Instructor Information

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Class Information

Classroom: CLCC170
Class Hours: T/TH 9:00a - 10:15a
Credits: 3
Prerequisites: None

Course Description

This course introduces social and behavioral scientists to modern data science using R, focusing on data analysis, visualization, collection, cleaning, statistical modeling, and effective communication. No prior computing or statistical skills are required. Students will start by learning to manipulate and transform data, create and recode variables, and understand data structures in R. They will develop critical thinking skills to evaluate data, identify biases, and create visualizations. The course covers debugging, code organization, documentation, and using R Markdown for reproducible analysis. Advanced topics include complex visualizations, causal relationships, and fitting linear models. In the final unit, students will learn the tidymodels framework for building and evaluating statistical and machine learning models. They will apply these skills to predict outcomes and extrapolate from data. A key component is designing an individual data science project, involving formulating research questions, finding and preparing data, visualizing data, and communicating analyses. This project includes a proposal, in-class pitches, peer reviews, and a final R Markdown document. By the end, students will have robust data science skills tailored to social and behavioral sciences, ready to tackle complex problems and communicate findings effectively.

See course schedule for full schedule of classes, holidays/breaks, exams, and assignment due-dates.

Course Content and Learning Outcomes

At the completion of this course, students will be able to:

Unit 1: "Exploring Data" (Modules 1-6)

- **Data wrangling and transformation:** Manipulate and transform data to create, transform, and recode variables.
- **Data visualization:** Create effective visualizations, improving your understanding of how to present data in a meaningful and digestible way.
- **Critical thinking:** Evaluate and interpret results from data analyses and make logical deductions, highlighting potential limitations or biases in the data or methodology.
- **Understanding of data structures:** Demonstrate proficiency in the use of basic data structures in R, including the ability to load, subset, and modify these structures to achieve desired analytical outcomes.
- **Debugging:** Resolve issues and troubleshoot problems in your code with the best use of practices like sanity checks and the use of interim outputs to verify the steps of computation.
- **Code organization and documentation:** Organize and document code effectively with the use of comments to explain what the code is doing, dividing code into logical chunks, and the use of proper naming conventions for variables and functions.
- **Use of R Markdown:** Effectively use R Markdown to integrate code, results and explanations in one document.
- **Reproducibility:** Create notebooks that are able to run from start to finish without any errors. This involves proper data loading, handling of file paths, and handling of libraries.

Unit 2: "Making Rigorous Conclusions" (Modules 7 - 8)

- **Advanced multivariate data visualization:** You will learn how to create more complex visualizations, such as for geospatial data and faceted plots visualizing relationships among more than two variables.
- **Causal inference basics:** You will learn how to think about (potential) causal relationships among variables and diagnose causal models through visualizations.
- **Statistical modeling:** You will be introduced to the concept of statistical models and gain hands-on experience fitting linear models to data. The focus is on your ability to build, interpret, and make predictions with basic statistical models. Additional emphasis will be placed on the data wrangling skills necessary to include different types of variables as predictors in linear models.

Unit 3: "Applications and Advanced Tools for Human-centric Analytics" (Module 9)

- **Introduction to `tidymodels`:** This unit focuses on learning tidymodels, a unified and consistent interface for building and evaluating statistical and machine learning models in R. The promise of tidymodels is that it reduces the complexity of the many functions and packages available for data analysis. Instead, you can use a single consistent syntax, i.e., a consistent experience, that applies to any number of models you might want to build and data pre-processing steps you might need to take.

- **Using models for prediction:** Learn how to apply the tidymodels toolkit to predict outcomes and to extrapolate from data to new scenarios.

Textbooks

There is no textbook for the course but we will be drawing from freely available online resources.

Course Access

We will be using Posit Cloud to work with the R programming language and to upload all completed assignments. You will need to log-in to the Posit Cloud using your ASURITE ID. Sign-in link will be provided during the first day of class.

Grading

Your evaluation will be based on five major components intended to test your knowledge of basic material and give you important opportunities to express your understanding through a variety of methods. These components are each weighted to reflect their importance and these weighted components are then composed together to form your final grade.

Greater detail for each component is provided in Canvas.

(1) Computing Labs (11 labs, 100 points each) [30% of total grade]

- Group assignment with R Notebooks
- Goal: Introduce you to fundamental concepts and practice learned concepts that will help you with homeworks
- Click HERE for an example of a lab from the "Data Wrangling" module

(2) Homeworks (9 homeworks, 100 points each) [30% of total grade]

- Individual assignment with R Notebooks
- Goal: Practice learned concepts and extend your knowledge beyond explicitly given instruction
- Click HERE for an example of a homework from the "Data Wrangling" module

(3) Data Science Project [20% of total grade]

- Individual assignment with R Notebooks
- Goal: Engage in the hands-on practical steps of beginning your own data science project; Emphasis on formulating research questions from the data, including how to find data, how to prepare it for evaluation, how to visualize it, and how to communicate possible analyses.
- There are several components to this assignment:

- **Proposal** (Graded for completion/participation)**: 150 points**
  - **Proposal pitches:** In-class "speed convos" with peers and instructors
  - **Proposal document:** Submit R markdown document using proposal template
  - **Proposal peer review** (requires you to be in class): **75 points**
- **Final project submission:**
  - **Project document** (submit final R Markdown document of the project) **250 points**
  - **Project peer review** (requires you to be in class) **125 points**

(4) Questions for Pre-Class Activities (9 opportunities, 20 points each) [10% of total grade]

- Individual assignment in Canvas
- Goal: Submit questions about lectures and readings (if any) to stay engaged and to clear up any misconceptions

(5) Participation (10 opportunities, 12 points each) [10% of total grade]

- Individual assignment
- We will select 10 of the live-lecture/lab-based sessions at random and give 12 points to whoever is in attendance
- Points: all or nothing (either participated or did not)

Your grade will be determined based on the following grading schema:

Grade	Percentage
A+	100 to 98%
A	< 98 to 94%
A-	< 94 to 90%
B+	< 90 to 87%
B	< 87 to 84%
B-	< 84 to 80%
C+	< 80 to 76%
C	< 76 to 70%
D	< 70 to 60%
E/F	< 60% to 0%
XE	Failure Due to Academic Dishonesty

Submitting Assignments

All assignments, unless otherwise announced, MUST be submitted to the designated area of Canvas. Please do not submit any assignments via email.

It is also your responsibility to take precautions to ensure your work is submitted correctly. If a problem arises during submission, you need to provide proper documentation. To do so, it is strongly recommended that you take a screenshot of the problem. It is also strongly recommended that you immediately reach out to Canvas support, or if the problem is with Yellowdig, that you contact their technical support and save your communications (best to do so with screenshots). A screenshot (with time stamp) will serve as confirmation and documentation that you attempted to correctly submit the assignment on time. To learn more about how to take a screenshot, visit: http://take-a-screenshot.org/.

Grading Procedure

Grades reflect your performance on assignments and adherence to deadlines. Grades on assignments will be available within 5 days of the due date. Please note that once posted, the points for an assignment are never adjusted unless an error was made by the instructor and a discussion with the student has taken place. This procedure necessarily implies that there is no "rounding up" of points to raise a grade from one letter level to another (e.g., rounding up a B- at 81.98% to 82% so a student can receive a B).

Extra Credit Policy
There will be no extra credit beyond what is already offered and extra credit cannot be used to raise a grade from an A to an A+.

Earning an A+
To earn an A+ you must score at least 98% (excluding any points earned from extra credit) OR score in the top 5% of the course (excluding any points earned from extra credit). There will always be a small subset of students who will earn an A+ every single semester.

Student Success

To be successful:

- check the course daily
- read announcements
- read and respond to course email messages as needed
- complete assignments by the due dates specified
- communicate regularly with your instructor and peers
- create a study and/or assignment schedule to stay on track

Late or Missed Assignments

Critical: The instructor DOES NOT accept late assignments. Please do not even ask. Published assignment due dates (Arizona MST) are firm. The instructor considers it an ethical violation to give an extension to a subset of students, but not to others, who experience avoidable problems. Either everyone gets an extension or no one gets an extension. We all have busy lives with a number of responsibilities. All the assignment dates are available from the first day of class. Expect the unexpected; do not wait until the last minute to turn in assignments. Many, if not all issues that might require an extension, can be avoided with the proper preparation and due diligence.

However, the instructor does make exceptions for emergencies and extenuating circumstances. To make such a request, you MUST notify the instructor BEFORE an urgent situation arises, or as SOON AS YOU CAN following the situation.

All requests MUST be submitted to the instructor by email. If approved, the extended deadline will be at the instructor's discretion.

The following are examples of emergencies and extenuating circumstances:

- Delivery of baby
- Death in the family or close friend
- Car accident
- Serious illness or injury: Remember that all ASU students can contact ASU Health Services
- Serving in the military and engaged in some military action
- An accommodation for religious practices or for University-sanctioned activities: Follow the appropriate University policies to request an accommodation for religious practices or to accommodate a missed assignment due to University-sanctioned activities

The following ARE NOT considered emergencies or extenuating circumstances:

- computer problems
- internet outages
- miscalculating the timezone
- oversleeping
- forgetting the assignment
- needing to stay late for work
- working overtime
- doing extra work
- car trouble
- child care issues
- other commitments and obligations, etc.

Communicating With the Instructor

Email
ASU email is an official means of communication among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly.
All urgent/critical instructor correspondence will be sent to your ASU email account.

Discussion Forum
For questions/ideas/discussion that might be relevant for the entire class, we will be using a discussion forum. There is a link to the forum within each of the modules. Here you will post general questions and comments about the course. You are encouraged to respond to the questions of your classmates.

Email questions of a personal nature to your instructor. You can expect a response within 72 hours.

Accessibility Statements

View the ASU Online Student Accessibility page to review accessibility statements for common tools and resources used in ASU Online courses.
If any other tools are used in this course, links to the accessibility statements will be listed below this sentence.

Syllabus Disclaimer

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. Remember to check your ASU email and the course site often.

Title IX

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling is available if you wish to discuss any

concerns confidentially and privately. ASU online students may access 360 Life Services, https://goto.asuonline.asu.edu/success/online-resources.html.