DANA 320 - Section 801 - Fall 2023
Data Visualization

Class: Online, asynchronous
Instructor: Colton Gearhart (colton.gearhart@bsu.edu; You can expect a response to emails within 24 - 48 hours)
Office Hours: TR 12:00 – 1:00 PM or by appointment, Office RB 411; **Please make appointment for office hours**

Credit Hours: 3
Prerequisite: CS 120 and MATH 181 or MATH 221 or MATH 320

Course Description: Introduction to data visualization concepts and techniques. Topics include principles of visualization design, visualization for a variety of data types, and practical experience communicating information using visualizations.

Course Rationale: Data visualization allows people to better understand data via visual perception. This course is designed to introduce students to the principles of effective visualization design, including basics of human perception, tailoring visualizations to the data at hand, and avoiding common visualization pitfalls. Course activities will give students practical experience designing visualizations to communicate information to their audiences.

Course Objectives: Upon successful completion of the course, students will be able to:
- Recognize traits of effective visualization
- Prepare data for visualization
- Select a visualization format that suits the data
- Create data visualizations using commonly available software packages
- Present data visualizations to communicate with audience

Course Content:
- Basics of human perception and how/why we visualize
- Graphics components for data visualization, such as colors, geometric objects, and fonts
- Various data types for visualization (numerical, categorical, time series, statistical data, etc.)
- Spatial and temporal visualization with the grammar of graphics including coordinate systems, facets, and scale
- Graph/network visualization
- Interactive data visualization
- Data dashboards

Course Materials: Students will need access to the following texts and software (additional download instructions will be provided when appropriate); all other course materials will be provided through canvas:
- Nussbaumer Knaflic, C. *Storytelling with data* (C. N. Knaflic, Ed.). John Wiley & Sons, 2015
- Grolemund, G., Mine , C.R., & Wickham, H. *R for Data Science (2e)*. O'Reilly Media, 2023
- Microsoft Excel
- Tableau (https://www.tableau.com/)
- R (https://cran.r-project.org/)
- RStudio (https://posit.co/download/rstudio-desktop/)

Additional Resources: For those of you searching for supplementary reading materials to better understand data visualization, I have compiled a short list of additional resources. In addition, more software-specific additional resources will be given where appropriate.
- Data Visualization Books – *Visualize This* (Nathan Yau), *Data Visualization Made Simple* (Kristen Sosulski)
- Online Platforms for Discussing and Sharing Data Visualizations – flowingdata.com, visualcomplexity.com, reddit.com/r/dataisbeautiful

Class Structure: This is an online, asynchronous course where students work on their own time but with scheduled due dates. It consists of 3 modules plus an introduction module, each containing several sections. Modules and sections will be released as the semester progresses. Each section includes videos to follow along with, a lab activity or discussion post, and a homework assignment. In addition, weekly readings and corresponding quizzes will be assigned continuously throughout the semester. The students will be expected to participate regularly in assigned course activities.

Reading Check Quizzes: Reading Check Quizzes will account for 10% of the course grade and serve to check that the assigned readings were completed. Readings will explore data visualization principles and specific techniques.

Labs, Discussion Posts and DataCamps: Lab activities, discussion posts and DataCamp assignments together will account for 25% of the course grade. The lowest Lab activity will be dropped (Discussion Posts and DataCamps cannot be dropped). The Lab activities are mainly designed to practice content from the lessons; discussion posts provide students the opportunity to discuss ideas from the course; and DataCamps serve as interactive lessons with built in learning checks.

Homework: Homework assignments will account for 40% of the course grade. The lowest score of these assignments will be dropped. The homework assignments are mainly designed to extend and apply content from the lessons.

Group Project: Students will work collaboratively on a final project that will account for 25% of the course grade. Interactive data visualizations and cooperative storytelling will be emphasized. Students will conduct peer reviews, which will factor in the final grade for the project.

Late work: Late assignments will not be graded and therefore receive a zero. An exception to this policy will be considered for legitimate circumstances that are presented to me (via e-mail or in person) *at least two days before the due date*.

This course will rely heavily on computer work. No allowance will be made for personal computer, software, or network issues. Content has been chosen so that all students will have free access to all necessary resources. Be sure to back up your work frequently, and do not wait until the last minute to complete the assignment. To back up a file, save it first to your local device, then save it to a remote drive such as OneDrive or Google Drive. Email to yourself is a simple option.

Grading: Your final grade will be comprised of the following elements:

- Reading Check Quizzes: 10%
- Labs, Discussion posts and DataCamps: 25%
- Homework: 40%
- Group Project: 25%

Letter grades:

$[97-100]$	A+	$[87-90)$	B+	$[77-80)$	C+	$[67-70)$	D+	<60	F
$[93-97)$	A	$[83-87)$	B	$[73-77)$	C	$[63-67)$	D		
$[90-93)$	A-	$[80-83)$	B-	$[70-73)$	C-	$[60-63)$	D-		

I may lower the grade thresholds, but will not raise them.

Academic Integrity: Homework assignments and Labs are to be completed by each student individually, however discussion of assigned materials is permitted between students. This means that you may collaborate in the process of learning concepts or finding solutions, but the assignment must be a product of your own efforts. Direct copying of text or code from a peer's assignment will not be tolerated.

The group project will require only a single submission per group and students will be required to evaluate the contributions made by all group members to the final product. If your group members indicate that your effort was insufficient, then your project score will be adjusted accordingly.

Plagiarism: The work you submit must be yours. Example code and templates are good starting points for your work, and can be used IF PROPER CREDIT IS GIVEN. You MUST cite any reference for code, web pages, or other sources you use.

Requesting help: The Homework and Labs are essential to success in this class because they are where you will practice the most with the software. Learning will come from spending time with the trying lots of things, see what works and just as important, what doesn't work and why. This is the best way to learn any new software. I am happy to help you with the assignments, but it is in your own best interest to work on a problem for a while before you come for help, even if you are stuck on it.

Disability Statement: Do not hesitate to contact me with any questions or concerns. If you need course adaptations or accommodations because of a disability, please contact me as soon as possible. Ball State's Disability Services Office coordinates services for students with disabilities; documentation of a disability needs to be on file in that office before any accommodations can be provided. Disability Services can be contacted at 765-285-5293 or dsd@bsu.edu.

If you are experiencing mental health concerns, telehealth services are available – here is a link to the Counseling Center website.

Diversity Statement: *Ball State University aspires to be a university that attracts and retains a diverse faculty, staff, and student body. We are committed to ensuring that all members of the community are welcome, through valuing the various experiences and worldview represented at Ball State and among those we serve. We promote a culture of respect and civil discourse as expressed in our* Beneficence Pledge *and through university resources found* here.

Important Links: Covid-19 Quick Links, Cardinals Care Pledge, Student Academic Ethics Policy, Code of Student Rights and Responsibilities

Important Dates: There is no class on Labor Day, Monday, September 4. Fall Break is October 9-10. Thanksgiving Break is November 22 – 26. The course withdrawal period ends Monday, October 30, 2023 at 5:00pm. Before this date, students can elect to receive a "W" by completing and submitting the proper form. The instructor's permission is not required. For details see https://www.bsu.edu/about/administrativeoffices/registrar/registration-activities/withdraw-from-classes as well as Degree Requirements and Time Limits in the current Undergraduate Catalog OR Withdrawal Procedures in the current graduate catalog.