



School of Information
144 West 14th Street, 6th floor
New York, NY 10011-7301

INFORMATION VISUALIZATION

Section: INFO-658-02
Semester: Spring 2021
Meeting Information: Thursdays, 6:30-9:20pm
Location: Online
Credits: 3
Prerequisites: INFO-654 or [waiver](#)

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COURSE DESCRIPTION

This course examines the art, science, and practice of information visualization. Particular emphasis is placed on the ways in which position, shape, size, brightness, color, orientation, texture, and motion influence perception of information and facilitate comprehension and analysis of large and complex bodies of information. Topics include cognition and visual perception; the aesthetics of visual media; techniques for processing and manipulating information for the purpose of visualization; studies of spatial, relational, multivariate, time-series, interactive, and other visual approaches; and methods for evaluating information visualizations.

COURSE GOALS & LEARNING OUTCOMES

The goals of this course are to:

- explore theoretical, practical, and aesthetic perspectives on information visualization
- examine cognitive and other research relevant to perception and information processing
- develop familiarity with a wide variety of visual representations, with particular emphasis on selecting appropriate representations based on data and audience
- build skills in planning, developing, and evaluating information visualizations

By the end of this course, students will be able to:

- critically discuss information visualizations in light of current research and practice
- make reasonable design choices in the context of various tasks, communications goals, and constraints of data and technology
- transform data into meaningful and effective visualizations using current software and tools

REQUIRED TEXTS & COURSE WEBSITE

Claus O. Wilke, *Fundamentals of Data Visualization* (O'Reilly 2019). <https://serialmentor.com/dataviz>

Additional readings are available on the course website at <https://pratt.instructure.com/courses/7675>

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COURSE FORMAT

This course will be predominantly asynchronous, meaning that you are responsible for consulting course materials and managing your own work (and time), within the broad framework of the course schedule. We will meet online synchronously during the first class (for introductions) and last class (for project presentations) and in pairs more routinely to share work and provide feedback. Attendance during scheduled labs is recommended but not required.

Throughout the semester, we'll cycle through several types of visualizations, beginning each time with basic concepts, design principles, and data formats. You'll put those concepts to work in lab using current tools, and get feedback from peers and the instructor during reviews. Attendance at labs is optional; peer and instructor reviews will be scheduled at mutually agreeable times.

- Before each lab, you should review all assigned resources so you're familiar with the fundamentals and ready to apply them in lab.
- For each lab, you should
 - Find or create one or more datasets that you want to analyze or explore
 - Find at least one design example that helps inform your approach
 - Be sure to choose a subject you are interested in and qualified to work with, otherwise you will have trouble interpreting the data and results

Labs are co-working time, and I will be online during scheduled course hours to help answer questions, provide specialized demos, troubleshoot data, offer design feedback, consult individually, etc. You can reserve a time with me during lab if you wish or schedule an appointment during my office hours.

- After each lab session, you'll post a short report and review your work with a classmate. We will also meet individually to discuss your visualization(s) and report. Reports are due on the Wednesday following each lab, meaning one day before our review meeting.

GRADING & ASSIGNMENTS

Throughout the semester, you will continually reflect on your own work through lab reports, classmates will provide feedback during reviews, and I will provide ongoing comments. Your final grade will be determined through a written self-assessment that takes all of these into account, as well as any late work (see policies). For reference, Pratt's grading scale is below, and a grade of C- or lower is considered failing at the graduate level.

- A sustained level of superior performance demonstrated in all areas of course requirements
- B consistent level of performance that is above average in a majority of the course requirements
- C performance that is generally average and course requirements are achieved
- D below average performance and achievement of the course requirements
- F accomplishment of the course requirements is not sufficient to receive a passing grade

Your proposed grade should use the following assignments and weights:

Final Self-Assessment (5%)

Your self-assessment (max. 500 words) should propose a final grade for the course, which I reserve the right to change. There are many ways to frame this narrative. Some examples include:

- reference to the course learning outcomes—to what degree did you achieve these, and what evidence can you point to?
- development throughout the semester—taking Week 1 as baseline, how far did you go?
- iterative progress/growth over the semester—how does each work build on the last?

