

Data Visualization with R

PMP 8551/4551 • Fall 2025



Instructor

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Course details

- Any day
- August 25–December 15, 2025
- Asynchronous
- Anywhere

Contacting me

- [Schedule an appointment](#)
- [Discord](#)

Course objectives

Data rarely speaks for itself. On their own, the facts contained in raw data are difficult to understand, and in the absence of beauty and order, it is impossible to understand the truth that the data shows.

In this class, you'll learn how to use industry-standard graphic and data design techniques to create beautiful, understandable visualizations and uncover truth in data.

By the end of this course, you will become (1) literate in data and graphic design principles, and (2) an ethical data communicator, by producing beautiful, powerful, and clear visualizations of your own data. Specifically, you should:

- Understand the principles of data and graphic design
- Evaluate the credibility, ethics, and aesthetics of data visualizations
- Create well-designed data visualizations with appropriate tools
- Share data and graphics in open forums
- Feel comfortable with R
- Be curious and confident in consuming and producing data visualizations

This class will expose you to **R**—one of the most popular, sought-after, and in-demand statistical programming languages. Armed with the foundation of R skills you'll learn in this class, you'll know enough to be able to find how to visualize and analyze any sort of data-based question in the future.

Important pep talk!

I *promise* you can succeed in this class.

Learning R can be difficult at first—it's like learning a new language, just like Spanish, French, or Chinese. Hadley Wickham—the chief data scientist at RStudio and the author of some amazing R packages you'll be using like `{ggplot2}`—[made this wise observation](#):

It's easy when you start out programming to get really frustrated and think, "Oh it's me, I'm really stupid," or, "I'm not made out to program." But, that is absolutely not the case. Everyone

gets frustrated. I still get frustrated occasionally when writing R code. It's just a natural part of programming. So, it happens to everyone and gets less and less over time. Don't blame yourself. Just take a break, do something fun, and then come back and try again later.

Even experienced programmers find themselves bashing their heads against seemingly intractable errors. If you're finding yourself taking way too long hitting your head against a wall and not understanding, take a break, talk to classmates, e-mail me, etc.



Allison Horst
@allison_horst

Troubleshooting lessons I guess I'll just relearn forever:

- take a break
- it's almost certainly not a bug
- extra eyes are awesome
- spelling

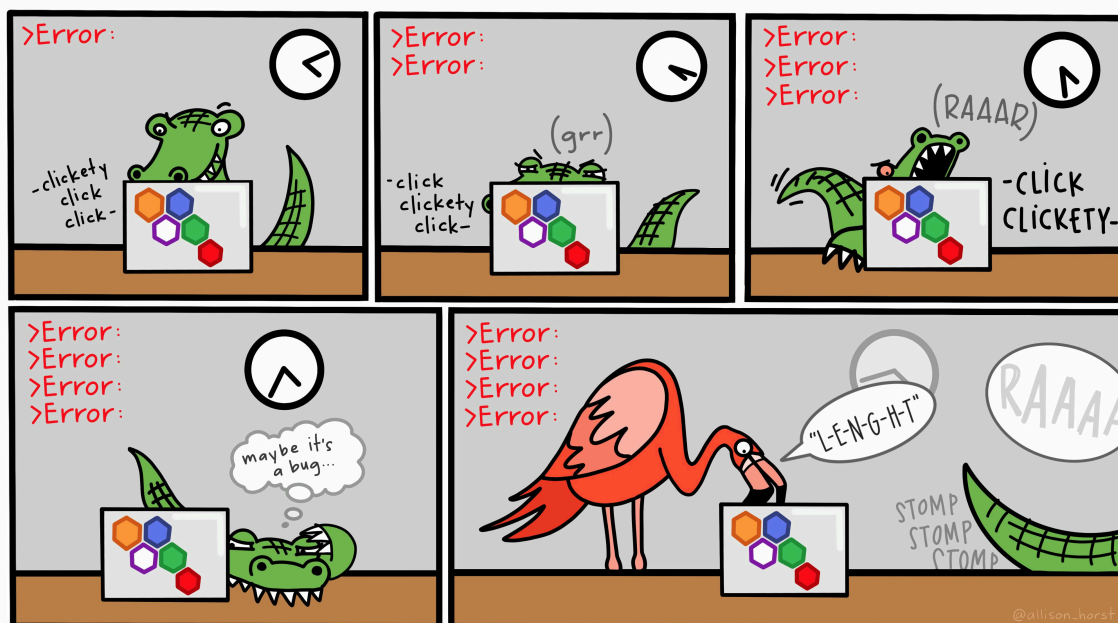


Figure 1: Allison Horst: Gator error

Course materials

All of the readings and software in this class are **free**. There are free online versions of all the textbooks, R and RStudio are inherently free, and you can use **free vector editing software**.

