

Data Communication and Visualization

CAS NS 330 (3 credits)

Course Catalog Description:

Information visualization strategies and associated software, emphasizing communication to diverse audiences. Select between geospatial (GIS) and qualitative data foci. Develop graphics and/or multimedia products supporting research projects in concurrent courses. Compile iterative digital portfolio.

Instructor: Dr. Benjamin Harden (SEA)

Location: Virtual (1 week), SEA campus in Woods Hole, MA (3 weeks), Catalina Island, CA (2 weeks), At sea aboard the SSV Robert C Seamans (6 weeks)

Prerequisites: Admission to SEA Semester. Sophomore standing or consent of instructor.

Course Philosophy and Approach:

Research projects begin with questions, which we attempt to answer through collecting and analyzing information. How we then share that data and our conclusions is the subject of this course. Effective and engaging communication skills enable us to convey complex information to a diverse audience both orally and in print. Students will be introduced to two different ways to communicate information – through data visualization and radio communication.

In data visualization, students will be given an introduction to organizing and visualizing data in the R programming. Student will learn a variety of techniques for visualizing data, develop graphic design decision-making skills, and undertake a project to visualize and contextualize data relevant to their oceanography research project.

As an introduction to radio communication, students will explore the theory and mechanics of writing for their voices and considerations around what strategies to choose for communicating different topics. They will then produce a short radio segment to communicate some aspect of their work in oceanography.

Students will also apply these communication skills to the generation of a scientific research poster that will describe the proposed work they will conduct at sea.

The culmination of this work will be the group production of an ArcGIS story map which will explain our voyage in a variety of formats.

Learning Outcomes:

1. Understand and demonstrate how to read, process, and visualize plain text data in R.
2. Become familiar with plotting options including time series, comparative plots and geospatial mapping in R.

3. Understand basic audience requirements for an effective radio communication piece
4. Demonstrate an effective use of communication strategies to present topics pertinent to climate change to a broad audience.
5. Be able to justify choices around data visualization and communication strategies.

Course Requirements

1. Punctual attendance is required at every class meeting. Please see instructor well in advance if you anticipate needing to miss a class.
2. Active participation in class, both speaking and listening, is expected.
3. The policy on academic accuracy, quoted below, will be strictly followed in this class.

*The papers that you submit in this course are expected to be **your original work**. You must take care to distinguish your own ideas and knowledge from wording or substantive information that you derive from one of your sources. The term "sources" includes not only published primary and secondary material, but also information and opinions gained directly from other people and text that you cut and paste from any site on the Internet.*

The responsibility for learning the proper forms of citation lies with you.

Quotations must be placed properly within quotation marks and must be cited fully. In addition, all paraphrased material must be acknowledged completely. Whenever ideas or facts are derived from your reading and research, the sources must be indicated. (Harvard Handbook for Students, 305)

Considerations for use of internet sources: *As you browse websites, assess their usefulness very critically. Who posted the information and why? Can you trust them to be correct? Authoritative? Unbiased? (It's okay to use a biased source as long as you incorporate it knowingly and transparently into your own work.) Keep track of good sources that might be useful for subsequent assignments, and annotate in your bibliography any sites you cite. Your annotation should include the name of the author or organization originating any material that you reference. If you can't identify the source, don't use it!*

Structure

The class is broken into three topics: "Visualize", "Design" and "Communicate". Each topic will be comprised of a number of modules, each with 4 levels to complete for students to learn different aspects of Data Visualization and Communication and demonstrate their understanding. Each section also has a culminating project.

Visualize

- **Modules:** Students will learn how to use the R programming language through 3 modules:
 - o Introduction to R: Some basics on how to use R and import data
 - o Plotting Data: How to produce a variety of plots

- Customizing Plots: How to make changes to your graphic design for more effective communication
- *Culminating Project*: Students will demonstrate their understanding by applying this knowledge to produce a visualization and accompanying text of oceanographic data pertinent to their research project.

Design

- *Modules*: Students will develop understanding of data and graphic design best practices in the following module:
 - Data Design: Some skills for how to make plots and posters effectively
- *Culminating Project*: Effective design and evaluation of their research proposal poster

Communicate

- *Modules*: Effective oral communication of scientific knowledge and climate change will be taught in two modules:
 - Writing for Voice: Basic mechanics of effective vocal communication on the radio
 - Storytelling: Going beyond the information to carve a narrative from data
- *Culminating Project*: Students will develop a short radio piece that will aim to explain a scientific concept/story/process to a general audience.

For a full class description including details of the self-paced model and breakdown of assessment, visit the class website: <https://s301dcv.netlify.app/>

Assessment

Visualize Modules	22.5%
Visualize Project	15%
Design Modules	7.5%
Design Project	15%
Communicate Modules	15%
Communicate Project	15%
At-sea Story Map Contribution	10%

Readings and Resources

Tufte, E.R. 2001. *The Visual Display of Quantitative Information*, 2nd edition. Graphics Press: Cheshire, CT. 197p.

Wickham, H. and Grolemund, G. 2017. *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data*, 1st edition, O'Reilly Media. 552p.

Healy, K. 2018. *Data Visualization: A Practical Introduction*. 1st Edition, Princeton University Press. (<https://socviz.co/>)

Cairo, A. 2016. *The Truthful Art: Data Charts and Maps for Communication*. 1st edition. New Rides. 382p.

Center for Research on Environmental Decisions (CRED), and ecoAmerica. Connecting on Climate: A Guide to Effective Climate Change Communication. New York and Washington, D.C. 2014. (https://www.flagstaff.az.gov/DocumentCenter/View/61117/EcoAmerica-CRED_Connecting-on-Climate_2014?bidId=)

Kern, J. 2008. Sound Reporting: The NPR Guide to Audio Journalism and Production. 1st edition. Univ. of Chicago Press. 380p.

Richman, J. and Allison, J. 2017. Radio Diaries: DIY Handbook. 1st edition. Radio Diaries. 45p (<http://radiohandbook.org/>)

Transom: A Showcase and Workshop for New Public Radio. www.transom.org. Accessed 12 Nov 2019.