python (Pandas DataFrame)
Scientific calculations including best fit, regression, using numpy and scipy
Creation of publishable quality data visualization including a basic animation
At the end of the semester, students should feel easy to use python as a day-2-day tool for any calculation needs

Textbook

None.

Relevant reading material and programming examples (including python scripts) will be provided. The 1st reading assignment (not graded) is Python4Physicists.pdf. Finish reading this during the 1st week before we jump in programming lectures.

Prerequisite

If you are completely new to programming, you can read What is programming? to get an introduction. This will not be covered in the course.

Course Outline

- Set up the python environment on your computer (install anaconda, ipython, matplotlib, numpy, & scipy)
- Very basics of scientific programming
- Several fundamental python commands
- Some essential command-line commands for iOS, Windows, & Linux
- Read/write various scientific data in python
- Create a graph in python
- User defined function/class
- Several mini projects

Missed Assignments/Make-Ups

There is no exam in this course, but there will be several mini-projects. It is very important to keep up with mini-projects.

These mini-projects are not group projects. You can discuss about the project with your classmates, however, you cannot share your scripts with others. Shared scripts will be regarded as
plagiarism and to be reported to the University.

Evaluation and Grading

There will be several (about 7 at the moment) mini-projects. Final letter grades will be based on the number of successful, on-time completion of these mini-projects. Although the following grade guideline is likely changed as we go through the semester, a tentative grading plan is as follows.

- A: 100% completion of all mini-projects and assignments
- B: 1-2 missing mini-project
- C: 3-4 missing mini-projects
- D: 5 or more missing mini-projects

Disability Statement

UGA is committed to the success of all learners, and we strive to create an inclusive and accessible online environment. In collaboration with the Disability Resource Center (http://drc.uga.edu/), we work with students who have documented disabilities to access reasonable accommodations and academic supports.

For more information or to speak with a Disability coordinator, please call the Disability Resource Center at (706)542-8719, TTY only phone (706) 542-8778.

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Technical Issues

For TECHNICAL PROBLEMS with eLC or other issues, contact: UGA's Enterprise Information Technology Services (EITS) Help Desk at 706-542-3106, oremail at helpdesk@uga.edu. You can also submit at a helpdesk request online at https://eits.uga.edu/support/request.

Additionally, there will be a forum in the online course for students to post any issues or concerns. (Including a forum for technical issues can be a great way to help your students and encourage them to help each other.)