PSY-703: Data Science for Psychologists

S. Mason Garrison

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Section: Monday	Section: Friday
Medium: Blended	Medium: Blended
Class Room: GREENE	Class Room: GREENE
Class Hours: M @ 9:30a-10:50a	Class Hours: F @ 9:30a-10:50a

Canvas: wakeforest.instructure.com/courses/29807
Github: https://github.com/DataScience4Psych/DataScience4Psych

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Course Description

Data Science for Psychologists (DSP) introduces on the principles of data science, including data wrangling, modeling, visualization, and communication. In this class, we link those principles to psychological methods and open science practices by emphasizing exploratory analyses and description, rather than confirmatory analyses and prediction. We'll work our way thru Wickham and Grolemund's R for Data Science text (http://r4ds.had.co.nz/) and develop expertise in tidyverse (https://www.tidyverse.org/). This class emphasizes replication and reproducibility. DSP is a practical skilled-based class and should be useful to students aiming for academia as well as those interested in industry. Applications of these methods can be applied to a full range of psychological areas, including perception (e.g, eye-tracking data), neuroscience (e.g., visualizing neural networks), and individual differences (e.g., valence analysis).

To do well in the course, you should read the assigned material before class and re-read previously assigned material as the course progresses. By reading the text before class you will be better prepared to ask questions and integrate the content of lectures with what was presented in the text. For synchronous classes, be sure to attend all lectures and arrive on time. For asynchronous classes be sure to watch all the video lectures and don't leave them until the last minute. Each topic builds directly on the previous one. Thus, if you miss one lecture or zip through a video, you run the risk of being completely lost in the next lecture.

Important Information for College and This Course:

In addition, many professors have implicit (*i.e.*, unspoken) expectations for college classes. I'm going to explicitly state some of those unspoken expectations. I suspect that your other professors have similar expectations – so this information will help you in your other classes.

Asynchronous courses put the onus on **YOU** to keep up with the work. You are not guaranteed any reminders throughout the semester. Go to the schedule included here and put it in your calendar. You should also:

1. check course announcements on Canvas often, and
2. check your email tied to Canvas often.

Email and canvas is how I communicate with you, and I will not continually repeat myself in emails after I have already posted or sent the information.

High school and college are different. In high school, you may have been permitted to turn in work as late as you like, to redo assignments or quizzes until you were satisfied, and to complete extra credit work. This is not the case in this college-level course. Unless explicitly stated, there are no late assignments, make-up work, redoing of assignments, or extra credit. These are course policies; they are not opportunities for negotiation. Although I am always happy to explain the reasoning and calculus behind my policies, they are not negotiable.

There is also a prevalent attitude of, "it doesn't hurt to ask." Yes, it does. If I have already made clear my policies and expectations, asking me to violate them damages your credibility as a student. One day you may ask for something that is truly reasonable given an emergency situation, but by then your reputation will precede you. Do not be "the boy who cried wolf;" it is not a respected position.

Finally, you should understand that college is not a fee-for-service arrangement. You are not paying me. You are paying tuition to a University for all kinds of things, very little of which actually "pays my salary." Salaries are more commonly paid out of government funds, including grants. You start with a zero in college courses and earn your points from there. I am not "giving" you grades or "taking away" points. You have nothing to begin with and earn your own score based on what you do and how well you do it (not simply on effort). What I offer you is an opportunity for education, not a grade.

Broad goals for the course:

- 1. Reproducibility;
- 2. Replication;
- 3. Robust Methods;
- 4. Really Nice Visualization; and
- 5. R.

Required Materials

Wickham and Grolemund's R for Data Science text (http://r4ds.had.co.nz/)

How to use the required text:

The text is intended to supplement the lectures. The lectures don't follow the order of chapters in the text and the text covers some material that won't be covered in the lectures, i.e., not all the information in each chapter is perfectly pertinent to the course requirements.

Course Assignments

Presentations

You will give two asynchronous presentations. Your team will give a 15-20 minute presentation of its data analysis problem. In addition, you will give a 15- minute individual presentation. These presentations are chance to practice a formal presentation in a relatively pressure-free setting).

Assignments
Portfolio

The major semester projects (described on the separate hand-out) is a set of EDA Projects, which you will summarize in an EDA Portfolio to be handed in on the last day of class.

Engagement

This experiential course requires active engagement. There will be few lectures and we will not be building toward an exam. Instead, we will work together to build our facilities for thinking critically about data. You should come to every class having read all of the required reading, watched the required videos, browsed the suggested resources, and so forth. You should enter the classroom prepared to discuss these materials with colleagues and complete both individual and group in-class assignments.

Grading Policy

In this course, you will determine the grade you receive by fulfilling a contract you will submit for my approval on <Friday, September 13th>.

