

STA 199 - Introduction to Data Science and Statistical Thinking

Fall 2023

Textbooks

All books are **freely available online**.

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|---|-------------------------------------|-----------------------------------|---|
| R for Data Science, 2e | Wickham, Çetinkaya-Rundel, Golemund | O'Reilly, 2nd edition, 2023 | Hard copy available on Amazon |
| Introduction to Modern Statistics | Çetinkaya-Rundel, Hardin | OpenIntro Inc., 1st Edition, 2021 | Hard copy available on Amazon |

Course learning objectives

By the end of the semester, you will...

- learn to explore, visualize, and analyze data in a reproducible and shareable manner using R and RStudio
- gain experience in data wrangling and munging, exploratory data analysis, predictive modeling, and data visualization
- work on problems and case studies inspired by and based on real-world questions and data
- learn to effectively communicate results through written assignments and project presentation

Course community

Duke Community Standard

As a student in this course, you have agreed to uphold the [Duke Community Standard](#) as well as the practices specific to this course.

Inclusive community

It is my intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that the students bring to this class be viewed as a resource, strength, and benefit. It is my intent to present materials and activities that are respectful of diversity and in alignment with [Duke's Commitment to Diversity and Inclusion](#). Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally, or for other students or student groups.

Furthermore, I would like to create a learning environment for my students that supports a diversity of thoughts, perspectives and experiences, and honors your identities. To help accomplish this:

- 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. If you prefer to speak with someone outside of the course, your academic dean is an excellent resource.
- 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 let me or a member of the teaching team know.

Pronouns

Pronouns are meaningful tools to communicate identities and experiences, and using pronouns supports a campus environment where all community members can thrive. Please update your gender pronouns in Duke Hub. You can learn more at the [Center for Sexual and Gender Diversity's website](#).

Accessibility

If there is any portion of the course that is not accessible to you due to challenges with technology or the course format, please let me know so we can make appropriate accommodations.

The [Student Disability Access Office \(SDAO\)](#) is available to ensure that students are able to engage with their courses and related assignments. Students should be in touch with the Student Disability Access Office to [request or update accommodations](#) under these circumstances.

Communication

All lecture notes, assignment instructions, an up-to-date schedule, and other course materials may be found on the course website: sta199-s24.github.io.

Announcements will be emailed through Canvas Announcements periodically. Please check your email regularly to ensure you have the latest announcements for the course.

Where to get help

- If you have a question during lecture or lab, feel free to ask it! There are likely other students with the same question, so by asking you will create a learning opportunity for everyone.
- The teaching team is here to help you be successful in the course. You are encouraged to attend office hours to ask questions about the course content and assignments. Many questions are most effectively answered as you discuss them with others, so office hours are a valuable resource. Please use them!
- Outside of class and office hours, any general questions about course content or assignments should be posted on the course discussion forum. There is a chance another student has already asked a similar question, so please check the other posts on the forum before adding a new question. If you know the answer to a question, I encourage you to respond!

Check out the [Help](#) tab for more resources.

Email

If there is a question that's not appropriate for the public forum, you are welcome to email me directly. **If you email me, please include "STA 199" in the subject line.** Barring extenuating circumstances, I will respond to STA 199 emails within 48 hours Monday - Friday. Response time may be slower for emails sent Friday evening - Sunday.

Lectures and labs

Lectures and labs are designed to be interactive, so you gain experience applying new concepts and learning from each other. My role as instructor is to introduce you to new methods, tools, and techniques, but it is up to you to take them and make use of them. A lot of what you do in this course will involve writing code, and coding is a skill that is best learned by doing. Therefore, as much as possible, you will be working on a variety of tasks and activities throughout each lecture and lab. You are expected to prepare for class by completing assigned readings, attend all lecture and lab sessions, and meaningfully contribute to in-class exercises and discussion. Additionally, some lectures will feature application exercises that will be graded based on completing what we do in class.

You are expected to bring a laptop, tablet, or Chromebook to each class so that you can participate in the in-class exercises. Please make sure your device is fully charged before you come to class, as the number of outlets in the classroom will not be sufficient to accommodate everyone.

TO DO: Say something about classes being recorded.

Teams

You will be assigned to a team early on in the semester. You are encouraged to sit with your teammates in lecture and you will also work with them in some of the lab sessions. All team members are expected to contribute equally to the completion of the project, and you will be asked to evaluate your team members throughout the semester. Failure to adequately contribute to any component of the project will result in a penalty to your mark relative to the team's overall mark.

You are expected to make use of the provided GitHub repository as the central collaborative platform. Commits to this repository will be used as a metric (one of several) of each team member's relative contribution for each project.

Activities & Assessment

You will be assessed based on five components: application exercises, labs, exams, project, and teamwork.

