GEOG 1180: Introduction to Geo-programming

Course Syllabus (Spring 2020)

Instructor

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Office Hours: Mon 1:30-3:00 pm, Wed 2:00-3:30 (or by appointment)

Prerequisites

No prior programming experience is required.

Course format

GEOG 1180 is a 3-credit hybrid course. The lectures are online and the lab section is on-campus (Tuesday 12:25-1:45 pm and Thursday 9:10-10:30 am in GC 1855). Expect to spend around 3 hours per credit on this course (9 hours per week), depending on your programming background.

Course overview

Contemporary research in Analytical Geography has placed an increasing demand on the computational skills of its practitioners. The advances in spatial data analysis and geographical modeling have also largely out-paced the capabilities of standard statistical software. At the same time, the multidisciplinary nature of the spatial sciences often translates into the need to deal with disparate data sources, formats, and programming languages. As such, students undertaking research confront a challenging set of tasks seldom covered in an integrated fashion. This course addresses this need.

Course objectives and scope

1. Introduce students to basic computational concepts using Python, an object-oriented scripting language, for data processing, analysis and application development.
2. Familiarize students with the fundamental concepts and tools in manipulating and analyzing geographic information
3. Provide students with skills that are in high demand within academic GIScience and commercial GIS development.

Required textbook

Downy, Allen B. 2015 (2nd Edition). *Think Python: How to Think Like a Computer Scientist,* O'Reilly. (ISBN-13: 978-1491939369)

Additional readings and supplementary material will be assigned via Canvas throughout the semester.

Required Software

Python 2.7 and an associated Interactive Development Environment (IDE) are required for this course (Wingware or IDLE). You may use the lab computers or install Python and any IDE on your own desktop or laptop.

Assessment

- There will be **10 required lab assignments** (70% total, 7 points each).
- There will be **10 quizzes** (30%, 3 points each).
- There will be **2 extra credit lab assignments** based on advanced topics in Python programming. Each extra credit assignment can **replace** either one quiz grade or one assignment grade (i.e. whichever combination helps you the most).

Assignments

The assignment due dates are shown in the following class schedule. I will also post the due date after each assignment weekly as well. All assignments will be submitted via Canvas. Completing each lab assignment is essential for student success because the skills covered in each assignment are required in subsequent assignments. Late assignments will be reduced 10% of the assignment value for each day late (i.e. 0.7 points per day for 7-point assignment).

Quizzes

The quizzes are timed and based on the previous week's slides, readings, and exercise(s). You will have 15 minutes from the time you start.

Course structure

Lecture and Reading

As this is a hybrid course, there will not be a live lecture in the traditional sense. Just like in a traditional course, however, you are expected to keep up with the class schedule by reviewing the slides and following the course outline below. There will be a weekly interactive lab with the instructor where you will have the opportunity to ask questions and explore each topic further.

Exercises

In the first seven weeks for Python programming basics, there will be exercises posted online designed to help you better understand and apply the concepts in the slides. While the exercises are not graded, they are critical in helping you successfully finish the weekly assignment and quiz. You are expected to complete the exercises before attending the lab.

Lab

Each (on-line) lecture corresponds with a lab section. Each lab section is 80 minutes and allows you to work on the weekly assignment, ask questions about the material presented, and seek help.

Canvas use

I will send all announcements via Canvas. **It is your responsibility to log in to the Canvas course website frequently,** and you are encouraged to set up email forwarding to ensure you receive important messages in a timely manner.

Course Schedule

This schedule may change, so always check the course web site for the latest schedule. Reading assignment refers to the textbook unless otherwise indicated.

Week	Lecture	Exercise	Lab	Reading
1 1/7	Course overview and introduction to geo-programming	**Exercise 0:** Download and install software	Course intro and python configuration	Chapter 1
2 1/14	Python programming basics: variables, operators, and statements	**Exercise 1:** variables, operators, and statements	**Quiz 1** **Assignment 1:** calculating Manhattan distance	Chapter 2
3 1/21	Python programming basics: conditionals	**Exercise 2:** conditionals	**Quiz 2** **Assignment 2:** building a simple grading system	Chapter 5
4 1/28	Python programming basics: loops I	**Exercise 3:** loops	**Quiz 3** **Assignment 3:** Summation	Chapter 7
5 2/4	Python programming basics: lists and loops II	**Exercise 4:** lists and loops	**Quiz 4** **Assignment 4:** identifying neighbors	Chapter 10
6 2/11	Python programming basics: strings	**Exercise 5:** strings	**Quiz 5** **Assignment 5:** calculating distance between counties in Utah	Chapter 8
7 2/18	Python programming basics: functions	**Exercise 6:** functions	**Quiz 6**	Chapters 3 & 6

			Assignment 6: Functionizing Assignment 2 & 4	
9 2/25	Centroid and slope	**Exercise 7:** centroid/slope	**Quiz 7** **Assignment 7:** calculating mean centroids and ski run slope	Smith, Goodchild, Longley: Chapter 4.2.5 and 6.2.1.1
10 3 / 3	Minimum Bounding Rectangles and Shape	**Exercise 8:** shape/MBR	**Quiz 8** **Assignment 8:** calculating shape index	Smith, Goodchild, Longley: Chapter 4.2.8 and 4.2.13.3
3/10	SPRING BREAK	No lab		
11 3/17	Spatial Interaction	**Exercise 9:** gravity model	**Quiz 9** **Assignment 9:** calculating breaking point of trade area	Harrington
12 3/24	Location Analysis	**Exercise 10:** location allocation	**Quiz 10** **Assignment 10:** location analysis	Smith, Goodchild, Longley: Chapter 7.4.1
13 3/31	Advanced Topics: files and modules	**EC Exercise 1:** file input/output	**EC Assignment 1:** binary contiguity relationships	Chapter 14 & 15
14 4/7	Debugging in Python		Debugging	Appendix A
15 4/14	Advanced Topics: graphical user interfaces: Tkinter	**EC Exercise 2**: Tkinter	**EC Assignment 2:** building a simple data entry system	Chapter 19

Additional Information

Academic Integrity: The University of Utah is committed to nurturing academic excellence, truth, honesty, and personal integrity. The faculty expects all students to maintain high ethical standards. Academic misconduct is not tolerated. Penalties will include failure of an assignment, or possibly the entire course, and the filing of formal charges with appropriate university authorities. Academic misconduct includes, but is not limited to, cheating, misrepresenting one's work, and plagiarism:

- Cheating involves the unauthorized possession or use of information in an academic exercise, including unauthorized communication with another person during an exercise such as an examination.

- Misrepresenting one's work includes, but is not limited to, representing material prepared by another as one's own work or submitting the same work in more than one course without prior permission of all instructors.
- Plagiarism means the intentional unacknowledged use or incorporation of any other person's work in one's own work offered for academic consideration or public presentation.

Faculty and Student Responsibilities: The class will follow accepted University of Utah policies and procedures. Please refer to the University of Utah Faculty Handbook and Student Code.

Specifically: All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in the Code. The Code also specifies proscribed conduct that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty's responsibility to enforce responsible classroom behaviors, beginning with verbal warnings and progressing to dismissal from class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee.

Disability Accommodation: The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.