

Scientific Visualization

CSCI 297b, Spring 2023

April 24, 2023

csci297b Scientific Visualization

- Instructor: Geoffrey Matthews gmatthews@wlu.edu
- <https://github.com/geofmatthews/csci297b>
- MTWRF, 10:30 AM - 12:30 PM, Parmly 405
- Office hours: 9:30 MWF and by appointment

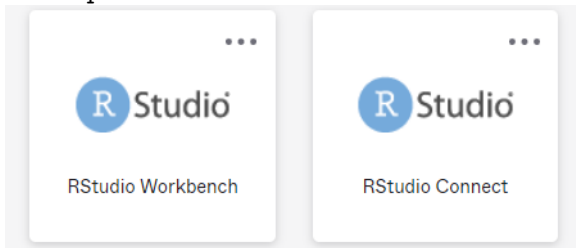
A bit about me and you

Online resources

- <https://www.r-project.org/> **R home**
- **Books**
 - <https://alexdi106.github.io/intro2R/index.html> An Introduction to R
 - <https://rbasics.netlify.app/index.html> Getting Used to R, RStudio, and R Markdown
 - <https://moderndive.netlify.app/index.html> A ModernDive into R and the Tidyverse
 - <https://rstudio-education.github.io/hopr/> Hands-On Programming with R
 - <https://bookdown.org/rdpeng/rprogdatascience/> R Programming for Data Science
 - <https://datasciencebook.ca/> Data Science: a First Introduction
 - <https://r4ds.had.co.nz/> R for Data Science
 - <https://ggplot2-book.org/> ggplot2: Elegant Graphics for Data Analysis
 - <https://clauswilke.com/dataviz/> Fundamentals of Data Visualization
 - <https://www.tmw.r.org/> Tidy Modelling with R
 - <https://bookdown.org/yihui/rmarkdown/> Rmarkdown: the Definitive Guide
- **Other**
 - <https://www.w3schools.com/r/default.asp> R tutorial
 - <https://education.rstudio.com/learn/beginner/> R Studio Education Links
 - <https://posit.cloud/learn/primers> Online primers
 - <https://rladiessydney.org/> Video tutorials
 - <https://rmarkdown.rstudio.com/> Rmarkdown videos

RStudio Workbench and Connect

`https://rstudioworkbench.wlu.edu/`



Installing R and RStudio on your own computer

- <https://www.r-project.org/>
- <https://posit.co/download/rstudio-desktop/>

Our textbooks

- <https://alexdl06.github.io/intro2R/index.html>
An Introduction to R
- <https://r4ds.had.co.nz/>
R for Data Science
- <https://clauswilke.com/dataviz/>
Fundamentals of Data Visualization

Schedule

Date	Day	Lab		Principles
		intro2r	RfDS2e	FoDV
2023-04-24	Monday	1		
2023-04-25	Tuesday	2		1,2,3
2023-04-26	Wednesday	2		4,5
2023-04-27	Thursday	3		6,7
2023-04-28	Friday	3		8
2023-05-01	Monday	4		9,10
2023-05-02	Tuesday	4		11,12
2023-05-03	Wednesday	5		13,14
2023-05-04	Thursday	5		15
2023-05-05	Friday	8		16
2023-05-08	Monday	8		17
2023-05-09	Tuesday		10	18,19
2023-05-10	Wednesday		10	20,21
2023-05-11	Thursday		11	22
2023-05-12	Friday		11	23,24,25
2023-05-15	Monday		12	26,27
2023-05-16	Tuesday		12	28,29
2023-05-17	Wednesday	Student presentations		
2023-05-18	Thursday	Student presentations		
2023-05-19	Friday	Student presentations		

Final Exam

Student presentations

- Each student will prepare a presentation on a dataset that interests them.
- Each presentation will feature at least five graphs.
- Presentations will be done in Rmarkdown.
- There will be a class presentation by the student during the final days of class.

Daily Schedule

Time	Activity
10:30	Lecture on R and in-class exercises
11:40	Break
11:50	Graph of the Day
11:55	Lecture & Discussion on Fundamentals
12:30	Class ends

Graph of the Day

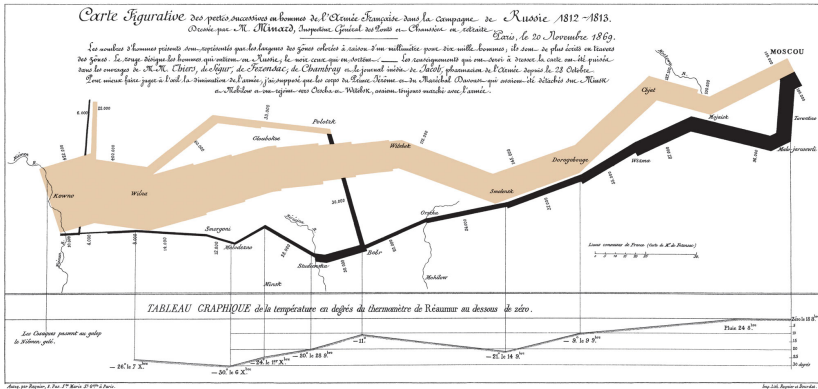
- Every day we will have a student presentation of the “Graph of the Day”
- You will select a graph from the internet that is particularly bad, good, or interesting in some way.

Ugly graphs

- <https://flowingdata.com/category/visualization/ugly-visualization/>
- <https://www.pinterest.com/simonlafosse6/ugly-dataviz/>
- <https://www.reddit.com/r/dataisugly/>
- <https://www.businessinsider.com/the-27-worst-charts-of-all-time-2013-6>
- <https://venngage.com/blog/bad-infographics/>
- https://www.usu.edu/math/symanzik/talks/2021_SouthwestMichiganChapter.pdf
- <https://getdolphins.com/blog/the-worst-graphs-of-2017/>
- <https://analytical.com/blog/examples-of-awful-data-visualization>

Set up ugly graph schedule

Good graphics



Good graphics

- <https://www.perceptualedge.com/>
- <https://www.edwardtufte.com/tufte/>
- <https://www.youtube.com/watch?v=jbkSRLYSojo>
- Hans Rosling's 200 countries, 200 years, 4 minutes

Good graphics

- <https://www.perceptualedge.com/>
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- Hans Rosling's 200 countries, 200 years, 4 minutes
- What are some issues that could use clarification?

Visualization vs. Statistics

Visualization

- Exploration
- Communication
- Persuasion

Statistics

- Confirmation
- Data transformations
- Data summaries

Your Brain

- 90% of the information transmitted to the brain is visual
- The human brain can process an image in just 13 milliseconds
- 50% of the brain is active in visual processing
- Human brains process visuals 60,000 times faster than they do text
- 93% of communication is nonverbal
- We are exposed to 5x more information today than we were in 1986

Sources: <https://blog.csgsolutions.com/15-statistics-prove-power-data-visualization>

Communication

- High quality infographics are 30x more likely to be read than plain text
- People who follow directions with illustrations do 323% better than those who follow text-only directions
- If a scientific claim is presented in pure words or numbers, 68% of people will believe that the information is accurate and truthful. But if you put a simple graph with the claim, the number rises to 97%
- The Wharton School of Business found that while only half of an audience was convinced by a purely verbal presentation, that number jumped to over two thirds when visuals were added

Sources: <https://blog.csgsolutions.com/15-statistics-prove-power-data-visualization>