

Instructors: William Frank

Office: ZHS 103

Office Hours: Mo 8:30-9:30AM and We 1:00-2:00PM

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### Course Description

Data analysis and numerical computing have become essential toolsets across the geosciences as computing power and datasets continue to grow at exponential rates. The course will start with a hands-on introduction to scientific computing (both python and Matlab in Unix(-like) environments), to bring all students up to speed. We will then explore different data analysis techniques and computational strategies depending on the topics explored within the student's ongoing research projects. Potential topics include, but are not limited to: time series analysis, signal processing, filtering, and statistical analysis. The course will finish with a report of the progress made on students' individual research projects, written in LaTeX.

### Learning Objectives

- explore large-scale datasets with various statistical and time-series analyses
- assess different computational strategies and languages to answer scientific questions
- properly document computational analyses to ensure reproducible science in scientific reports

### Class format

Each 2-hour class will include a short lecture, hands-on computer work, and will finish with a discussion of common themes and applications among ongoing research.

### Required readings

TBD based on the students' interests and research topics. The goal of the readings will be to further explore and provide context on different methodological approaches in the scientific literature. A good self-guided Earth science-focused tutorial for python is: [http://krischer.github.io/seismo\\_live/](http://krischer.github.io/seismo_live/). Matlab provides its own tutorial: <https://www.mathworks.com/learn/tutorials/matlab-onramp.html>. If needed, references for Matlab, python, LaTeX can be provided, although the best reference for precise computing language questions is (un)fortunately google.

### Evaluation

The students will be evaluated on their participation during the workshops (2/3 of final grade), and a short paper on their research project at the end of the course (1/3 of final grade). The participation grade will be based on in-class discussions, an initial project proposal, and two

mid-semester meetings where students will meet individually with the instructor to report on their progress and discuss outstanding challenges.

Grade breakdown

15% — participation

50% — progress on research during weekly workshops

35% — paper on research project

Doing well in the class

Students will be expected to attend and participate in every workshop. Active student participation is crucial to enable this freeform workshop-style to function. The timeliness and quality of the one-page proposal, and the individual progress meetings will be reflected in the students' participation grades. Late submissions of the proposal and the final report will be docked one letter grade for every day late.

## Weekly Course Schedule

	Monday	Notes
Week 1	Jan 13: Scientific computing in a Unix-like environment	
Week 2	Jan 20 (MLK day)	
Week 3	Jan 27: Introduction to Matlab	One-page proposal due
Week 4	Feb 3: Introduction to python	
Week 5	Feb 10: Presentation of research problems	
Week 6	Feb 17 (Pres. Day)	
Week 7	Feb 24: Presentation of different computational strategies	Individual progress meetings
Week 8	Mar 2: Presentation of different computational strategies	
Week 9	Mar 9: Presentation of different computational strategies	
Week 10	Mar 16: Presentation of different computational strategies	
Week 11	Mar 23: Presentation of different computational strategies	
Week 12	Mar 30: Introduction to LaTeX	Individual progress meetings
Week 13	Apr 6: Freeform work on projects	
Week 14	Apr 13: Freeform work on projects	
Week 15	Apr 20: Freeform work on projects	
Week 16	Apr 27: Freeform work on projects	

## Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

## Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call  
studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call  
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention and Services (RSVP) - (213) 740-9355(WELL),  
press “0” after hours – 24/7 on call  
studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED)- (213) 740-5086 | Title IX – (213) 821-8298  
equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations. The university also prohibits sexual assault, non-consensual sexual contact, sexual misconduct, intimate partner violence, stalking, malicious dissuasion, retaliation, and violation of interim measures.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298  
usc-advocate.symplicity.com/care\_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity |Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs - (213) 740-0776

[dsp.usc.edu](http://dsp.usc.edu)

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

[uscsa.usc.edu](http://uscsa.usc.edu)

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

[diversity.usc.edu](http://diversity.usc.edu)

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

[dsp.usc.edu](http://dsp.usc.edu), [emergency.usc.edu](http://emergency.usc.edu)

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

[dsp.usc.edu](http://dsp.usc.edu)

Non-emergency assistance or information.