Labs (4 reports, 15% each)

Throughout the course, we will explore various tools for manipulating data and creating visualizations. You will be responsible for finding appropriate datasets for these exercises, as well as example visualizations that inform or inspire your designs. By the due dates indicated in the schedule, you should submit a report (max. 1,000 words) that includes:

- introduction to the topic and question(s) you are asking;
- brief discussion/critique of 1–3 visualizations that inform/inspire your questions/designs;
- materials, including software and datasets used in the lab (remember to link!);
- methods/process used to create visualizations, including some rationale;
- results and interpretation, including images linked to interactive visualizations; and
- reflection on what you made and future directions for this experiment.

Your report should be written for a public audience (provide enough background) and present the reasoning behind your topic, questions, methods, and designs. You may post your report publicly (recommended) or behind a password at studentwork.prattsi.org/infovis. You can consult [past examples of lab work](#) and my [rubric](#) for evaluating lab reports.

Final project (5% proposal, 30% report)

Final projects should focus on a single topic, using data and visualization with purpose and polish. You may work individually or collectively, and your final project may extend from prior lab work or may use data tools beyond those explored in labs (please discuss this with me first). The visualization(s) may be print or digital, static or interactive, as appropriate to the information and intended audience. The project should incorporate UX research at one or more points, using relevant methods such as observations, task completion, think-alouds, interviews, etc. At least two UX participants are required, and they should be people reasonably connected to your topic (e.g., potential audience members, subject experts, other researchers using similar data—probably not other students in the class, unless they genuinely fit this description). For group projects, the final products and UX research should scale with the number of people in the group.

You should feel free to talk to me about ideas at any point in the semester. By April 21, you should submit a formal **project proposal** that describes:

- project topic,
- dataset(s),
- tools
- expected design products (e.g., format, quantity, content), and
- plan for UX research (who, what, when, how).

The final **project report** (2,000–3,000 words) should include:

- introduction to the visualization(s), including subject matter and goals;
- process used to design visualizations, including UX research methods (participants, activities);
- rationale for design choices, demonstrating that the design is based in the theory and best practices of information visualization, as well as user research;
- findings, both of the visualization and of the UX research, organized into major topics; and
- recommendations for revision based on those findings.

For group projects, each member must email me a short statement (max. 300 words), copied to all other group members, describing their individual contributions to the project; alternatively, a single statement from the group is acceptable, provided it is agreed upon and copied to all members.

Students will make a brief online presentation of their projects for the final class (May 6). Revisions may be made after presenting, and final reports are due to studentwork.prattsi.org/infovis by May 9.

PORTFOLIO WORK

Work from this class may be used to satisfy graduating portfolio requirements for students in specific programs. Detailed information on the learning outcomes and requirements for each program is available at si.pratt.edu. Please discuss with the instructor or your faculty advisor which assignments may satisfy which requirements. Typically, your final project can serve as portfolio-ready work, though in some cases a set of lab reports may be sufficient.

POLICIES

Community Standards

All students must adhere to the Pratt [Community Standards](#) listed in the current Student Handbook.

Academic Integrity

Academic integrity means using your own and original ideas in creating academic work. It also means that if you use the ideas or influence of others in your work, you must acknowledge them. I am required to report all incidents of academic dishonesty, and my default penalty for any infraction is failure of the course. For more information, see Pratt's [Academic Integrity Policy](#).

Attendance and Late Work

Because this course is primarily asynchronous, attendance is not required during scheduled course times, with the exception of the first and last classes. Attendance is not required at labs. You are expected to attend peer review meetings and review meetings with the professor. If you miss a meeting with me please reschedule, and if you are late in posting a report, please post it as soon as possible. You are allowed one 4-day extension on any lab report—since class is on Thursdays, this effectively gives you through the weekend to complete it. Upon a second or following late submission, your grade on that assignment will be lowered by one mark every three days (e.g., A to A- if submitted up to 3 days late; A to B+ if submitted 4–6 days late). Students who encounter significant health issues should provide documentation to the [Office of Health and Counseling](#) and discuss their options with me.

Disabilities

Pratt Institute is committed to the full inclusion of all students. If you are a student with a disability and require accommodations, please contact the [Learning/Access Center \(L/AC\)](#) at LAC@pratt.edu to schedule an appointment to discuss these accommodations. Students with disabilities who have already registered with the L/AC are encouraged to speak to the professor about accommodations they may need to produce an accessible learning environment.

Human Rights, Equity, and Title IX

Pratt Institute seeks to provide an environment that is free of bias, discrimination, and harassment. If you have been the victim of harassment, discrimination or sexual misconduct, we encourage you to report this. If you inform me of an issue of harassment, discrimination, or sexual misconduct I will keep the information as private as I can, but I am required to bring it to the attention of the institution's Title IX Coordinator. If you would like to speak to someone confidentially, you should contact non-mandatory reporters, such as Health Services, Counseling Services, or Campus Ministries. For more information, please refer to the [Community Standards](#) webpage.

