Syllabus

Overview

Teaching: min
Exercises: min
Questions

- How will this class work?

Objectives

- To define how this online class will operate and make sure that all learners know how to access and operate the required technology

CLIM 680 Climate Data Analysis

Instructors

Dr. Luis Ortiz Uriarte

Dept. Atmospheric, Oceanic, and Earth Sciences

Email: lortizur at gmu dot edu

Meeting Days/Times

Tuesday and Thursday @ 4:30-5:45, 121 Research Hall

Weekly schedule (https://pdirmeyer.github.io/CLIM680-Climate-Data/)

Prerequisites

- Computer programming course or experience in any language
- MATH 115 or an equivalent course

Materials

- Your laptop computer (a tablet will not be sufficient)
- Access to Blackboard. Need help with Blackboard? (https://its.gmu.edu/knowledge-base/blackboard-instructional-

technology-support-for-students/)
- A Github Account (https://github.com/) (we will take care of this together in class)
- Your own dataset (we will work on this together in the first week of class)
- GMU Computer Account. If you do not have an account on GMU's high performance computing system (Hopper or Argo) visit the Office of Research Computing (ORC) website (https://orc.gmu.edu/new-user-information/) and click on "ORC Account Request Form")
- There is no required book for this course.

Best ways to contact us

1. *Blackboard Discussion Board*: For general questions, problems, etc. addressed to the other students as well as instructors. We realize there is a wide range of expertise among the students and instructors - we can all help each other solve problems and learn via this open forum.
2. *Email*: For questions directed only to the instructors. We will respond to emails within 24hrs during the work week and on Mon morning for emails that arrive over the weekend. If you have not heard a response by this time, then we may not have received your email, so please re-send.
3. *Office Hours*: Please email us both if you wish to meet outside of class and we will schedule a time to meet in person or via Blackboard Collaborate Ultra.

Class Attendance

This is a face-to-face course. It is in your best interest to attend class during the scheduled class time - please don't be late.

Live Coding: One of the reasons you should attend class in person is that this class will utilize a methodology called "Live Coding". This means you will follow along with the Instructor(s) while we share and write code on the screen and explain the code as we go. There will be no PowerPoint presentations. This method is shown to be effective because it slows down the pace so everyone can keep up, allows us to take the time to explain what we are doing, helps you get accustomed to running codes yourself on your computer setup, and lets us see you make mistakes and how to correct them. Real-time diagnosis helps you learn faster.

If you miss class

We understand that there can be various reasons for missing class. If you miss class for whatever reason, the lesson material will be available online.

Tech Issues

We will try to minimize any technology issues and promptly address problems that arise on our end with the resources where we as instructors have responsibility (e.g., Blackboard content, provided code samples). However, you are responsible for the tech in your possession (namely your laptop, but also your network access). If you are having problems with your hardware that require service or repair, please let us know promptly so we can try to accommodate your disruption.

Continuity Plans

Given the current times, there are constant changes and new University guidance regarding University operations. There is also the possibility that a student, instructor, or family member that they care for may become ill and alternate arragements will need to be made.

We will follow all University guidance. Typically we learn official University guidance at the same time as you. We will

promptly follow up with you about how the latest guidance impacts this class.

In the event that you as a student are unable to continue with the course, please notify us immediately so that we can discuss your options. With two Instructors, hopefully there will be no disruptions, but we will continue as planned at the same day/time with a backup instructor if necessary.

How will you be graded?

This course requires students to apply the analysis techniques learned in class on sample datasets to a dataset used in their own research. Your grade will consiste of 50% *homework assignments* and 50% your *final project* and calculated as follows:

- Homework Assignments: 50%
- Final Project: 50% (25% Github repository and website; 25% presentation)

Assignments

Assignments are given most weeks and require you to add something to the previous week's analysis of your dataset, building on your work. It is in your best interest to complete these assignments on time in order to keep up with the class. Assignments will be given in class. Several of the assignments will be formally graded. **You will turn in each assignment by providing a Github link to it.** Instructions will be provided in class.

Assignments will be graded as satisfactory (A), not satisfactory (C), or not/minimally attempted (F) promptly after the due date. Feedback will be provided via Blackboard or Github Issues.

If the assignment is graded not satisfactory or not attempted, **you may redo the assignment** until it is satisfactory until the last day of class (Dec 3). The point of analysis with climate data is to get it done right… ultimately! There is no shame in revising work to make it better - coding is an iterative process. But you must notify us if/when you wish us to re-grade a re-submitted assignment.

Final Project

In addition to the graded assignments, You are also expected to complete a project with a website in Github and give a presentation in class of your project. Project details will be provided in class and posted on Blackboard.

Exams

This class has no exams.

University Policies

Evolving COVID Situation

All students are required to follow the university's public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage (https://www2.gmu.edu/safe-return-campus). Mason classrooms are mask-optional, but masks are encouraged, especially in close quarters or where ventilation is low. If you're more comfortable wearing a mask, feel free to continue. If you feel ill or test positive for COVID, please do not attend class, inform the instructor and observe quarantine guidance (https://www.gmu.edu/safe-return-campus/personal-and-public-health/isolation-and-quarantine).

