Syllabus:
IB 599 ANALYTICAL WORKFLOWS

Course Description

Have you proposed a modeling chapter for your dissertation but need support getting things up and running? Are you sitting on a data set ready for analysis and visualization but don't know how or where to begin? Maybe you're far along in some series of analyses and feel "lost in the trees."

This course will help you with these challenges by practicing the development and implementation of efficient, reproducible *workflows* for your projects. Every project should (and can) be modular and fully automated, hence reproducible, portable and easily modified. Rerunning a model under a different set of parameters should (and can) be as simple as a few keystrokes. Regenerating all analyses, figures and tables after finding a typo in your code or dataset should (and can) be painless.

Efficient workflows start at project conception and end only if the project idea is itself a dead end. Thus, in this course, we'll work to practice (1) refining and articulating project ideas and goals, (2) creating modular and automated analyses, and (3) using best-practices in coding and project management. We'll learn how to use Git, GitHub, LaTeX and Markdown. The instructors will mostly use R within RStudio, but users of other programming languages and text editors are welcome and encouraged. You will need either (1) a large unwieldy dataset and an end goal (e.g., reproducing someone else's analysis or visualization) or (2) a dynamical model or simulation (or sufficiently well-developed ideas for one). The use of other people's data or published models is also encouraged, as needed.

Prerequisites

Officially, only graduate standing (or instructor approval). But see end of *Course Description* for what you should have coming in.

Learning Outcomes

After successful completion of this course, you should be able to:

1. Translate a research plan into an explicit analytical workflow;
2. Apply best practices in scientific programming to construct reproducible research;
3. Manage and collaborate on complex research projects using a version control system;
4. Apply analytical workflows to advance their dissertation research.

Meeting Times and Location

Fall 2020, Tuesdays and Thursdays, 10-11:50am
100% remote
Zoom: 994 7452 7966, *Password*: workflowz

Instructor

Mark Novak
Email: mark.novak@oregonstate.edu
Phone: 541-737-3610
Zoom: 561 350 4634 (*differs from regular class Zoom ID*)
Office: ~~Cordley 3006~~ Home

Office Hours

I'm more than happy to meet (via Zoom) at any point in the quarter. Please use email to set up an appointment.

Course Materials

All available on https://github.com/analyticalworkflows

Course Work

This course combines almost 4 hours of weekly instruction and activities for a total of 4.0 credits. There will be no exams, tests, or quizzes. I will not grade your work because there won't be "correct" answers to the problems you will solve. In fact, my goal is for you to not have any "homework" (besides readings and making progress on your project). However, the course *will* require a significant allocation of time for thought and reflection outside of class. There *will* also be readings for in-class discussion to be read before class (see Schedule). Finally, you will need to complete all assigned in-class work (e.g., challenges and Git commits), ideally by the end of the week in which the topic is covered but definitely before the end of Week 10.

Evaluation of Student Performance

Grading (A-F) will be based on your participation, initial and final project presentations (see rubric on the Github repository), and the completion of the various in-class "tasks" assigned throughout the quarter. Accommodations for missed classes (e.g., due to fieldwork) are okay in principle, as long as we can identify a path to your having fully participated in the course. Please discuss your specific situation with me during Week 1. Everyone who puts the effort into the class will get a grade that will make them happy (if you, as a graduate student, even still care about grades).

Collaboration

My hope is for you to make a tremendous amount of progress on your chosen (and ideally, thesis-related) project during this course. Your work will therefore, almost by definition and necessity, be your own. That said, I will *strongly* encourage everyone to work collaboratively in whatever way possible! That's because what this course is all about is to provide you with tools. Tools have to be learned and practiced. They can't be plagiarized, and you won't get anything out of them (or this course) if you try. Moreover, there's nothing (I repeat, *nothing*) better for learning to understanding something than to try explain how something works to someone else. Therefore, I repeat, I will *strongly* encourage you to collaborate, and will do so throughout the quarter by getting you to work or discuss your work in pairs or teams.

Schedule

Wk	Day	Date	Topic	To do	Readings
0	Th	9/24	Course organization & Philosophy of workflows	c	
1	T	9/29	Project setup & Version control (Git)	d	c
	Th	10/1	Project presentations	d	c
2	T	10/6	b	d	c
	Th	10/8	b	d	c
3	T	10/13	b	d	c
	Th	10/15	b	d	c
4	T	10/20	b	d	c
	Th	10/22	b	d	c
5	T	10/27	b	d	c
	Th	10/29	b	d	c
6	T	11/3		*Election day!*	
	Th	11/5	b	d	c
7	T	11/10	b	d	c
	Th	11/12	b	d	c
8	T	11/17	b	d	c
	Th	11/19	b	d	c
9	T	11/24	b	d	c
	Th	11/26	*Thanksgiving - no class*	d	c
10	T	12/1	Project presentations	d	c
	Th	12/3	Project presentations & Wrap-up	d	c

I reserve the right to change the schedule, policies, and assignments in this course due to extenuating circumstances or by mutual agreement with you. Things happen.

Course Policies

Equity Justice and Inclusion

Oregon State University, and the Department of Integrative Biology, have [a lot of] work to do on improving the level of equity, justice and inclusion in our community. We, the instructors and students in this class, [must] take responsibility for creating an affirming climate for everyone in the course, and especially for those who are underrepresented and marginalized in academia and in our society, because of their race, creed, color, sex, religion, national origin, citizenship status, ancestry, genetic information, pregnancy, marital status, domestic partnership status, familial status, age, body size, education level, disability, veteran status, sexual orientation, and gender identity or expression. If you have concerns or suggestions related to these issues as they pertain to the course, please do not hesitate to contact me and/or the Office for Institutional Diversity (https://diversity.oregonstate.edu/).

Student Conduct

Choosing to join the Oregon State University community obligates each member to a code of responsible behavior, which is outlined in the Student Conduct Code (http://oregonstate.edu/studentconduct/). This Code is based on the assumption that all persons must treat one another with dignity and respect in order for scholarship to thrive.

Students with Disabilities

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval, please contact DAS at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Religious Holidays

Oregon State University strives to respect all religious practices. If you have religious holidays that are in conflict with any of the requirements of this class, please see me as soon as you can so that we can make alternative arrangements.