Books, articles, and other materials

We'll rely heavily on these books, which are all available online (**for free!**). I recommend getting the printed versions of these books if you are interested, but it is not required.

- Alberto Cairo, *The Truthful Art: Data, Charts, and Maps for Communication* (Berkeley, California: New Riders, 2016). \$20 used, \$50 new at [Amazon](#).

A **free** eBook version is available through GSU's library through O'Reilly's Higher Education database. The easiest way to access it is to visit a special URL (<http://go.oreilly.com/georgia-state-university>), log in with your GSU account, and then search for "The Truthful Art".

- Kieran Healy, *Data Visualization: A Practical Introduction* (Princeton: Princeton University Press, 2018), <http://socviz.co/>. **FREE** online; \$20 used, \$40 new at [Amazon](#).
- Claus E. Wilke, *Fundamentals of Data Visualization* (Sebastopol, California: O'Reilly Media, 2018), <https://serialmentor.com/dataviz/>. **FREE** online; \$36 used, \$50 new at [Amazon](#). An eBook version is also available through [the O'Reilly database](#), but you can just use [the online version](#).

There will occasionally be additional articles and videos to read and watch. When this happens, links to these other resources will be included on the content page for that session.

R and RStudio

You will do all of your analysis with the open source (and free!) programming language **R**. You will use **RStudio** as the main program to access R. **Think of R as an engine and RStudio as a car dashboard**—R handles all the calculations produces the actual statistics and graphical output, while RStudio provides a nice interface for running R code.

R is free, but it can sometimes be a pain to install and configure. To make life easier, you can (and should!) use the free [Posit.cloud](#) service, which lets you run a full instance of RStudio in your web browser. This means you won't have to install anything on your computer to get started with R! We will have a shared class workspace in Posit.cloud that will let you quickly copy templates for examples, exercises, and mini projects.

Posit.cloud is convenient, but it can be slow and it is not designed to be able to handle larger datasets or more complicated analysis and graphics. You also can't use your own custom fonts with Posit.cloud. Over the course of the semester, you'll probably want to get around to installing R, RStudio, and other R packages on your computer and wean yourself off of Posit.cloud. This isn't 100% necessary, but it's helpful.

You can [find instructions for installing R, RStudio, and all the tidyverse packages here](#).

Online help

Data science and statistical programming can be difficult. Computers are stupid and little errors in your code can cause hours of headache (even if you've been doing this stuff for years!).

Fortunately there are tons of online resources to help you with this.

Class community on Discord

We have a class Discord server where anyone in the class can ask questions and anyone can answer. The invitation to the server is on iCollege since that's a password protected place and I want the server to be limited to only students in the class.

I will monitor Discord regularly and will respond quickly. (It's one of the rare Discord servers where I actually have notifications enabled!) Ask questions about the readings, exercises, and mini projects.

You'll likely have similar questions as your peers, and you'll likely be able to answer other peoples' questions too.

Online communities

If you use Bluesky or Mastodon or Threads or LinkedIn, post R-related questions and content with `#rstats`. The R community is exceptionally generous and helpful.

Searching for help with R on Google can sometimes be tricky because the program name is, um, a single letter. Google is generally smart enough to figure out what you mean when you search for "r scatterplot", but if it does struggle, try searching for "rstats" instead (e.g. "rstats scatterplot"). Also, since most of your R work will deal with `{ggplot2}`, it's often easier to just search for that instead of the letter "r" (e.g. "ggplot scatterplot").

You can also check out the [Posit Community](#), a forum specifically designed for people using RStudio and the tidyverse (i.e. you).