Your written contract will detail:

- The requirements you will meet in order to receive the grade for which you've contracted,

- the penalties you will incur for not meeting those requirements,

- a calendar you will follow for meeting the requirements you have outlined.

Many aspects of this calendar will be determined by windows outlined on the course schedule, but your contract will take ownership of these deadlines while committing to specific due dates for the course's more flexible assignments.

Contract Details

To fulfill any grade contract a student must do the following, which should nonetheless be specified in the contract submitted for approval. When writing self-assessments students must describe how they have met these requirements in addition to the grade-specific requirements:

- Come to class prepared to discuss any assigned readings, videos, or other media. Participate actively in class activities and discussions, making observations and asking questions that help the class think together.

- Meet with me in person—during office hours or another scheduled time—at least once around midterm—roughly between weeks 5-8 to ensure you are on-track to meet your contract requirements, discuss any questions or concerns you have about the course or your progress, and decide on any necessary contract amendments.

- Revise contractual assignments as necessary until both you and I consider them "Satisfactory."

- Complete a final self-assessment demonstrating that your work has met the agreed requirements, submitting it to me by 5pm on the last day of class.

The professor reserves the right to award a grade of D or F to anyone who fails to meet a contractual obligation in a systematic way. A "D" grade denotes some minimal fulfilling of the contract. An "F" is absence of enough satisfactory work, as contracted, to warrant passing of the course. Both a "D" and "F" denote a breakdown of the contractual relationship implied by signing any of the contracts described above.

What About Exceptional (or Mediocre) Work?

I also reserve the right to reward exceptional work throughout the semester using the full range of Wake Forest's grading scale. If you contract for a "B," for instance, and submit particularly strong pieces to fulfill that contract, I may elect to raise your contracted grade to a "B+."

Likewise, if you consistently submit mediocre work in fulfillment of your contract, I reserve the right to adjust your grade one half-step down (e.g. from "A" to "A-") or even, in extreme cases, a full step.

Contract Adjustments

Periodically during the semester I will ask you to evaluate your work thus far and compare it against what you agreed in your grade contract. In these moments you can also take the opportunity to request an adjustment to your contract in either direction. If you find that you will be unable to meet the obligations of your contract, you may request to move to the next lowest grade and its requirements. Contrariwise, if you find that you've been performing above the obligations of your contract, you may request to fulfill the requirements for the next higher grade. Important Note: In order to effectively evaluate your own progress, you must keep track of your work, including days missed, and so forth.

Contract Grades

"A" Contract

To contract for an "A" in this course, you agree to:

- Earn "Satisfactory" on all in-class assignments save two.

- Earn "Satisfactory" on 12 self-paced lab assignments on a schedule you will specify in your contract.

- Miss no more than two classes.

- Produce at least 10 "Satisfactory" portfolio pieces over the course of the semester.

- Complete one "Satisfactory" group data problem and present it as an asynchronous presentation.

- Complete two "Satisfactory" Unessays on a schedule you will specify in your contract and present the strongest as an asynchronous presentation.

"B" Contract

To contract for an "B" in this course, you agree to:

- Earn "Satisfactory" on all in-class assignments save three

- Miss no more than three classes.

- Produce at least 8 "Satisfactory" portfolio pieces over the course of the semester.

- Earn "Satisfactory" on 10 self-paced lab assignments on a schedule you will specify in your contract.

- Complete one "Satisfactory" group data problem and present it as an asynchronous presentation.

- Complete one "Satisfactory" Unessay on a schedule you will specify in your contract and present it during the last week of class

"C" Contract

To contract for an "C" in this course, you agree to:

- Earn "Satisfactory" on all in-class assignments save four

- Miss no more than three classes.

- Produce at least 6 "Satisfactory" portfolio pieces over the course of the semester.

- Earn "Satisfactory" on 8 self-paced lab assignments on a schedule you will specify in your contract.

- Complete one "Satisfactory" Unessay on a schedule you will specify in your contract and present it during the last week of class

Course Policies

Class Engagement, Presence, and Participation.

In previous semesters, I have had a deliberately hardline attendance policy. In the light of the public health crisis, I have done away with the this policy, as it doesn't align with my general philosophy of treating students as junior colleagues. The student who misses a class meeting is responsible for any assignments and/or announcements made.

Class engagement points are given to encourage your active engagement with the material. Specific instructions for engagement, can be found on Canvas. In general, you will be rewarded with a perfect score as long as you engage meaningfully and intentionally with the material and your peers.