GMU strongly recommends vaccinations for all students who work, study, or live on campus. This includes those who attend classes. There is nothing better than the in-person learning experience. Mason offers flexible excused absence options for students receiving vaccination and those with side effects after vaccination. If you are healthy – please be in class!

If the campus closes, or if a class meeting needs to be canceled or adjusted due to weather or other reasons, notices will be posted to Blackboard and emailed to all registered students.

Academic integrity

It is expected that students adhere to the George Mason University Honor Code as it relates to integrity regarding coursework and grades. The Honor Code reads as follows: To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this: Student members of the George Mason University community pledge **not** to cheat, plagiarize, steal and/or lie in matters related to academic work. More information about the Honor Code, including definitions of cheating, lying, and plagiarism, can be found at the Office of Academic Integrity website at (http://oai.gmu.edu). **In this class, working together is strongly encouraged and doing so is not a violation of the Honor Code. However, each student must complete their own analysis codes and figures, and their own writeup of each assignment.**

Disability accomodations

Disability Services (http://dsgmu.wpengine.com/) at George Mason University is committed to providing equitable access to learning opportunities for all students by upholding the laws that ensure equal treatment of people with disabilities. If you are seeking accommodations for this class, please first visit Disability Services (http://dsgmu.wpengine.com/) for detailed information about the Disability Services registration process. Then please discuss your approved accommodations with me. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu | Phone: (703) 993-2474

Sexual Harassment, Sexual Misconduct, and Interpersonal Violence

As faculty members and designated *Responsible Employee*, we are required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434) or Counseling and Psychological Services (703-993-2380). You may also seek assistance from Mason's Title IX Coordinator (703-993-8730; titleix@gmu.edu).

Diversity and Inclusion

Diversity and inclusion mean much more than *do not harrass*. They mean creating an environment where diverse viewpoints and perpsectives are welcome and everyone feels they are part of the team. This class aims to be an intentionally inclusive community that promotes and maintains an equitable and just work and learning environment. We welcome and value individuals and their differences including race, economic status, gender expression and identity, sex, sexual orientation, ethnicity, national origin, first language, religion, age, and disability.

Mason Non-Discrimination Policy (https://universitypolicy.gmu.edu/policies/non-discrimination-policy/)

Mason Diversity Statement (https://stearnscenter.gmu.edu/knowledge-center/general-teaching-resources/mason-diversity-statement/)

The following kinds of behaviors are encouraged to foster an inclusive environment:

- Use welcoming and inclusive language
- Be respectful of different viewpoints and experiences
- Gracefully accept constructive criticism
- Focus on what is best for the community
- Show courtesy and respect towards other community members
- Be Kind

Netiquitte

An important component of inclusivity is to be aware of how our communication impacts others. Electronic communications require additional care to avoid misinterpretation. The following behaviors are encouraged for online communications:

- Avoid vague words, jargons, and sarcasm.
- Limit or eliminate the use of exclamation points, bolding, capital letters, and emoticons.
- Change subject lines of email chains regularly.
- Plan carefully who to CC on messages.
- **Proofread what you write before sending - edit meticulously.**

Religious Holidays

It your responsibility to notify us within the first two weeks of the semester of any occasions when you will be absent or unavailable due to religious observances.

Privacy

Student privacy is governed by the Family Educational Rights and Privacy Act (FERPA) and is an essential aspect of any course. Students must use their Mason email account to receive important University information, including communications related to this class. We cannot, in the interest of academic privacy, respond to messages sent from or send messages to a non-Mason email address.

Student Support Services

A complete list of student support services ((https://stearnscenter.gmu.edu/knowledge-center/knowing-mason-students/student-support-resources-on-campus/)

Keep Learning, Learning Services (http://learningservices.gmu.edu/keeplearning/)

University Libraries (http://library.gmu.edu)

Writing Center (http://writingcenter.gmu.edu)

Counseling and Psychological Services (http://caps.gmu.edu)

Feedback

Feedback is always welcome and will be regularly requested at the end of each class period. Additionally, a post course survey will provided to get your overall feedback on the course separate from standard university-administered course evaluations, which do not provide sufficient useful information for improving the course. Please help to develop this course by providing feedback so that the course can improve and adapt.

Key Points

- This class meets in person
- This class will use Blackboard
- This class will request feedback often

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CLIM 680 Climate Data

George Mason University

Department of Atm, Ocn, and Earth Sciences

Tuesdays and Thursdays, Research Hall 121, 4:30-5:45pm

Dr. Luis Ortiz Uriarte (https://science.gmu.edu/directory/luis-ortiz)

Information

CLIM 680 Climate Data is a graduate course in the MS Climate Science and PhD Climate Dynamics in the Department of Atmospheric Ocean and Earth Sciences (http://aoes.gmu.edu) at George Mason University (https://www2.gmu.edu/) originally developed by Dr. Kathy Pegion. This course prepares learners to be able to work with climate datasets for their research.