AI, LLMs, BS, and vibe coding

I *highly recommend* **not** using ChatGPT or similar large language models (LLMs) in this class.

I am deeply opposed to LLMs for writing.

I am kinda opposed to LLMs for code, but I am deeply opposed to them for beginners at code.

By definition, LLMs and other AI tools cannot produce truth (or even lies). They generate **bullshit**¹—a formal philosophical term that refers to text or speech that has no regard for truth.²

[Please read this](#) to better understand how LLMs circumvent the writing and learning process.

Do not replace the important work of writing with AI BS slop. The point of writing is to help crystalize your thinking. Chugging out words that make it look like you read and understood the content will not help you learn. Chugging out code that you hope works is **vibe coding** and it will not help you learn.

A key theme of the class is the search for truth. Generating useless content will not help with that.

In your session check-ins and assignments, I want to see good engagement with the readings. I want to see your thinking process. I want to see you make connections between the readings. I want to see your personal insights. I don't want to see a bunch of words that look like a human wrote them. That's not useful for future-you. That's not useful for me. That's a waste of time.

I will not spend time trying to guess if your assignments are AI-generated.³ If you do turn in AI-produced content, I won't automatically give you a zero. I'll grade your work based on its own merits. I've found that AI-produced content will typically earn a ✓– (50%) or lower on my check-based grading system without me even needing to look for clues that it might have come from an LLM.

¹I'm a super straight-laced Mormon and, like, never ever swear or curse, but in this case, the word has a formal philosophical meaning (Harry G. Frankfurt, *On Bullshit* (Princeton University Press, 2005)), so it doesn't count :)

²Michael Townsen Hicks, James Humphries, and Joe Slater, "ChatGPT Is Bullshit," *Ethics and Information Technology* 26, no. 2 (2024): 38, <https://doi.org/10.1007/s10676-024-09775-5>; Frankfurt, *On Bullshit*.

³There are tools that purport to be able to identify the percentage of a given text that is AI, but they do not work and result in all sorts of false positives.

Remember that text generated by these platforms is philosophical bullshit. Since it has nothing to do with truth, it will not—by definition—earn good grades.

Course schedule

We have no regularly scheduled meeting times.

Instead, 100% of the class content is asynchronous. You can do the readings and watch the videos on your own schedule at whatever time works best for you. Many of you work full time and you have childcare and parental care responsibilities, leaving you with only evenings for coursework. I've designed this asynchronous system with *you specifically* in mind. I also can only really do teaching work at night when my kids are in bed—I recorded all these videos between like 10 PM and 2 AM. We're all in similar pandemic boats.

Each week has (1) a set of readings and an accompanying lecture, (2) a lesson, (3) an example with lots of reference code, and (4) a short assignment. The [schedule page](#) provides an overview of all these moving parts.

I recommend following this general process for each session:

- Do everything on the content page ()
- Work through the lesson page ()
- Complete the assignment () while referencing the example ()

Learning in troubled times

Life still sucks right now. None of us is really okay. **We're all just pretending.**

You most likely know people who have lost their jobs, have been hospitalized, or have even died (I myself know people in all those categories). You all have increased (or possibly decreased) work responsibilities and increased family care responsibilities—you might be caring for extra people (young and/or old!) right now, and you are likely facing uncertain job prospects (or have been laid off!). You might know neighbors, relatives, or friends who have been detained or deported. You might face an uncertain legal future yourself.

I'm fully committed to making sure that you learn everything you were hoping to learn from this class! I will make whatever accommodations I can to help you finish your problem sets, do well on your projects, and learn and understand the class material. Under ordinary conditions, I am flexible and lenient with grading and course expectations when students face difficult challenges. During these troubled times, that flexibility and leniency is intensified.

If you tell me you're having trouble, I will not judge you or think less of you. I hope you'll extend me the same grace.

You *never* owe me personal information about your health (mental or physical). You are *always* welcome to talk to me about things that you're going through, though. If I can't help you, I usually know somebody who can.

If you need extra help, or if you need more time with something, or if you feel like you're behind or not understanding everything, **do not suffer in silence!** Talk to me! I will work with you. **I promise.**

Please sign up for a time to meet with me during student hours at <https://calendly.com/andrewheiss/>. I'm also available through e-mail and Discord. I've enabled notifications on my Discord account, so I'll see your messages quickly!