Life Happens (Extensions and Absences)

As a reasonable and empathetic human, I recognize that life happens. There will be times when your outside life conflicts with scheduled class events. These life events can be any of the obvious things (sports, religious holidays, illness, interviews, etc), but they can also be the less obvious, like spending the entire night looking for your lost pet. My general approach is to work with you. You just need to let me know *ahead* of time. These late policies value discussion and communication over deductions and punishment. It is difficult for me as an instructor to know your situation and reason for lateness (e.g. are you sick? did you lose wifi? struggling with mental health? or just forgot?). Without communication, I will assume that students are choosing not to submit work and do not plan on submitting work. An email will help me better understand your needs and focus on coursework. I'm more than happy to give extensions and accommodations, so don't be afraid to email me. You don't need to disclose personal details (your privacy is important to me), so a heads up or request for assistance is enough.

Excused absences

Except in the case of *true* emergencies, a possible excused absence should be discussed with me as far in advance as possible and *must* occur beforehand. You should not assume that an excused absence will automatically be granted – but you may assume that I am a reasonable, empathetic person. This discussion should occur via email. If you also discuss your situation verbally, please send a summary of the discussion via email to me. An unexcused absence will result in a zero for any graded work that should have been performed for or during the missed class.

Late Work

Be sure to pay close attention to deadlines. If an assignment is not submitted by the deadline (i.e., is late), the student must email the instructor and provide a new deadline, ask for an alternative, or explain concerns *within 36 hours* of the missed deadline. Ideally, you will have communicated with me in advance of the deadline, but on occasion life happens. As long as you've communicated within *36 hours*, I will do my best to work with you to come up with a new deadline or modification, so that you can receive full credit. This late policy does not apply to exams, tests, or quizzes.

If contact is not made *within 36 hours* of the missed deadline, the missing assignment will receive a 0. Alternative deadlines will be within one week of the original deadline. Exceptions to the 1 week policy are at the instructor's discretion. In general, I will be much more sympathetic and accommodating if you communicate in advance.

It is your responsibility to ensure that the instructor has received the assignment by the established due date and to ensure that the assignment submitted is the complete and correct version. Unless otherwise specified, all work must be submitted through Canvas.

Unless you have communicated with me in advance, there will be no make-up quizzes or tests.

Accommodations Policy

If you are (or become) disabled (in any capacity, permanently, or temporarily), and need accommodations in class, reading, or any other work in this course, please contact me to discuss your specific needs as soon as possible. Under the Americans with Disabilities Act, you are legally entitled to reasonable accommodations for disabilities. I will do everything in my capacity as your professor to ensure that you receive those accommodations.

Students who need reasonable accommodations for disabilities also should contact the Learning Assistance Center & Disability Services lac.wfu.edu. These accommodations are not retroactive. Therefore, I strongly encourage you to use those accommodations. You rightfully deserve them, both in the legal, moral, and ethical sense.

Academic Dishonesty Policy

All work submitted for credit must be the student's own and is subject to the provisions of the Wake Forest Honor Code. Details can be found at the Student Conduct web site: studentconduct. wfu.edu/honor-system-wfu. It is your responsibility to avoid even the appearance of cheating.

Unless I have explicitly stated otherwise, every assessment is closed to outside resources (including, but not limited to books, notes, phones, people). Ignorance of the honor code and assignment instructions is not an acceptable explanation and/or defense.

It is *ALWAYS* academic dishonesty to share test questions, post course materials on any third-party websites, or to work together on tests. And frankly, it is really obvious in Canvas when you work together. I literally wrote a R program that checks for working together on tests.

Violations of this policy result in a zero for the assignment, my perpetual disappointment, and possible additional penalties, including, but not limited to: - a referral to honor council, - failing the class, - forfeiting all extra credit, and - being excluding from the course curve, drop policy, late policy, and extra credit.

Communication

I ask that you provide me with the respect that I should spend my time engaging with students in meaningful ways, not pointing you to material you can find on your own. Be sure to check the syllabus, course website, course content, and classmates before emailing me. This is important training for life after college – when you have a question, the first thing you do should not be to email your boss. I do not want to discourage you from engaging with me. I love teaching because I love interacting with students. However, I do not want to engage with you in ways that nurture your inability to critically think and prevents me from engaging with other students.

Minimums

You are expected to read every LMS announcement, message, and email; as well as view the media embedded within those communications. Students are expected to check e-mail on a frequent and regular basis in order to stay current with University-related communications, recognizing that certain communications may be time-critical. At minimum, you should be checking your communications within 24 hours. Ignorance of a class communication is not grounds for an excused absence or extension.

Self Advocacy

If you are struggling in this class, please talk to me. Do not assume that I know what is going on in your life. Talk to me and tell me what you need.

Grading Questions

Please send any questions about grades in writing via email within *two* weeks after the assignment is returned. If I erred in scoring or in calculating the grade, I will happily update the record.