Schedule

This schedule is tentative and subject to change. We will adapt the course to each specific class as needed.

Week

Tuesday

Thursday

1 (Aug 24 & 26)
Class Intro, Overview, Syllabus (https://prukutu.github.io/AOES-CLIM-CLIM680-Intro/)
Intro to GMU Computing (https://prukutu.github.io/AOES-CLIM-intro-gmu-computing/)

2 (Aug 29 & Aug 31)
Using Shells (https://prukutu.github.io/AOES-CLIM-CLIM680-Unix-Files-Directories/)
Programming Review and Python Intro: Part 1 (https://prukutu.github.io/AOES-CLIM-Python-and-Prog/)

3 (Sep 5 & 7)
Setting up JupyterLab (https://prukutu.github.io/AOES-CLIM-Setup-Python-Jupyter/)
JupyterLab & Python Part 2 (https://prukutu.github.io/AOES-CLIM-Python-and-Prog2)
Climate Data: Where to find it, how to read it (https://prukutu.github.io/AOES-CLIM-ClimateData-WhereHow/)

4 (Sep 12 & 14)
Managing your Conda Environment (https://prukutu.github.io/AOES-CLIM-Conda-Environment/01-manage-conda/index.html)
Assignment 1, Part A (assigned)
Making maps with cartopy (https://prukutu.github.io/AOES-CLIM-cartopy)
Assignment 1, Part B (assigned)

5 (Sep 19 & 21)
Version control with git and Github (https://prukutu.github.io/AOES-CLIM-git)
Assignment 1, Part C (assigned)
Getting Data for Today (https://prukutu.github.io/AOES-CLIM-WorkingWithData/01-intro/index.html)
Subsetting (https://prukutu.github.io/AOES-CLIM-WorkingWithData/02-subsetting/index.html)
Aggregating (https://prukutu.github.io/AOES-CLIM-WorkingWithData/03-aggregating/index.html)

6 (Sep 26 & 28)
Masking (https://prukutu.github.io/AOES-CLIM-WorkingWithData/04-masking/index.html)
Interpolating (https://prukutu.github.io/AOES-CLIM-WorkingWithData/05-interpolating/index.html)
Longitude Shifting (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/ShiftingLons.ipynb)
Groupby (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/GroupByExample.ipynb)

7 (Oct 3 & 5)
Climatology and Anomalies (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/ClimAnoms.ipynb)
Interpolating Irregular Grids (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/Arctic_Rean_Regrid.ipynb)
Multi-panel Plotting (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/multipanel.ipynb)
Functions in Python (https://swcarpentry.github.io/python-novice-inflammation/08-func/index.html)
Assignment 2 (assigned) (https://prukutu.github.io/AOES-CLIM-Conda-Environment/03-Assignment2/index.html)

8 (Oct 10 & 12)
Fall Break -- No Class
Pandas for Tabular Data Part 1 (http://swcarpentry.github.io/python-novice-gapminder/07-reading-tabular/index.html)
Pandas for Tabular Data Part 2 (http://swcarpentry.github.io/python-novice-gapminder/08-data-frames/index.html)
Pandas and Climate Data (https://prukutu.github.io/AOES-CLIM-Python-and-Prog2/04-pandas/index.html)

9 (Oct 17 & 19)
Accessing Climate Data in the Cloud: GEFS on AWS (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/GEFS_AWS.ipynb)
Accessing Climate Data in the Cloud: CMIP6 on Google Cloud (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/CMIP6.ipynb)
Composites (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/Composites.ipynb)
Github Pages (for building your class project website) (https://prukutu.github.io/AOES-CLIM-git/github-pages/index.html)

Working with Large Datasets (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/dask_2022.ipynb)

10 (Oct 24 & 26)
Discussion of Assignment 2
Presenting of project outlines (5 min each)
Significance for Means/Composites (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/Composites_Significance_2022.ipynb)
Assignment 3 (assigned)

11 (Oct 31 & Nov 2)
Correlation and Significance for Correlation (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/Correlation_2022.ipynb)
Batch computing - submitting jobs with Slurm (https://github.com/Prukutu/clim680_nb/blob/main/SLURM_Nov3.ipynb)

12 (Nov 7 & 9)
Student update on Python Project
Linear Regression Overview (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/Regression-SciPyNumpy_Intro_2022.ipynb)

13 (Nov 14 & 16)
Linear Regression with maps (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/Regression_maps_2022.ipynb)
Introduction to Empirical Orthogonal Function Analysis (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/EOFs_Intro_2022.ipynb)

14 (Nov 21 & 24)
Calculating EOFs (https://github.com/prukutu/clim680-codes/blob/gh-pages/src/CalculatingEOFs_2022.ipynb)
Thanksgiving -- No Class

15 (Nov 28 & 30)
Student Project Presentations
Student Project Presentations

This course website is adapted from The Carpentries Workshop Template (https://github.com/carpentries/workshop-template)