Application exercises

Parts of some lectures will be dedicated to working on Application Exercises (AEs). These exercises which give you an opportunity to practice apply the statistical concepts and code introduced in the prepare assignment. These AEs are due by the end of the week (of the

corresponding lecture period). To submit the AEs all you need to do is to push your work to your GitHub repo. **TO DO: Add specific time.**

Because these AEs are for practice, they will be graded based on completion, i.e., a good-faith effort has been made in attempting all parts. Successful on-time completion of at least 80% of AEs will result in full credit for AEs in the final course grade.

Labs

In labs, you will apply what you've learned in the videos and during lectures to complete data analysis tasks. You may discuss lab assignments with other students; however, lab should be completed and submitted individually. Lab assignments must be typed up using Quarto, all work must be pushed to your GitHub repository for the lab, and the PDF output of the lab must be submitted on Gradescope by the deadline.

Labs are due at 8 am ET on the indicated due date (generally the Monday after the lab).

The lowest lab grade will be dropped at the end of the semester.

Exams

There will be two exams in this course. Each exam will include a closed-notes in-class component and an open-note take-home component. Through these exams you have the opportunity to demonstrate what you've learned in the course thus far. The exams will focus on both conceptual understanding of the content and application through analysis and computational tasks. The content of the exam will be related to the content in videos and reading assignments, lectures, application exercises, and labs. More detail about the exams will be given during the semester.

Project

The purpose of the project is to apply what you've learned throughout the semester to analyze an interesting data-driven research question. The project will be completed with your lab teams, and each team will present their work in video and in writing during the final exam period. More information about the project will be provided during the semester.

Grading

The final course grade will be calculated as follows:

| Category | Percentage |
|-----------------------|------------|
| Labs | 40% |
| Project | 15% |
| Exam 1 | 20% |
| Exam 2 | 20% |
| Application Exercises | 2.5% |
| Teamwork | 2.5% |

The final letter grade will be determined based on the following thresholds:

| Letter Grade | Final Course Grade |
|--------------|--------------------|
| A | ≥ 93 |
| A- | 90 - 92.99 |
| B+ | 87 - 89.99 |
| B | 83 - 86.99 |
| B- | 80 - 82.99 |
| C+ | 77 - 79.99 |
| C | 73 - 76.99 |
| C- | 70 - 72.99 |
| D+ | 67 - 69.99 |
| D | 63 - 66.99 |
| D- | 60 - 62.99 |
| F | < 60 |

Five tips for success

Your success on this course depends very much on you and the effort you put into it. The course has been organized so that the burden of learning is on you. Your TAs and I will help you by providing you with materials and answering questions and setting a pace, but for this to work you must do the following:

1. Complete all the preparation work before class.
2. Ask questions. As often as you can. In class, out of class. Ask me, ask the TAs, ask your friends, ask the person sitting next to you. This will help you more than anything else. If you get a question wrong on an assessment, ask us why. If you're not sure about the lab, ask. If you hear something on the news that sounds related to what we discussed, ask. If the reading is confusing, ask.
3. Do the readings.

4. Do the lab. The earlier you start, the better. It's not enough to just mechanically plow through the exercises. You should ask yourself how these exercises relate to earlier material, and imagine how they might be changed (to make questions for an exam, for example).
5. Don't procrastinate. The content builds upon what was taught in previous weeks, so if something is confusing to you in Week 2, Week 3 will become more confusing, Week 4 even worse, etc. Don't let the week end with unanswered questions. But if you find yourself falling behind and not knowing where to begin asking, come to office hours and work with a member of the teaching team to help you identify a good (re)starting point.

Course policies

Academic honesty

TL;DR: Don't cheat!

Please abide by the following as you work on assignments in this course:

- You may discuss lab assignments with other students; however, you may not directly share (or copy) code or write up with other students. For team assignments, you may collaborate freely within your team. You may discuss the assignment with other teams; however, you may not directly share (or copy) code or write up with another team. Unauthorized sharing (or copying) of the code or write up will be considered a violation for all students involved.
- You may not discuss or otherwise work with others on the exams. Unauthorized collaboration or using unauthorized materials will be considered a violation for all students involved. More details will be given closer to the exam date.
- **Reusing code:** Unless explicitly stated otherwise, you may make use of online resources (e.g. StackOverflow) for coding examples on assignments. If you directly use code from an outside source (or use it as inspiration), you must explicitly cite where you obtained the code. Any recycled code that is discovered and is not explicitly cited will be treated as plagiarism.
- **Use of artificial intelligence (AI):** You should treat AI tools, such as ChatGPT, the same as other online resources. There are two guiding principles that govern how you can use AI in this course:² (1) *Cognitive dimension:* Working with AI should not reduce your ability to think clearly. We will practice using AI to facilitate—rather than hinder—learning. (2) *Ethical dimension:* Students using AI should be transparent about their use and make sure it aligns with academic integrity.
 - **AI tools for code:** You may make use of the technology for coding examples on assignments; if you do so, you must explicitly cite where you obtained the code. Any recycled code that is discovered and is not explicitly cited will be treated as plagiarism. You may use [these guidelines](#) for citing AI-generated content.