Otherwise, I will be most receptive toward questions framed in terms of your learning (rather than simply your performance), as research has shown that focusing overly on extrinsic rewards (like grades) is likely to lead to all sorts of outcomes that I don't wish for you (lower interest in the course material, lower learning, lower enjoyment).

Instructor Availability

I am readily accessible during business hours (9:00AM-5:30PM; Monday-Friday) via email/ LMS/ zoom/ carrier pigeon. Outside those hours, I do not typically respond to messages, in order to devote time to my family, rest, and living my life. Messages received during these times will receive attention once I am back online. Otherwise you can expect to receive a response to your message within 12 to 24 hours, often much sooner. If you do not hear back after 36 hours, please follow-up with me.

I have given out my cell-phone number, in the case of *true* emergencies. Please be mindful that poor planning on your part does not constitute an emergency for me.

Is it an true emergency?

How do you know if it is a true emergency?

- Ask yourself, would a reasonable person consider this situation an emergency?
- How would the situation change if you waited a until morning?
- Could this situation have been prevented by starting earlier?
- Would Professor Mason really want to know about this situation *right* now?
- If you were in Professor Mason's shoes, would you consider this an emergency?

Public Health in the age of COVID-19

Each of us shares responsibility for the health and safety of all in a learning space. Maintaining a consistent six feet of distance; wearing a face covering; limiting our gathering sizes; and isolating or quarantining when ill or exposed to someone with the virus are Wake Forest University directives and policies we all must follow. Students are encouraged to visit the Our Way Forward website (ourwayforward.wfu.edu) to stay informed about the latest guidance and review the Public Health Emergency Addendum to the Student Code of Conduct.

Specifically, in this room, we will mitigate the risks of virus transfer and take care of our community by abiding by the following safety directives:

- maintain six feet of distance at all times when feasible.
- wear a face covering for the entirety of class. This face covering should cover your mouth and your nose, and adhere to our University face covering policy (no face shields without masks; no neck gaiters; no bandanas; and no masks, including N95, with a one-way valve).
- stay out of class when sick or after being exposed to someone who is sick.

In this class, any student who does not follow these requirements will be asked once to follow the safety directives. I will offer you a mask or ask you to find one. If you do not comply, I will ask you to leave the class for that day. I will also refer the matter to the COVID-19 compliance reporting system. Possible disciplinary actions may follow as described in the Wake Forest University Undergraduate Student Conduct Code Public Health Emergency Addendum.

Classroom Climate

I aim to create a learning environment for my students that supports a diversity of thoughts, perspectives, and experiences, and honors your identities (including race, ethnicity, sex, gender, gender-identify, class, sexual orientation, religion, ability, political affiliation, etc.) To help accomplish this:

- If you have a name and/or set of pronouns that differ from those that appear in your official records, please let me know!

- If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. I want to be a resource for you.

- I (like many people) am still in the process of learning about diverse perspectives and identities. If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it.

- If you reached here in the syllabus, e-mail me a picture of a cat. If you do it before the end of the first week, you get a small bonus.

Department Statement

The Psychology Department values, respects, and celebrates the experiences, beliefs, and practices stemming from varied cultures and circumstances (emphasizing, but not limited to, those from historically underrepresented groups),and our deep commitment to diversity, equity, and inclusion plays out through coursework, programming by majors, and research.

Tentative Class Schedule

This syllabus is intended to give the student guidance in what may be covered during the semester and will be followed as closely as possible. Dates for tests and assignments won't change, barring extraordinary events. However, I reserve the right to modify, supplement and make changes as the course needs arise. I try to avoid changes to the syllabus. Nevertheless, if changes occur, I will only make changes that are less burdensome and more advantageous to the students. (If I make a change that increases your burden, please talk to me.)

Week 01, 01/25 - 01/29 : **What is Data Science and Meet the Toolkit**

Week 02, 02/01 - 02/05 : **Data and Visualization**

Week 03, 02/08 - 02/12 : **Grammar of data wrangling**

Week 04, 02/15 - 02/19 : **Data types and Data Transformations**

Week 05, 02/22 - 02/26 : **Tips for effective data visualization**

Week 06, 03/01 - 03/05 : **Scientific studies and confounding**

Week 07, 03/08 - 03/12 : **Web scraping**

Week 08, 03/15 - 03/19 : **Functions**

Week 09, 03/22 - 03/26 : **Data and Ethics**

Week 10, 03/29 - 04/02 : **Fitting and interpreting models**

Week 11, 04/05 - 04/09 : **Prediction and overfitting**

Week 12, 04/12 - 04/16 : **Cross validation**

Week 13, 04/19 - 04/23 : **Quantifying uncertainty**

Week 14, 04/26 - 04/30 : **Special Topics (like: Text analysis; Interactive web apps; Machine learning; Bayesian inference**

Week 15, 05/03 - 05/07 : **Special Topics**

References