I want you to learn lots of things from this class (Graphic design! Fancy charts! R! ggplot!), but I primarily want you to stay healthy, balanced, and grounded during these chaotic, awful times.

Course policies

Be nice. Be honest. Don't cheat.

We will also follow [Georgia State's Code of Conduct](#).

This syllabus reflects a plan for the semester. Deviations may become necessary as the course progresses.

Student hours

Please watch [this video](#): (*this is not me, btw—this is a different Andrew*)

Student hours are set times dedicated to all of you (most professors call these “office hours”; I don't⁴). This means that I will be waiting for you to talk to me (in person or remotely) with whatever questions you have. This is the best and easiest way to find me and the best chance for discussing class material and concerns.

Since my schedule is often chaotic⁵ I don't have official permanently-set student hours every week. Instead, the best way to meet with me is to [make an appointment with me here](#). You can choose an online or in-person slot—if you choose an online slot, the confirmation e-mail will contain a link for a Webex meeting. You can also find me through e-mail and Discord.

Late work

My general philosophy towards late work is that I don't care if stuff is late—if you turn it in, great! In past versions of this class (and other of my classes), I would have no late penalties and accept late work until the very end of the semester.

While many students have appreciated the flexibility of this system, I've received *a lot* of feedback from students that such a system actually hurts them. With total freedom and no hard deadlines, lots of people put off assignments until the end and then end up not learning much and feel incredibly stressed for weeks and weeks.

So to counter this, **I use kinda-sorta-hard-ish deadlines** to help you stay on schedule but also provide flexibility when needed.

⁴There's fairly widespread misunderstanding about what office hours actually are! [Many students often think that they are the times I *shouldn't* be disturbed](#), which is the exact opposite of what they're for!

⁵Shuttling 5 kids around to different sports and music lessons, parenting while my wife is in her classes (she's a PhD student at UGA), meeting and traveling for research, and so on

You will lose 0.5 points per day for each day an exercise is late. This is designed to not be a huge penalty (3 days late = 18.5/20 points on an exercise/session check-in that gets a ✓), but instead is a commitment device to help you stay on schedule.

I will (typically) not accept work that is more than two weeks late. Again, this is not designed to be punitive—this is to help keep you on schedule. Being four or five weeks behind will only make you fall even more behind. HOWEVER if you have extenuating circumstances, I'm more than happy to accommodate. Just check in with me and let me know what's up.

Counseling and Psychological Services (CPS)

Life at GSU can be complicated and challenging (especially during a pandemic!). You might feel overwhelmed, experience anxiety or depression, or struggle with relationships or family responsibilities. **Counseling and Psychological Services (CPS)** provides free, *confidential* support for students who are struggling with mental health and emotional challenges. The CPS office is staffed by professional psychologists who are attuned to the needs of all types of college and professional students. Please do not hesitate to contact CPS for assistance—getting help is a smart and courageous thing to do.

Basic needs security

If you have difficulty affording groceries or accessing sufficient food to eat every day, or if you lack a safe and stable place to live, and you believe this may affect your performance in this course, please contact the **Dean of Students** for support. They can provide a host of services including free groceries from the **Panther Pantry** and assisting with homelessness with the **Embark Network**. Additionally, please talk to me if you are comfortable in doing so. This will enable me to provide any resources that I might possess.

Lauren's Promise

I will listen and believe you if someone is threatening you.

Lauren McCluskey, a 21-year-old honors student athlete, **was murdered on October 22, 2018 by a man she briefly dated on the University of Utah campus**. We must all take action to ensure that this never happens again.

If you are in immediate danger, call 911 or GSU police (404-413-3333).

If you are experiencing sexual assault, domestic violence, or stalking, please report it to me and I will connect you to resources or call **GSU's Counseling and Psychological Services** (404-413-1640).

Any form of sexual harassment or violence will not be excused or tolerated at Georgia State. GSU has instituted procedures to respond to violations of these laws and standards, programs aimed at the prevention of such conduct, and intervention on behalf of the victims. Georgia State University Police officers will treat victims of sexual assault, domestic violence, and stalking with respect and dignity. Advocates on campus and in the community can help with victims' physical and emotional health, reporting options, and academic concerns.

