STA 404/504A Advanced Data Visualization

Spring 2025, Miami University

1- Instructional Information

Class Meeting Times and Locations
• STA 404/504 A: MW 10:05 AM- 11:25 AM, UPH 314

Instructor

Dr. Mahsa Ashouri
Office: DSB 356
E-mail: ashourm@miamioh.edu

Office Hours: Mon 01:00 PM - 03:00 PM, Wed 01:00 PM - 02:00 PM, or by appointment.
Note**:** Office hour is not a time to work through the assignments together with the instructor or GA. Please work on the assignments by yourselves first, then ask questions after your careful thinking.

Graduate Assistant

Reece Fannon
Email: fannonre@miamioh.edu
GA Office Hour∗: TBA

Course Website

The two sections B and C have been cross-listed. You can use Canvas (https://miamioh.instructure.com/courses/228713) for all necessary class-related documents, including course material, data and code files, assignments and announcements, etc.

2- Course Information

Prerequisite

STA 261, 301, 368, 671, IMS 261, ISA 205, 225, or permission of the instructor. A willingness to work, previous programming experience in R.

Learning Objectives

- IDENTIFY appropriate visualization methods for different data characteristics, audiences, and goals.
- USE appropriate software tools to PRODUCE their own data visualizations.
- COMMUNICATE clearly, efficiently, and in a visually compelling manner with data visualizations.
- INTEGRATE narratives and data visualization.
- CRITIQUE static and interactive data visualizations based on design principles, statistical characteristics, and narrative quality.

Threads of Course

There are a few primary threads that are woven throughout the course: Data Science, Graphical Aesthetics, Technology and Narrative. Course material as well as assignments will balance these threads. It is understood that students come in with differing levels of strength and experience in each of these threads. I will do my best to level the playing field in early lectures and tutorials. However, students should expect to engage in self-directed learning in areas they deem deficient. The instructor is more than willing to guide and coach them. It's worth noting that faculty are always learning as well.

Topics and Tentative Plan of the Semester

Topics	Time
Module 1: Data and Basic Visualization Methods	Week 1 - Week 6
Module 2: Design Principles and Advanced Static Plots	Week 7 - Week 11
Module 3: Dynamic Plots	Week 12 - Week 15

3- Course Material

Materials in Class

Notebook and laptop computers

Textbook

- Wilke, C. O. –Fundamentals of Data Visualization [available through lib.miamioh.edu]
- Knaflic, C. N. – Storytelling with Data [available through lib.miamioh.edu]
- Chang, W. – R Graphics Cookbook [available through lib.miamioh.edu, also at https://r-graphics.org/]

Software

R and RStudio will be the primary tools.

- R
- Rstudio
- RStudio is also available on computers on campus, through the Stat App Portal and an internal RStudio server.
- Getting started with R and RStudio tutorial

Supplementary Resources

1- Data Visualization Books

- Visualize This – Nathan Yau
- The Visual Display of Quantitative Information – Edward Tufte
- Graphics of Large Datasets – Unwin, Theus and Hofmann
- Show Me the Numbers – Stephen Few
- Beautiful Evidence – Edward Tufte
- Visualize Explorations – Edward Tufte

2- Online Platforms

- Flowing Date
- Visual Complexity
- Data is Beautiful Sub-Reddit
- NY Times-Open

3- R resources

- R Short Reference Card
- R coding topic cheat sheets
- Datacamp
- swirl R coding tutor
- Codeschool Try R
- Coding Style Guide (by Hadley)

4- Course Content

Readings and Tutorials

There may be some readings and technology tutorials assigned during the course, they are expected to be done before the specified deadline.

Classroom Participation

The class periods will consist of lectures, demonstrations, work time and discussion. Most classes will have at least one exercise or quiz designed to teach the technology/how to data visualization and to reinforce the conceptual material covered.

Homework

Throughout the semester there will be individually completed homework assignments that relate to material from course lectures. Grades for homework assignments will be based upon the quality, technical accuracy, interpretation, aesthetics, reproducibility, documentation and other aspects of the submitted work. All the homework will be due at 11:59pm, EST. Late assignments will not be accepted without prior approval.

