Data Visualization for Environmental Science
ESM 439 – Winter 2024

Class times: Tuesdays 5:00–7:30 pm, January 9 – February 6, 2024
(5 meetings)
Class location: BH 1424
Final project due February 6

Instructor: Stacy Rebich Hespanha, PhD
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Office Hours: by appointment via Zoom

Description: This course will focus on basic principles for effective communication through data visualization. Students who complete the course will deepen their understanding of how people perceive and interpret graphical representations, and will learn about information visualization frameworks they can apply to design intuitive and impactful data visualizations. Beyond effective visualization design, we will explore 'storytelling with data' -- integration of visual elements and text in a way that is clear, concise and engaging. Class time will consist of brief periods of lecture interspersed with small group and whole group discussions, peer critiques, and hands-on data visualization activities. Assignments will involve applying such frameworks and concepts in critique of existing visualizations, and in creation of data visualizations using Tableau. Assignments will not require experience with a coding environment or use of programming languages, but students already proficient with such tools may use them to complete course assignments, if desired. Students may use this short course to prepare and receive feedback on data visualizations that will be useful for other coursework or projects.

Format: Each class meeting will include a lecture / discussion portion and a hands-on portion, with a short break approximately halfway through the meeting time.

Computing Requirements: Students should plan to install Tableau Desktop and Tableau Prep Builder on their own computers to use for completing certain class assignments. Information about how to download and install Tableau products (including software activation key) will be available via Canvas. Students may also complete many assignments (including the final project) using computing tools of their choice (e.g., R).

COURSE READINGS / VIDEOS
TBA, will be provided through Canvas

Data visualization sample & beginning-of-course survey: *to be completed by January 8th*
Enrolled students will receive information and reminders through Canvas.

- **Submit data visualization and data:** Students should provide a data visualization they have created, along with a brief description of the data upon which it is based, the intended user (or viewer) and the purpose of the visualization. Students will benefit the most from this exercise if the data visualization they submit presents key information relevant to a topic or dataset they would like to analyze and/or communicate about. ***Students are encouraged to submit materials they have***

created as part of other courses or projects; creation of new materials is not necessary.
- **Complete a short survey:** Students input provided via a brief survey will be used to tailor the focus of the course. Questions will focus on goals/expectations for the course, current use of data visualization tools, and data visualization skill self-assessment. This survey will be available online prior to the first week of class, and must be submitted by January 8.

ASSIGNMENTS
All assignments will be submitted digitally via Canvas. Detailed assignment descriptions will also be available through Canvas.

Grading
This is a grading-optional course. Students who choose S/U grading will receive an S if they earn at least 70% of the possible points for class assignments. Grades will not be curved, and will be based on the number of points earned through weekly assignments and a final project.   Detailed information about grading (including re-submission and extra credit options) will be available on Canvas.

	Due Date	Value
Sample data visualization	January 8	5 points
Pre-course survey	January 8	5 points
Observing your visualization in action assignment	January 15	10 points
Choosing dataset and audience assignment	January 22	10 points
Design brief assignment	January 29	20 points
Visual storytelling: final project	February 5	30 points

Final Project: Visual Design and Storytelling *– due Feb 5*
Students choose a dataset (of their own, or one provided by instructor), create one or more data visualizations based on this data, and apply visual storytelling techniques to combine visualization and text in a way that tells an engaging story about the topic of interest. This project may be a re-design and elaboration upon the sample data visualization submitted at the beginning of the course, or may be based upon any other dataset that is relevant to the student's interest. Students may choose the format in which to prepare their visual storytelling artifact – written documents, web pages, posters, slide decks, and video recordings are all acceptable.

SCHEDULED TOPICS AND ACTIVITIES

Week 1: Visual Perception and Cognition; Principles of Visual Design
- Lecture & discussion: Designing for humans; visual perception and cognition; visualization critiques
- Hands-on activities: Create a variety of simple data visualizations using Tableau

Week 2: Visual Variables and Visual Design Patterns
- Lecture & discussion: Visual variables, basic chart types, principles of visual communication
- Hands-on activities: Clean up and connect to data using Tableau Prep; subset and visualize connected data using Tableau

Week 3: Accessibility & Visual Storytelling
- Lecture & discussion: Visual narrative and storytelling techniques; designing for accessibility
- Hands-on activities: Create a multi-visualization and/or interactive dashboard or 'story' in Tableau

Week 4: Dashboard & Infographic Design
- Lecture & discussion: Dashboard and interactivity design principles; visual and interactivity critiques
- Hands-on activities: Annotate and beautify your dashboard / story; build in accessibility features

Week 5: Final Projects and Beyond!
- Lecture & discussion: Student project presentations and peer feedback
- Hands-on activities: 'Hacky' reverse engineering with Tableau Public