- **No AI tools for narrative:** Unless instructed otherwise, AI is not permitted for writing narrative on assignments. In general, you may use AI as a resource as you complete assignments but not to answer the exercises for you. You are ultimately responsible for the work you turn in; it should reflect your understanding of the course content.

If you are unsure if the use of a particular resource complies with the academic honesty policy, please ask a member of the teaching team.

Regardless of course delivery format, it is the responsibility of all students to understand and follow all Duke policies, including academic integrity (e.g., completing one's own work, following proper citation of sources, adhering to guidance around group work projects, and more). Ignoring these requirements is a violation of the Duke Community Standard. Any questions and/or concerns regarding academic integrity can be directed to the Office of Student Conduct and Community Standards at conduct@duke.edu.

Any violations in academic honesty standards as outlined in the [Duke Community Standard](#) and those specific to this course will automatically result in a 0 for the assignment/assessment as well as further reduction in the course grade (e.g., a letter grade reduction in your overall course grade) and will be reported to the [Office of Student Conduct](#) for further action.

Late work & extensions

The due dates for assignments are there to help you keep up with the course material and to ensure the teaching team can provide feedback within a timely manner. We understand that things come up periodically that could make it difficult to submit an assignment by the deadline. Note that the lowest lab assignment will be dropped to accommodate such circumstances.

- Labs may be submitted up to 3 days late. There will be a 5% deduction for each 24-hour period the assignment is late.
- There is no late work accepted for application exercises, since these are designed to help you prepare for other assessments in the course.
- There is no late work accepted for exams.
- The late work policy for the project will be provided with the project instructions.

Waiver for extenuating circumstances

If there are circumstances that prevent you from completing a lab by the stated due date, you may email the course coordinator, [Dr. Mary Knox](#), before the deadline to waive the late penalty. In your email, you only need to request the waiver; you do not need to provide explanation. This waiver may only be used **once** in the semester, so only use it for a truly extenuating circumstance.

If there are circumstances that are having a longer-term impact on your academic performance, please let your academic dean know, as they can be a resource. Please let Dr. Çetinkaya-Rundel know if you need help contacting your academic dean.

Regrade requests

Regrade requests must be submitted on Gradescope within a week of when an assignment is returned. Regrade requests will be considered if there was an error in the grade calculation or if you feel a correct answer was mistakenly marked as incorrect. Requests to dispute the number of points deducted for an incorrect response will not be considered. Note that by submitting a regrade request, the entire question will be graded which could potentially result in losing points.

No grades will be changed after the project presentations.

Attendance policy

- **COVID Symptoms, Exposure, or Infection:** Student health, safety, and well-being are the university's top priorities. To help ensure your well-being and the well-being of those around you, **please do not come to class if you have tested positive for COVID-19 or have possible symptoms and have not yet been tested.** If any of these situations apply to you, you must follow university guidance related to the ongoing COVID-19 pandemic and current health and safety protocols. If you are experiencing any COVID-19 symptoms, [contact student health \(dshcheckin@duke.edu, 919-681-9355\)](mailto:dshcheckin@duke.edu). Learn more about current university policy related to COVID-19 at <https://coronavirus.duke.edu>. To keep the university community's safe and healthy as possible, you will be expected to follow these guidelines. Please reach out to me and your academic dean as soon as possible if you need to quarantine or isolate so that we can discuss arrangements for your continued participation in class.
- **Inclement weather:** In the event of inclement weather or other connectivity-related events that prohibit class attendance, I will notify you how we will make up missed course content and work. Asynchronous catch-up methods may apply.
- **Religious accommodations:** Students are permitted by university policy to be absent from class to observe a religious holiday. Accordingly, Trinity College of Arts & Sciences and the Pratt School of Engineering have established procedures to be followed by students for notifying their instructors of an absence necessitated by the observance of a religious holiday. Please submit requests for religious accommodations at the beginning of the semester so that we can work to make suitable arrangements well ahead of time. You can find the policy and relevant notification form here: <https://trinity.duke.edu/undergraduate/academic-policies/religious-holidays>.

Note: If you've read this far in the syllabus, email me a picture of your pet if you have one or your favourite meme!

TO DO: Maybe we have them post on Discussions instead of emailing me to get them started?

Important dates

TO DO: Update dates for this semester!

- **Aug 29:** Classes begin
- **Sep 9:** Drop/add ends
- **Sep 29:** Exam 1 released
- **Oct 3:** Exam 1 due (at 2pm)
- **Oct 10-11:** Fall break
- **Nov 11:** Last day to withdraw with W
- **Nov 17:** Exam 2 released
- **Nov 21:** Exam 2 due (at 2pm)
- **Nov 23-25:** Thanksgiving recess
- **Dec 9:** Classes end
- **Dec 10-13:** Reading period
- **Dec 14-19:** Final exams

For more important dates, see the full [Duke Academic Calendar](#).