



**STAT 041: Topics in Applied Statistics**  
**Statistical Graphics and Data Visualization**  
**January 2021**

<b>MEETINGS:</b>	MTWR	11am-12pm ET (Discussion) 1pm-2pm ET (Lab)
<b>PROFESSOR:</b>	Amanda Luby Office Hours:	aluby1@swarthmore.edu TBD
<b>WEBSITE:</b>	<a href="https://swarthmore.edu/NatSci/aluby1/stat041">https://swarthmore.edu/NatSci/aluby1/stat041</a>	
<b>SOFTWARE:</b>	R, free download from <a href="https://www.r-project.org/">https://www.r-project.org/</a> RStudio, free from <a href="https://www.rstudio.com/">https://www.rstudio.com/</a>	

**COURSE DESCRIPTION**

Graphical displays of information can improve our understanding of both data and statistical models. Data Visualization has become a key component in decision-making about everything from the COVID-19 pandemic to sports analytics to climate change. While these visualizations can help synthesize complex phenomena into a single graph, we have also been inundated with maps, charts, and diagrams that often present conflicting conclusions. Drawing heavily from contemporary examples including the COVID-19 pandemic and 2020 election results, this course will cover common forms of data visualization and their uses and misuses.

In this course, you will learn how to create, critique, and present graphics in a concise and statistically sound way. Topics include: common data types and visualizations in R using the ggplot2 package; incorporating statistical concepts such as transformations, smoothing, and uncertainty into visualizations; interactive graphics; and non-traditional types of data such as time series, maps, networks, or text.

You will leave the course having built a portfolio of static and interactive visualizations, statistical writing, and presentations. This is a project-based course, and you are encouraged to bring additional ideas for datasets and research questions.

## COURSE OBJECTIVES

I guarantee you will be asked to create, critique, or interpret a data visualization in your first two years after graduation. By the end of this course, you should be able to:

- Demonstrate an understanding of fundamental concepts of data visualization
- Create technically sound and aesthetically pleasing visualizations of data and statistical model results using R and ggplot2
- Critique existing data visualizations according to principles of data visualization in a constructive way
- Communicate findings through writing and presentations

## COURSE COMPONENTS

*COURSE MEETINGS:* There will be four synchronous course meetings per week (MTWR). Course meetings will combine: large and small group discussion, R demonstrations, and brief presentations.

*LABS:* There will be four asynchronous data visualization labs per week (MTWR). Each lab will include both guided and open-ended exercises, and include a short write-up that is due on Sunday.

*MINI-PROJECTS:* Each week, you will also complete a mini-project to apply concepts learned in class to a dataset of your choosing. You should work on these throughout the week, and mini-projects are due on Sundays.

*FINAL PROJECT:* The final project includes a paper and presentation component and will be due at the end of the course. A “milestone” will be due each Sunday to help you stay on track and work on it throughout the course.

## GRADING POLICIES

This is a portfolio-building course with no quizzes, exams, or problem sets. Each of you are coming to the course with a different set of skills, background knowledge, and interests. We are also trying to teach and learn in a pandemic and economic crisis that is impacting folks in different ways. I want you to use this January to learn new skills, try new techniques, explore topics you are interested in, and create products you are proud of. Given the unique setting of this course, I don't think a usual percentage-based grading scheme is conducive to these goals.

Labs will be graded on a completion basis (satisfactory or needs improvement), and projects will be graded on a mastery basis (excellent, satisfactory, or needs improvement). Each project will include guidelines to meet an excellent or satisfactory grade. You can re-submit each project or lab once. If you need an extension, just let me know. Please understand that work turned in after the due date may not be graded in a timely manner.

Final course grades will be assigned based on the following:

- A: Excellent mini and final projects; 90%+ satisfactory labs
- B: Some combination of satisfactory and excellent mini and final projects; 80%+ satisfactory labs
- C: Satisfactory mini and final projects; 70%+ satisfactory labs
- D: No more than 1 “needs improvement” mini-project; 60%+ satisfactory labs

“+” and “-” grades will be assigned at the discretion of the instructor based on attendance, participation, and improvement throughout the course.

### **ACADEMIC INTEGRITY**

I encourage you to work on labs with others, but you should write up your solutions on your own. I also encourage you to try to solve R errors or coding problems on your own, including using resources on the internet. Cheating, copying, etc will not be tolerated; please ask if you are unsure of whether or not your actions are complying with the lab or project instructions. Always default to acknowledging any help received.

### **DIVERSITY AND INCLUSION**

We value diversity and inclusion, and are committed to a climate of mutual respect and full participation in and out of the classroom. This class strives to be a learning environment that is usable, equitable, inclusive and welcoming, regardless of race, ethnicity, religion, gender and gender identities, sexual orientation, ability, socioeconomic background, and nationality. If you anticipate or experience any barriers to learning, please discuss your concerns with me.

### **RESOURCES**

*ACCOMMODATIONS:* If you believe you need accommodations for a disability or a chronic medical condition, please contact Student Disability Services at [studentdisabilityservices@swarthmore.edu](mailto:studentdisabilityservices@swarthmore.edu) to arrange an appointment to discuss your needs. As appropriate, the office will issue students with documented disabilities or medical conditions a formal Accommodations Letter. Since accommodations require early planning and are not retroactive, please contact Student Disability Services as soon as possible. For details about the accommodations process, please visit the Student Disability Services website (<http://www.swarthmore.edu/academic-advising-support/welcome-to-student-disability-service>). You are also welcome to contact me privately to discuss your academic needs. However, all disability-related accommodations must be arranged, in advance, through Student Disability Services.

*ACADEMIC SUPPORT COORDINATOR:* Danielle Ledford, our department's friendly neighborhood Academic Support Coordinator, is a terrific resource - she is happy to set up appointments with you ([dledfor1@swarthmore.edu](mailto:dledfor1@swarthmore.edu)) if you feel you need extra support.

*TITLE IX:* Please be aware that all faculty are “responsible employees”, which means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking, I **must** share that information with the Title IX Coordinator. Although I have to make this notification, you will control how your case will be handled, including whether or not you wish to meet with the Title IX coordinator or pursue a formal complaint.

*COUNSELING AND PSYCHOLOGICAL SERVICES:* If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, I strongly encourage you to seek support. Counseling and Psychological Services (CAPS) is here to help: call [610-328-7768](tel:610-328-7768) to speak with a licensed counselor at anytime or visit their website at [swarthmore.edu/counseling-and-psychological-services](http://swarthmore.edu/counseling-and-psychological-services) to schedule an appointment. Consider reaching out to me, a friend, faculty or family member you trust for help getting connected to the support that can help.

And finally....

**Take care of yourself.** Do your best to maintain a healthy lifestyle this January by wearing a mask, eating well, exercising, avoiding excessive drug and alcohol use, getting enough sleep and taking some time to relax. Your mental health is more important than your grade in this course. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. If you are experiencing mental health symptoms as a result of coursework, please speak with me so we can address the problem together.