Using R to Create Reproducible Research

PSY4802| Fall 2024 | 3 Credits

Lecture Information:

Tuesday/Thursday 9:45 -11:00 AM Bruininks Hall 420A

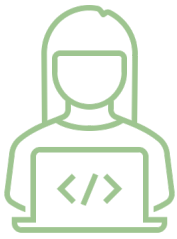
All Course Materials will be posted on the **Course Canvas Page.**

Course Description:

Conducting psychological research involves collecting data, but what happens next? Completing research projects involves more than just analyzing data! In this course, we will learn how to incorporate Open Science tools like R programming into the research process in order to generate reproducible and transparent analyses. Specifically, students will learn how to clean data, and create R Markdown files that contain statistics, data visualizations, and interpretations. Finally, students will learn how to share their code and data via GitHub and the Open Science Framework as well as how to use and evaluate each other's code. A large component of this course will involve applying R skills and Open Science knowledge in a group secondary data analysis project that will culminate in a brief presentation.

Course Goals:

By the end of this course, students will be able to:



- Comprehend code written in R. Interpret and solve coding errors
- Use R programming to create data visualizations and analyze data
- Create an efficient workflow including using R and R Studio
- Use GitHub and OSF to incorporate open science principles in your workflow

Professor Contact Information:

Dr. Amanda Woodward, PhD | she/her/hers |
woodw284@umn.edu

Office Hours: Tuesday 11-12pm or By Appointment* |Elliott Hall S 246 Zoom Room Link
* I am happy to meet with you if you have questions about the course or if you'd like to chat about psychology! To schedule an appointment please email me or request a time on my google calendar so that we can find another time to meet that works for both of us.

Course Materials:

In this course, we will be using several types of open-source materials.

R/R Studio/R Cloud: R and R Studio are free, open-source statistical programs. We will be using them in discussion and in class to compute our statistics more easily. You can download R and R Studio from https://rstudio.com. You will need to download both versions. If you would prefer, you can also access R Studio through the cloud website: https://rstudio.cloud. You will need to make an account, and the free version should be sufficient for this class. You can access R Studio Cloud on your mobile device, if necessary. Please note there is a limited number of files you can make with a free account on the website version. **It is your responsibility to download these materials, and to tell your professor if you have any issues accessing R or R Studio.**

To participate fully in the course, you'll need:
Our course will be using a Canvas site as well as taking advantage of Github, which should provide you access to all materials you will need for the class. These technical requirements will allow you to access the Canvas site, send/receive online communications, complete assignments, and view media content.

- A U of M internet ID (your official U of M email address)
- Reliable, high-speed Internet access
- A supported Web browser
- Laptop, desktop, or tablet

Grading Scheme:

The table to the left displays the letter grade associated with the grade you **earn** in this class. I do **NOT** round grades – a 79.9% is a C+, not a B-. As a general rule, I do not allow resubmissions. Your earned grade will be based on the following categories:

Letter Grade	Percentage Earned
A	94 - 100%
A-	90 - 93.9%
B+	87 - 89.9%
B	84 - 86.9%
B-	80 - 83.9%
C+	77 - 79.9 %
C	74 - 76.9%
C-	70 - 73.9%
D+	67 - 69.9%
D	60 - 66.9%
F	Below 60%

Assignment	%
Introduction Activities and Reflections	5%
Class Participation	5%
Weekly Assignments	25%
Quizzes	25%
Peer Review	10%
Final Project	30%

Course Requirements:

The following are the activities and assignments you will complete in this course. Further descriptions of each assignment are available on Canvas/ELMS and additional materials may be made available through GitHub classroom.

Assignments in this course are meant to build on each other to help ensure that you learn the material. The most effective way for students to learn is repeated exposure and repeated attempts. For this reason, students will complete several types of assignments to help them learn the concepts.

Introduction and Reflection Materials:

Introduction activities are important for helping us get to know each other and to ensure that students know what is expected of them. In this course, you receive credit for completing these activities.

Reflection is an important aspect of learning. Throughout the semester, you will have brief assignments to think about where you're starting, how you're doing, and where you will go.

Class Participation:

Participating in lecture is essential for student learning. If you are healthy, you are expected to attend lecture in person. Attendance will be marked by answering questions, working on in class problems, or other methods that will be announced. These assignments are graded based on completion.

If you are sick or must otherwise miss a class meeting (because life happens!), you have the ability to make up missed points by submitting a one page reflection summarizing the content you missed, the topics you feel comfortable with, and any questions you have. These can be emailed to me.

You will not receive partial credit for made up attendance, and you will not receive points for handing in annotated power points or notes from another lecture. Makeup notes must be handed in within two weeks of the missed class meeting. Please note that this opportunity will not have a due date on Canvas. It is your responsibility to be aware of this and to ask questions if you have them.

Weekly Assignments:

There will be weekly assignments to assess your knowledge of that week's materials. All assignments will be posted at the beginning of the week and will be due by Friday at 11:59pm. This is intended to give me time to grade assignments and allow you to ask questions in the subsequent class. Weekly assignments will be graded based on both good faith effort and accuracy.