“In-class” Assignments

“In class” assignments, such as lecture related surveys, exercise, quizzes and small activities may be given. For specific weeks, especially if there are other activities, there may be no “in-class” assignment. Further, some activities may be interactive where you are expected to provide feedback on the visual displays created by me and your classmates. No makeup will be given unless the absence was previously excused. The lowest grade will be dropped.

Project 1: Static Display - Solo Project

Each student will create a visualization that reveals a compelling story through a visual display that is aesthetically appropriate. The documentation and R code need to be thorough, clean, and efficient. The accompanying write-up must carry a coherent, accurate, and data-supported narrative. An individual presentation will be submitted by each student. Project1 is going to be introduced around the middle of the semester. There are many stages for the project, details will be introduced later.

Project 2: Interactive Display - Group Project

In lieu of a final exam, groups will be formed to combine efforts towards an interactive visual display (i.e., a dashboard). The interactivity needs to add significant value beyond what could be accomplished in a static visualization. Group members will work together through meetings and evaluate each other's contribution to the final product once it’s done. Instructor will evaluate the group project displays, narratives, etc by looking at the final presentations by each group. Project 2 is going to be introduced towards the end of the semester. There are many stages for the project, details will be introduced later.

Graduate Project (for STA 504 students only)

Graduate students taking the course have additional expectations and responsibilities. Specifically, they will be held to a higher standard on homework and assignments, on occasion there may be graduate-specific problems on assignments and quizzes. As part

of the final exam, they will complete an additional individual project related to their graduate research. The graduate project is going to be introduced around the middle of the semester. Details will be introduced later.

5- Grading

Your final grade will be comprised of the following elements:

STA 404	STA 504
30% Homework	30% Homework
20% In-class assignments	20% In-class assignments
20% Project 1	20% Project 1
30% Project 2	20% Project 2
	10% Graduate Project

Letter grades (percentages reflect the minimum requirement for a particular letter grade):

98% A+	73% C
93% A	70% C-
90% A-	67% D+
87% B+	63% D
83% B	60% D-
80% B-	<60% F
77% C+	

6- Expectations

Attendance

No student, faculty, staff member who is ill or has been in close contact with an individual who has tested positive for COVID-19 should attend class or come to campus. Instructors will, without prejudice, provide students with reasonable opportunities for completing missed work. However, students are ultimately responsible for material covered in class, regardless of whether the student is absent or present. If your absence is of significant duration or severity, as your instructor, I will advise you about other options that might be available including assigning an incomplete grade or requesting a medical withdrawal. The pace of this class is such that it will not be advisable to miss any sessions. If you know you will be absent, please inform the instructor in advance. When you are absent, it will be your responsibility to refer to the course website, contact the instructor, or another student for the notes and announcements. Please let the instructor know in advance if you will be absent for a certain class or leave earlier.

- You are expected to be an active participant for the entire class.
- Please respect your classmates and instructor.

Classroom Environment

- The course is designed to encourage active participation on the part of students.
- Classroom discussion and critiques are conducted in an atmosphere that encourages interaction and mutual respect.
- Be mindful of differences – that is, we all come from a variety of experiences

Teamwork

- You will be working in teams for the final project.
- Be responsible to each other.
- Accept full responsibility for your professional performance and the performance of your team.
- You will have the opportunity to evaluate your team members as they will have the opportunity to evaluate you.

Backup

This course will rely heavily on computer work. No allowance will be made for personal computer or network failures. Be sure to back up your work frequently, and do not wait until the last minute to complete the assignment.

Academic Integrity

All Miami University policies concerning academic integrity apply to this course. See http://miamioh.edu/integrity/index.html for details. For this course, the most relevant areas are 1)

Turning in your own work for the assignments. Even if you work with other students as a study group, your submissions should not be similar to others; and 2) Working on projects with your own work.

Disabilities, Diversity, and Discrimination

If you need specific accommodations, please let me know and I will be glad to make necessary accommodations for your learning. For more information, see the Office of Student Disability Resources (www.units.muohio.edu/oeeo/odr/). Respecting each person in the class is important.
Please see http://miamioh.edu/diversity-inclusion/about/statement/ and http://miamioh.edu/about-miami/pubs-policies/non-discrimination/.

Important Dates

• No classes: March 24-30 (Spring Break).
• Academic deadlines: February 13 is the last day to drop without a grade; April 7 is the last day to drop from the course with “W” and also the last day to change to/from an audit;