COVID-19

We are in an ongoing pandemic. Please be mindful of your health, including your mental health, and seek [student services](#) as need arises. If *at any point*, you feel behind, lost, overwhelmed, etc., please talk to me about the course. I do ask that you always keep review appointments with me, even if you are behind on work, so that we can discuss your circumstances and make a plan for timely progress in the course.

COURSE SCHEDULE

This is a tentative outline of topics, readings, and assignments. On occasion, I may add, delete, or substitute topics or readings. Changes will be posted here and on Canvas.

DATES TOPICS, READINGS, AND ASSIGNMENTS

Additional resources provided on LMS

Jan 21 **Online class meeting (6:30pm Eastern/US)**

INTRODUCTION

Overview

- Heer, Jeffrey, Michael Bostock & Vadim Ogievetsky (2010). "A Tour through the Visualization Zoo: A Survey of Powerful Visualization Techniques, from the Obvious to the Obscure" *ACM Queue* 8(5). <https://queue.acm.org/detail.cfm?id=1805128>
- Wilke, Claus O. (2019). *Fundamentals of Data Visualization*, Ch. 28
- D'Ignazio, Catherine & Lauren Klein (2019). "Data and Power" and "Data Feminism in Action" in *Data Feminism*. MIT Press. <https://data-feminism.mitpress.mit.edu/pub/rrfa9szd/release/3#data-and-power>

History of Visualization

- Tufte, Edward (2001). *The Visual Display of Quantitative Information*, 2nd ed., Chs. 4–5.
- Popova, Maria. "W.E.B. Du Bois's Little-Known, Arresting Modernist Data Visualizations of Black Life for the World's Fair of 1900," <https://www.brainpickings.org/2017/10/09/w-e-b-du-bois-diagrams>
- van de Winkel, Goof (2020). "Rules Are Relevant," *Nightingale*. <https://medium.com/nightingale/rules-are-relevant-71e1415eff4a>

Jan 28 **Lab 1: TimelineJS** (optional attendance 6:30–9:20pm Eastern/US)

Dataset requirements

Curate a timeline about any single theme in the history of visualization (design, data, technology, etc.). Your timeline should include 5–10 events, each with a date, title, description, and media.

Usability and Evaluation

- Mais, Valerie (2020). "Four User-Centered Strategies for Designing Useful Data Visualizations." *Nightingale*. <https://medium.com/nightingale/four-user-centred-strategies-for-designing-useful-data-visualizations-5c6daeb91c8f>
- Neeman, Patrick (2013). "Five Things I've Learned from Usability Testing." *Usability Counts*. <http://www.usabilitycounts.com/2013/08/20/five-things-ive-learned-from-usability-testing>
- Holder, Eli (2020). "What is This Graph Telling You?" *UX Collective*. <https://uxdesign.cc/crucial-questions-for-user-testing-data-visualizations-297413f7d6ab>

Peer review of lab work (set up a meeting with your assigned partner, to take place before Feb 5)

Feb 4 **Lab 1 report due & review meeting with professor**

QUANTITATIVE

Visual Perception, Color, and Interaction

- Healey, Christopher G. (2009) "Perception in Visualization" <http://www.csc.ncsu.edu/faculty/healey/PP/index.html>
- MacDonald, Lindsay W. (1999). "Using Color Effectively in Computer Graphics" *Computer Graphics and Applications, IEEE* 19(4): 20–35
- FDV, [Ch. 4](#) and [Ch. 19](#)
- Yi, Ji Soo, Youn ah Kang & John T. Stask.. (2007). "Toward a Deeper Understanding of the Role of Interaction in Information Visualization" *IEEE Transactions on Visualization and Computer Graphics* 13(6): 1224–1231

Data Structure & Manipulation

- Gebru, Timnit, Jamie Morgenstern, Briana Vecchione, Jennifer Wortman Vaughan, Hanna Wallach, Hal Daumeé III, Kate Crawford (2018) "Datasheets for Datasets." *Proceedings of the 5th Workshop on Fairness, Accountability, and Transparency in Machine Learning, Stockholm, Sweden* PMLR 80. <https://arxiv.org/abs/1803.09010>
- Broman K.W. & Woo K.H. (2017) "Data organization in spreadsheets" *PeerJ Preprints* 5:e3183v1 <https://doi.org/10.7287/peerj.preprints.3183v1>
- Wickham, Hadley (2014). "Tidy Data" *Journal of Statistical Software* 59(10)