Quizzes:

In addition to weekly assignments, there will be several larger homework assignments. These assignments will include information from prior weeks and will assess your programming ability. These are open note/ open internet and will undergo peer review.

Peer Review:

Part of learning how to code is learning how to interact with the code programmed by your peers. In this class, you will be responsible for completing a peer review for three of your peers' assignments (2 quizzes and Step E of your final projects). Your peer review will be graded based on thoughtfulness, respectfulness, and your use of constructive feedback. We will discuss how to complete a peer review in class.

Final Project:

The final project for this course involves cleaning, analyzing, and visualizing data in an .Rmd file. We will discuss the exact framework for this project in class. You can expect that this project will involve analyzing a preexisting data set, formulating a preregistration, sharing your materials publicly through GitHub or OSF, and presenting your work in class. You

can find more information about the final project in this guidebook.

Course and University Policies:

Late Work/ Extensions:

Please remember that legitimate absences (e.g., religious observance, intercollegiate athletics, ROTC, National Guard service, subpoenas, University band, University student government, a death in the family, jury duty, or a confirmed medical illness) can lead to an extension. If I have not heard from you within 48 hours of the due date, you forfeit any right to an extension for any reason.

Life happens. If you require any extensions, you are responsible for speaking with me as soon as possible. Please note that asking for an extension does not guarantee you will receive full credit for work. If you do not have a legitimate absence (as defined by the university), you may still turn in late work for partial credit. You must contact me to let me know that you plan to turn in late work- or you will not receive credit. Late assignments will lose 10% of the grade for each day late.

While I am happy to talk to you in person, all extensions need to be documented in writing (email).

Incompletes:

Incompletes will only be granted in the case of medical or personal emergencies. Incompletes can only be given if you are receiving a grade of "C-" or higher on work already completed and you must have completed at least half of the work in the course, preferably at least 75% of the work in the course. Let me know as soon as possible if suspect you might need to take an incomplete in the course. Please note that in order to receive an incomplete you must sign a written agreement stating your timeline for completing missed work.

Student Conduct Code:

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected to adhere to Board of Regents Policy: Student Conduct Code. Click here to review the Student Conduct Code.

Disability Accommodations:

In compliance with the Americans with Disabilities Act (1990) and the

University of Minnesota policy, students with any documented disabilities are eligible for reasonable and appropriate accommodations in this class. A number of accommodations can be made in class if this applies to you.

Please contact us and the Disability Resource Center as soon as possible if you need special accommodation for this course.

Electronic Devices:

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. In this class, we will be using computers to compute our statistics. I expect that you will be on task and that you will not distract students around you.

Use of Course Materials:

Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see the University policy.

Academic Integrity:

You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. See the Student Conduct Code.

If it is determined that a student has cheated, the student may be given an "F" or an "N" for the course and may face additional sanctions from the University.
The Office for Community Standards has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty.

Sexual Misconduct:

The University prohibits sexual misconduct and encourages anyone experiencing sexual misconduct to access resources for personal support and reporting. If

you want to speak confidentially with someone about an experience of sexual misconduct, please contact your campus resources including the Aurora Center, Boynton Mental Health or Student Counseling Services. If you want to report sexual misconduct or have questions about the University's policies and procedures related to sexual misconduct, please contact your campus Title IX office or relevant policy contacts.
Instructors are required to share information they learn about possible sexual misconduct with the campus Title IX office that addresses these concerns. This allows a Title IX staff member to reach out to those who have experienced sexual misconduct to provide information about personal support resources and options for investigation. You may talk to instructors about concerns related to sexual misconduct, and they will provide support and keep the information you share private to the extent possible given their University role.

Duo Security:

If you use Duo Security to sign in to University applications, YOU ARE STRONGLY ENCOURAGED to set up back-up devices in Duo Security so that you are prepared in the event that your primary Duo device is unavailable (e.g., you forgot it, it was stolen, it is broken, the battery is dead).
As a Duo user, it is your responsibility to be prepared to sign in to applications necessary for class activities, including exams and quizzes. If you are unable to sign in, you might lose points for the class activity. Failure to have your Duo device or a back-up is not an excused absence or a valid reason for make-up work.

Definition of grades and academic workload policy:

According to the University Senate policy, the course syllabus must include a definition of grades. The University of Minnesota has adopted the following definition for letter grades:
A Achievement that is outstanding relative to the level necessary to meet course requirements.
B Achievement that is significantly above the level necessary to meet course requirements.
C Achievement that meets the course requirements in every respect.
D Achievement that is worthy of credit even though it fails to meet fully the course requirements.
F Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I.
I Assigned at the discretion of the instructor when, due to extraordinary circumstances (e.g., hospitalization) a student is

prevented from completing the work of the course on time. Requires a written agreement between instructor and student.

In addition, the University Senate requires the following description of workload
expectations for courses in which an undergraduate can enroll:
"For undergraduate courses, one credit is defined as equivalent to an average of three
hours of learning effort per week (over a full semester) necessary for an average student
to achieve an average grade in the course. For example, a student taking a three credit
course that meets for three hours a week should expect to spend an additional six hours a week on coursework outside of the classroom."