Academic honesty

Violation of **GSU's Policy on Academic Honesty** will result in an F in the course and possible

disciplinary action.⁶ All violations will be formally reported to the Dean of Students.

Special needs

Students who wish to request accommodation for a disability may do so by registering with the [Office of Disability Services](#). Students may only be accommodated upon issuance by the Office of Disability Services of a signed [Accommodation Plan](#) and are responsible for providing a copy of that plan to instructors of all classes in which accommodations are sought.

Students with special needs should then make an appointment with me during the first week of class to discuss any accommodations that need to be made.

Assignments and grades

You can find descriptions for all the assignments on the [assignments page](#).

Assignment	Points	Percent
Session check-ins (15 × 10)	150	22.1%
Exercises (15 × 10)	150	22.1%
#TidyTuesday	30	4.4%
Mini project 1	75	11.0%
Mini project 2	75	11.0%
Final project	200	29.4%
Total	680	100.0%

Grade	Range	Grade	Range
A	93–100%	C	73–76%
A–	90–92%	C–	70–72%
B+	87–89%	D+	67–69%
B	83–86%	D	63–66%
B–	80–82%	D–	60–62%
C+	77–79%	F	< 60%

Recipes

Once you have read this entire syllabus and [the assignments page](#), post your favorite recipe (either a link or the text) to the [#recipes](#) channel on Discord. I love cooking ([see here for a feed of some of my cooking adventures](#)) and I'm always on the lookout for new things!

⁶So seriously, just don't cheat or plagiarize!

Schedule

Foundations		
Session 1	August 25–August 29	Truth, beauty, and data + R and tidyverse
	September 2	Assignment for session 1 due (<i>due by 11:59 PM</i>)
Session 2	September 2–September 5	Graphic design
	September 8	Assignment for session 2 due (<i>due by 11:59 PM</i>)
Session 3	September 8–September 12	Mapping data to graphics
	September 15	Assignment for session 3 due (<i>due by 11:59 PM</i>)
Core types of graphics		
Session 4	September 15–September 19	Amounts and proportions
	September 22	Assignment for session 4 due (<i>due by 11:59 PM</i>)
Session 5	September 22–September 26	Themes
	September 29	Assignment for session 5 due (<i>due by 11:59 PM</i>)
Session 6	September 29–October 3	Uncertainty
	October 6	Assignment for session 6 due (<i>due by 11:59 PM</i>)
Session 7	October 6–October 10	Relationships
	October 13	Assignment for session 7 due (<i>due by 11:59 PM</i>)
Session 8	October 13–October 17	Comparisons
	October 20	Assignment for session 8 due (<i>due by 11:59 PM</i>)
Project	October 20	Mini project 1 due (<i>due by 11:59 PM</i>)
Special applications		
Session 9	October 20–October 24	Annotations
	October 27	Assignment for session 9 due (<i>due by 11:59 PM</i>)
Session 10	October 27–October 31	Enhancing graphics
	November 3	Assignment for session 10 due (<i>due by 11:59 PM</i>)
Session 11	November 3–November 7	Interactivity
	November 10	Assignment for session 11 due (<i>due by 11:59 PM</i>)
Session 12	November 10–November 15	Space
	November 17	Assignment for session 12 due (<i>due by 11:59 PM</i>)
Project	November 17	Mini project 2 due (<i>due by 11:59 PM</i>)
Session 13	November 17–November 21	Time

	December 1	Assignment for session 13 due (<i>due by 11:59 PM</i>)
Project	November 24–November 28	Thanksgiving break!
Session 14	December 1–December 5	Text
	December 8	Assignment for session 14 due (<i>due by 11:59 PM</i>)
Conclusions		
Session 15	December 8–December 9	Truth, beauty, and data revisited
	December 9	Assignment for session 15 due (<i>due by 11:59 PM</i>)
Project	December 9	Final deadline for #TidyTuesday creation (<i>due by 11:59 PM</i>)
Project	December 15	Final project due (<i>due by 11:59 PM</i>)