Syllabus

STAT 5731

Introduction to R for Data Science I: Basic R

- Summer 2025
- 1 Credit Hour
- Online

Course overview

Instructor

- Vincent Q. Vu, Ph.D.
- Email: vqv@stat.osu.edu

- Office hours on Zoom on Mondays 9:00 AM - 10:00 AM, except holidays
    - Schedule and meeting links on Carmen

Note: My preferred method of contact is the CarmenCanvas Inbox. When writing an email, it may be helpful to include a screenshot, but do not use a screenshot as the only form of communication. If you have a question about a specific problem, please explain in words what you are trying to do and what you have tried so far. The more context you can provide, the better I can help you. If you do not provide any context, I will reply with a very brief response, but do not interpret my brevity as a sign of rudeness or lack of interest. I am happy to help you, but I need to know what you are trying to do and what you have tried so far.

Course Description

R is a freely available statistical computing environment and programming language. It has become a dominant workhorse for modern statistical research and data analysis and has been widely adopted in industrial data analytics as well. This course is part of a sequence whose goal is to teach students how to use R effectively for doing data science – importing raw data and transforming it into insights and knowledge that can be communicated with others. Throughout the sequence, there will be an emphasis on coding practices for ensuring reliability, reproducibility, and transparency of data analyses. Part I of the sequence introduces the basic workflow and focuses on basic usage of important tools in R for visualization, transformation, and organization of data.

Course expected learning outcomes

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

1. Produce basic visualizations of data in R using the ggplot2 package.
2. Transform and summarize data in R for generating insights.
3. Organize (i.e. tidy) data in R in such a way that makes it easily amenable to visualization and analysis.
4. Import data in various tabular formats into R.
5. Organize code, data, and analyses into scripts and projects.
6. Author dynamic, reproducible documents that combine code, results, and prose with Quarto.

Generative AI tools and this course

The learning goals of this course are to help you learn how to use R for data science. This includes basic coding skills, data wrangling, and data visualization. Given that these skills are a fundamental part of becoming proficient in using R, it is important that you learn how to do them yourself.

Generative AI tools, such as ChatGPT, Gemini, and Claude, can be very powerful aids, but they are not a substitute for learning, and relying on them from the beginning can hinder your development. Importantly, these tools often produce incorrect or misleading information, and they can be overly confident in their answers. This is easy for skilled R coders and data scientists to spot, but it can be very difficult for beginners like you. So it is important that you learn how to do things yourself first, and then, after completing this course, you can use AI tools to help with tedious/non-creative aspects of your work once you become more proficient.

I do permit students to use AI tools to help with understanding concepts and debugging errors. For example, you can ask an AI tool about a specific function and its usage, or you use it help you debug your code and decipher error messages. Basically, you can use AI tools like an enhanced search engine.

However, you are not permitted to use AI tools to write code or produce text for your assignments.

If I suspect that you have used an AI tool on an assignment for this course, I will ask you to explain your process for completing the assignment in question. The unauthorized use of AI tools will result in referral to the Committee on Academic Misconduct.

The assignment and academic policies sections of the syllabus has more details on the use of AI tools in specific assignments and policies.

Prerequisites

STAT 1350, 1350.01, 1350.02, 1430, 1430.01, 1430.02, 1450, 1450.01, 1450.02, 1550, 2450, 2450.01, 2450.02, 2480, 2480.01, 2480.02, 3201, 3202, 3450, 3450.01, 3450.02, 3460, 3470, 3470.01, 3470.02, 4202, 5301, or 5302, or equiv., or graduate standing, or permission of instructor. Not open to students with credit for STAT 5730.

How this online course works

Mode of delivery

This course is 100% online. There are no required sessions when you must be logged in to Carmen at a scheduled time. I will send all important class-wide messages through the Announcements tool in Carmen. Please check your notification preferences to ensure you receive these messages.

Pace of online activities

This course is divided into weekly modules, consisting of short video lectures and assignments, that are generally released at the beginning of each week. Students are expected to keep pace with weekly deadlines but may schedule their efforts freely within that time frame.

Credit hours and work expectations

This is a 6-week, 1-credit-hour course. According to Ohio State policy, students should expect around 2 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 4 hours of homework (reading and assignment preparation, for example) to receive a grade of at least (C) average.