Tips for Success:

The items below are meant to help you succeed in this course

Email:

Primary course communication will occur via email. Please check your UMN email frequently and let us know if you have questions. You should also check your Canvas email regularly for course updates. When emailing me, you should include "PSY4802" in the subject line.
I will do my best to respond to email with 24 – 48 hours (and will often respond faster). Please note that I typically sign off around 6 pm and emails sent late at night may not be answered until the following morning. For this reason, I recommend looking at assignments ahead of time.

Time Management:

This document contains every assignment that will be due in this course. Due dates are both in this syllabus and on the course website, and I expect you to manage your time appropriately. Semesters go by fast, so please do not wait until the end to submit your work. If you have any questions about ways to manage time or keep track of assignments, please see the following for some applicable strategies or feel free to come to office hours to discuss other strategies:

Effective U Resources
Effective U Time Management Tutorial
Managing Time More Effectively TED Talk
Free Time and Time Management TED Talk

Be curious:

Ask questions! Explore on your own and share. Make connections between your own life/ TV/ the real world in class. These techniques help solidify course concepts, and I hope that you share these thoughts with me and with your peers.

Expectations:

Attendance:

I expect that you will attend lectures and discussion sections when you are able. If you are unable to attend the class, I expect you to complete class activities and email your peers or attend office hours if

you have questions. You are ultimately responsible for the material you miss and completing any assignments.

Grade Disputes:

I will do my best to ensure that the gradebook is up to date. If you receive a grade that you believe does not reflect your work, you will have one week after the grade is released to request a formal regrade. To request a regrade, you must email me with 1) the assignment in question, 2) what you think is incorrect about the grade, and 3) any supporting evidence for your request. Please note that a regrade does not guarantee a higher grade and can result in a lower grade. The regrade is final, and I will not use the original grade, regardless of which is higher.

Self- Care:

Life happens. I expect you to prioritize your health and wellness and that of your loved ones. In these cases, I expect you to practice self-care and focus on taking care of yourself. If you require additional resources, please see the following:
http://www.mentalhealth.umn.edu
http://www.mentalhealth.umn.edu/stressmgmt/index.html

Class Expectations:

During the first class, we will discuss expectations of our class and how to interact. Generally, I expect that the classroom will be a place where you should feel comfortable and safe. I expect you all to act civilly and professionally. If I ever do something that makes you feel excluded from the classroom, and you feel comfortable, please let me know so that I can improve.

Classroom Etiquette:

Lectures will be held in person. This is a time of transition for all of us. Please make sure to follow all university guidance regarding face masks and safety protocols.

Have a Question?

- Check the course website and all course information
- Email me and include “PSY 4802” in the subject line.

Tentative Course Schedule:

Date	Day	Content	Resources	Class Assignment (s)
9/3	Tuesday	Introduction to Course		
9/5	Thursday	Introduction to Open Science	Baker 2016 Yong 2012 Smith & Makel 2019 Chopik et al 2018	Welcome Survey Syllabus Activity Reflection Due before Class
9/10	Tuesday	An Introduction to Workflows and GitHub		
9/12	Thursday	Introduction to R Markdown Files		Weekly Assignment 1
9/17	Tuesday	Base R Programming		
9/19	Thursday	Base R Programming		Step A Due
9/24	Tuesday	Using For loops and Functions to Wrangle Data		
9/26	Thursday	Using For loops and Functions to Wrangle Data		Weekly Assignment 2
10/1	Tuesday	Intro to Dataset Manipulation and Data Wrangling		
10/3	Thursday	Dataset Manipulation: Wide to Long Format		Weekly Assignment 3 Weekly Assignment 4 Step B
10/8	Tuesday	Dataset Manipulation: Subsets and Joining Data		Quiz 1 Due

10/10	Thursday	Dataset Manipulation: Scoring Data in R		Weekly Assignment 5 Step C
10/15	Tuesday	Visualizing Data with ggplot		
10/17	Thursday	Advanced ggplot		Weekly Assignment 6 Quiz 2
10/22	Tuesday	More ggplot		
10/24	Thursday	Plotting Interactions		
10/29	Tuesday	Plotting Interactions and Shiny Apps		
10/31	Thursday	Pre-registration and setting up markdown files for analyses		Weekly Assignment 7
11/5	Tuesday	Statistics in R		
11/7	Thursday	Stats in R		Week 8 Assignment Step D Quiz 3 Peer Review #1
11/12	Tuesday	Advanced statistics using R		
11/14	Thursday	Statistics in R		Week 9 Assignment Week 10 Assignment
11/19	Tuesday	Statistics		
11/21	Thursday	Statistical Writeups and Workflows		Quiz 4

				Week 11 Assignment Step E Due
11/26	Tuesday	Project		
11/28	Thursday	Thanksgiving- No Class		
12/3	Tuesday	Project		Step F Due
12/5	Thursday	Project		Step G Due Quiz 5
12/10	Tuesday	Project Presentations and Course Wrap Up		Evaluation Survey Step H Step I

* Assignments are due by 11:59 pm on Friday unless otherwise specified