OpenRefine activity

Statistical Visualization

- Few, Stephen (2005). "Effectively Communicating Numbers: Selecting the Best Means and Manner of Display" ProClarity.
- FDV, Chs. [5](#) (see Chs. 6–14 for details), [23](#)
- "Caveats," *From Data to Viz*, <https://www.data-to-viz.com/caveats.html>

Feb 25

Lab 2: Tableau Public (optional attendance 6:30–9:20pm Eastern/US)

Dataset suggestions

- ~1000+ records/rows
- 1+ quantitative dimensions
- 1+ categorical dimensions
- historical (has time-oriented data)

Peer review of lab work (set up a meeting with your assigned partner, to take place before Mar)

Mar 3

Lab 2 report due & review meeting with professor

Dashboard Design

- Bakusevych, Taras (2018). "10 Rules for Better Dashboard Design." *UX Planet*. <https://uxplanet.org/10-rules-for-better-dashboard-design-ef68189d734c>
- FDV, Chs. [21](#), [22](#), [29](#)

NETWORKS

Network Analysis & Visualization

- NetSciEd. "Network Literacy: Essential Concepts and Core Ideas." <https://sites.google.com/a/binghamton.edu/netscied/Network-Literacy-low-res.pdf>
- Weingart, Scott (2011). "Demystifying Networks, Parts I & II" *Journal of Digital Humanities*. <http://journalofdigitalhumanities.org/1-1/demystifying-networks-by-scott-weingart/>
- Venturini, Tommaso, Mathieu Jacomy & Pablo Jensen (2019). "What Do We See When We Look at Networks" <https://arxiv.org/abs/1905.02202>.

Mar 18

Lab 3: Gephi (optional attendance 6:30–9:20pm Eastern/US)

Dataset suggestions

- ~100+ rows/records
- Graph file or CSV file structured as source, target, type (and optional relation data)
- (optional) CSV or Excel file with nodes and attributes

Peer review of lab work (set up a meeting with your assigned partner, to take place before Apr 2)

Mar 24

WELLNESS DAY

Data Storytelling

- Segel, E. and J. Heer (2010). "Narrative Visualization: Telling Stories with Data" *IEEE Trans. on Visualization and Computer Graphics* 16(6): (Nov/Dec)
- Weber, Wibke (2020). "Exploring Narrativity in Data Visualization in Journalism" in *Data Visualization in Society*, eds. Martin Engebretsen & Helen Kennedy (Amsterdam University Press), pp. 295–312. <https://doi.org/10.2307/j.ctvzgb8c7.24>
- Accurat studio (2016). "Beautiful Reasons: Engaging Aesthetics for Data Narratives." Medium. <https://medium.com/accurat-studio/beautiful-reasons-c1c6926ab7d7#.nmhloc1z8>
- Amabili, Lorenzo (2021). "From Storytelling To Scrollytelling: A Short Introduction and Beyond*" *Nightingale* <https://medium.com/nightingale/from-storytelling-to-scrollytelling-a-short-introduction-and-beyond-fbda32066964>

Mar 31

Lab 3 report due & review meeting with professor

MAPPING

Spatial Data & Visualization

- FDV, Ch. 15.
- MacEachren, Alan M. and Menno-Jan Kraak (2001). "Research Challenges in Geovisualization" *Cartography and Geographic Information Science* 28(1), 3–12..
- Kidd, Dorothy (2019). "Extra-activism: Counter-mapping and Data Justice" *Information, Communication & Society* 22(7): 954–970.

Apr 15

Lab 4: Carto (optional attendance 6:30–9:20pm Eastern/US)

Dataset suggestions

- ~100+ records/rows
- spatial point data (lat/long) or relevant shapefiles
- 1+ quantitative or qualitative dimension

Peer review of lab work (set up a meeting with your assigned partner, to take place before Apr 23)

Apr 21

Lab 4 report due & review meeting with professor

FINAL PROJECTS

Apr 21

Proposals due & conference meeting with professor

Apr 29

Online Lab: Final Projects (optional attendance 6:30–9:20pm Eastern/US)

May 6

Online presentations

May 9

Final project report & course self-assessment due