Participation requirements

Because this is an online course, your attendance is based on your online activity and participation. The following is a summary of students' expected participation:

Participating in online activities

You are expected to log in to the course in Carmen every week. Online activities also include watching prerecorded lecture videos and posting in Carmen discussion forums, including a weekly discussion assignment. During most weeks you will probably log in many times. If you have a situation that might cause you to miss an entire week of class, discuss it with me as soon as possible.

Office hours and live sessions (optional)

All live, scheduled events for the course, including my office hours, are optional.

Course communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

Writing style

While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation.

Tone and civility

Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online. A more conversational tone is fine for non-academic topics.

Citing your sources

When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.

Protecting and saving your work

Consider composing your academic posts in a word processor/text editor, where you can save your work, and then copying into the Carmen discussion.

Course materials and technologies

Textbooks

Required

- [**R4DS2E**] Wickham, Çetinkaya-Rundel, and Grolemund (2023): *R for Data Science*, 2nd Edition. Electronic version: r4ds.hadley.nz. This web version of the book can be accessed freely from any web browser.

Course technology

Technology support

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at it.osu.edu/help, and support for urgent issues is available 24/7.

- Self-Service and Chat support: it.osu.edu/help
- Phone: 614-688-4357(HELP)
- Email: 8help@osu.edu
- TDD: 614-688-8743

Technology skills needed for this course

- Basic computer and web-browsing skills
- Navigating Carmen
- CarmenZoom virtual meetings for optional office hours

Required Equipment

- Computer: current Mac (macOS) or PC (Windows 10) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed and tested
- Microphone: built-in laptop or tablet mic or external microphone
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Required software

Please install the **latest** versions of the following software on your computer. Even if you have installed these programs before, it is a good idea to check for updates. I will not provide support for outdated software.

- **R** https://cloud.r-project.org
- **RStudio** Desktop IDE https://posit.co/download/rstudio-desktop
- **Quarto** https://quarto.org/docs/get-started

Carmen Access

You will need to use BuckeyePass multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click Enter a Passcode and then click the Text me new codes button that appears. This will text you ten passcodes good for 365 days that can each be used once.

- Download the Duo Mobile application to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

Grading and instructor response

How your grade is calculated

Assignment Category	Points and/or Percentage
Participation	10%
Homework	60%
Final Exam	30%
Total	**100%**

Description of major course assignments

Participation

- Description

  You are expected to watch all lectures. The lectures will be delivered asynchronously and posted on the Carmen course webpage. There will be a discussion assignment associated with each module.

Students will be divided into discussion groups in which they will be prompted to post an answer to one of the "quiz" prompts from lecture, share an example of applying a technique, e.g. creating a plot, or modify an example shown in the lecture. The prompt will vary from module to module, and groups will be shuffled every 3 modules. The purpose of these assignments is to keep you engaged with the weekly pace of the material and to see what other students have shared. However, you will not see other students' posts until you have made one yourself. This is a low stakes assignment that will be graded complete/incomplete and not based on correctness. You will be allowed to drop one such assignment from your grade.

- Academic integrity and collaboration guidelines

  Discussion posts should be your own work. They will generally require you to repeat an example or answer a question posed in the lecture videos. These assignments will be graded based on completion rather than correctness. You may not use AI tools to write these discussion posts.

Homework

- Description

  Homework will be assigned (approximately) weekly, will be due on announced dates and will be graded. Learning to compute and program requires practice. Homework assignments will mainly consist of exercises designed to reinforce the concepts covered in class during the previous week.

- Academic integrity and collaboration guidelines

  You may collaborate with classmates on your homework, but ultimately the code that you write and submission that you make must be your own work. For example, I encourage you to discuss strategies for solving problems, but the actual code and explanations that you write must be your own. Moreover, keep in mind the university policies on plagiarism. Do not copy or plagiarize anything

you may find on the Internet or anything produced by an AI tool. You may use generative AI tools, e.g. ChatGPT, Claude, Gemini, etc... to help you understand concepts, like. For example, you can ask an AI tool about a specific function and its usage. However, you are not permitted to use of AI tools to write code or produce text for you. In particular, you should not use AI tools to write code for your homework assignments.

Any collaboration or use of AI tools must be acknowledged in the disclosures section of your homework submission.

Final Exam

- Description

  There will be a "take home" final exam during the last week of the course. It will involve R programming and data analysis/visualization. The exam will be designed to take about 3 hours to complete, but it will be untimed so that you will have several days to complete it. Additional information about the exam will be announced on Carmen.

- Academic integrity and collaboration guidelines

  The exam is an individual assignment. You should complete the exam on your own and your submission should be your own original work. You should not discuss it with anyone else. The use of AI tools is not allowed at all.

Late assignments

Late homework assignments will automatically receive a 10 percentage point deduction each day that they are late. After the 5th day submissions will no longer be accepted. All other assignments (discussion and final exam…) will not be accepted after the due date. Please pay attention to the exact date and time that an assignment is due. For example, if an assignment is due at 11:59:00 PM, and you submit it at 10 seconds after at 11:59:10 PM, then it will be considered late.

If you absolutely need to turn in an assignment late and have a valid excuse, please contact me for the necessary arrangements. However, you must notify me **in advance** in such a situation. Exceptions to this policy will be permitted only in extreme situations such as serious injury immediately prior to an assignment being due or severe illness requiring hospitalization.

Grading Scale

- 93-100: A
- 90-92: A-
- 87-89: B+
- 83-86: B
- 80-82: B-
- 77-79: C+
- 73-76: C
- 70-72: C-
- 67-69: D+
- 60-66: D
- Under 60: E

> ⓘ Instructor feedback and response time
>
> Please use the discussion board in Carmen for questions about the course material and assignments. If you have a question that is personal or that you would like to discuss privately, please email me. I will respond to questions posted on the discussion board or by email within 24 hours (except for weekends and university holidays). If you would like to meet with me over Zoom, please message me to set up an appointment.

Grading and feedback

For weekly assignments, you can generally expect feedback and grades within 10 days.

Preferred contact method

If you have an individual or sensitive question, please contact me through my Ohio State email address–not Carmen messages. I will reply to emails within 24 hours on days when class is in session at the university.

Academic policies

Academic misconduct

See Descriptions of major course assignments, above, for my specific guidelines about collaboration and academic integrity in the context of this online class.

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule

3335-5-487). For additional information, see the Code of Student Conduct: http://studentlife.osu.edu/csc/.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct web page <go.osu.edu/coam>
- Ten Suggestions for Preserving Academic Integrity <go.osu.edu/ten-suggestions>

Copyright for instructional materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at https://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Commitment to a diverse and inclusive learning environment

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Land acknowledgement

We would like to acknowledge the land that The Ohio State University occupies is the ancestral and contemporary territory of the Shawnee, Potawatomi, Delaware, Miami, Peoria, Seneca, Wyandotte, Ojibwe and Cherokee peoples. Specifically, the university resides on land ceded in the 1795 Treaty of Greeneville and the forced removal of tribes through the Indian Removal Act of 1830. I/We want to honor the resiliency of these tribal nations and recognize the historical contexts that has and continues to affect the Indigenous peoples of this land.

More information on OSU's land acknowledgement can be found here: https://mcc.osu.edu/about-us/land-acknowledgement

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily

activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Accessibility accommodations for students with disabilities

Requesting accommodations

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the Safe and Healthy Buckeyes site for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Religious accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination

or harassment based on religion, individuals should contact the Office of Institutional Equity.

Policy: Religious Holidays, Holy Days and Observances

Course Schedule

Refer to our Carmen course page for up-to-date assignment due dates.

Week	Date	Topics/Readings/Assignments
1	5/6	Module 1: Introduction to R, RStudio and very basic Quarto
1	5/6	Reading: *R4DS2E Introduction, 2, 28.1–.5.1*
1	5/12	Module 2: Basic visualization with ggplot2
1	5/12	Reading: *R4DS2E 1*
2	5/13	**Homework 1 due**
2	5/19	Module 3: Data transformation and summarization
2	5/19	Reading: *R4DS2E 3*
3	5/20	**Homework 2 due**
4	5/27	Module 4: Good coding style; Good data style — data tidying

Week	Date	Topics/Readings/Assignments
4	5/27	Reading: *R4DS2E 4–5*
4	5/27	**Homework 3 due**
4	6/2	Module 5: Scripts and projects; Data import
4	6/2	Reading: *R4DS2E 6–8*
5	6/3	**Homework 4 due**
5	6/9	Module 6: From data to analysis to final product with Quarto
5	6/9	Reading: *R4DS2E 28–29*
6	6/10	**Homework 5 due**
6	6/11	Final Exam opens
6	6/13	**Final Exam due**