INFO 4602/5602: Information Visualization

Tuesday/Thursday, 3:30-3:45
Education 220

Instructional Team:

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Course Description:

Data is everywhere. Charts, graphs, and other types of information visualizations help people to make sense of this data. This course explores the design, development, and evaluation of these information visualizations. By combining aspects of design, computer graphics, HCI, and data science, you will gain hands-on experience with creating visualizations, using exploratory tools, and architecting data narratives. Topics include interactive systems, user-centered and graphic design, graphical perception and cognition, data storytelling, and insight building. Throughout this course, you will work directly with stakeholders to analyze data from a variety of domains and applications.

Textbook:

Tamara Munzner. Visualization Analysis & Design.

The book is available online through the Libraries:
http://www.crcnetbase.com.colorado.idm.oclc.org/isbn/9781466508934

Hard copies are available through Amazon or other online retailers. Note that the full-text download link through the Libraries is not currently functioning, but you can download individual chapters. Any additional readings will be made available through the course website.

Topic Schedule:

Subject to Change

Week One *Jan 16 + 18*	Ways & Histories of Data Analysis ➔ What is visualization? ➔ How has data changed? ➔ How has visualization changed?
Week Two *Jan 23 + 25*	Touring the Visualization Zoo ➔ Common Visualizations ➔ Flavors of Data ➔ Lying with Data

Week Three *Jan 30 + Feb 1*	Common Systems, Tools, & Platforms ➔ Ways to Create Visualizations ➔ Tableau & D3 ➔ Non-Traditional Visualizations
Week Four *Feb 6 + 8*	Anatomy of a Visualization ➔ Representing Data ➔ Color ➔ **Small Project #1 Due**
Week Five *Feb 13 + 15*	Analysis Tasks & Workflows ➔ Questions We Ask of Data ➔ Knowledge Production ➔ Sensemaking
Week Six *Feb 20 + 22*	Design Processes ➔ Design Studies ➔ Five Design Sheets ➔ Iterative & Participatory Design
Week Seven *Feb 27 + Mar 1*	Principles of Perception ➔ Gestalt Perception ➔ Vision Science ➔ Graphical Perception ➔ Color ➔ **Small Project #2 Due**
Week Eight *Mar 6 + 8*	Uncertainty & Interaction ➔ Representing Uncertain Data ➔ View Coordination ➔ Direct Manipulation
Week Nine *Mar 13 + 15*	Evaluation Methods & Insights ➔ Levels of Evaluation ➔ Insight-Based Evaluation ➔ Provenance
Week Ten *Mar 20 + 22*	Quantitative Evaluation ➔ Experimental Design ➔ Experimental Statistics ➔ **Small Project #3 Due**
Spring Break (March 26 - 30)	
Week Eleven *April 3 + 5*	Handling Scalability ➔ Data Structures ➔ Aggregation ➔ Computational Techniques ➔ **Final Project Proposals Due**
Week Twelve *April 10 + 12*	Visual Data Mining ➔ Dimensionality Reduction ➔ Model Visualization ➔ Human-in-the-Loop ML

	➔ **Small Project #4 Due**
Week Thirteen *April 17 + 19*	Data Storytelling ➔ Presentation vs. Exploration ➔ Story Structures ➔ Specificity vs. Flexibility
Week Fourteen *April 24 + 26*	Overflow or Class Choice
Week Fifteen *May 1 + 3*	Final Project Work **Final Projects Due 5.5**

Course Objectives & Outcomes:

The purpose of this course is to enable students to design, construct, and evaluation visualizations, with an emphasis on user-centered design and system development.

Upon completing this course, students will:

- Understand the basic factors, workflows, and processes involved in creating effective visualizations
- Compare methods for visualizing data and understand how these different methods might guide users towards different conclusions
- Understand different ways of formally measuring trade-offs in different visualization approaches
- Develop a toolkit for exploring and communicating complex data using visualizations
- Construct interactive visualizations for the web using D3 and other popular platforms
- Conduct a series of design studies with stakeholders to develop novel solutions to current analytics challenges
- Understand design and engineering challenges for data-centered systems

Assignments:

Grades in this course will be assessed as a combination of participation, weekly reading assignments, small course projects, and a larger final project. All information about class assignments will be posted to the course Canvas page: https://cuboulder.instructure.com/courses/16157

Participation:

This course meets in person twice per week. During this time, you are expected to attend class, participate in course discussions, and actively complete in-class activities. There will also be two to three presentation sessions that will likely occur outside of class hours during which you will showcase your work. I will give you at least two weeks advance notice for any such showcase.

Reading Assignments:

For each week's readings, you will be expected to post either a small guided prototype or written reflection based on provided prompts directly on the course message board. Unless otherwise posted, reflections and prototypes will be due on Mondays at 11:59pm. Late reading reflections and prototypes will not be accepted for credit. However, you will be allowed to drop your lowest three scores from your overall grade.

You will also respond to at least two (undergraduate students) or three (graduate students) responses or prototypes posted by other students as part of your participation grade. Responses should demonstrate substantive engagement with the course content. These will be due Wednesdays at 11:59pm. Late responses to prototypes and reflections will not be accepted for credit.

Projects:

You will be expected to contribute to four small projects either individually or in small teams depending on the specifications of the project. All projects will be submitted through the course GitHub. Late projects will be deducted 10% for each day they are late. Projects will no longer be accepted after 72 hours.

You will also work either individually or in a small team to complete a final project on a topic of your choice. No late final projects will be accepted.

Extra Credit:

While the course will not have dedicated extra credit assignments, some projects and reading assignments will have *bells & whistles.* Bells will count for 2 points extra credit and whistles will count for 5 points.

Grade Distribution:

- Participation: 10%
- Written Reflections & Prototyping Assignments: 25%
- Projects: 40%
- Final Project: 25%

This course will use a standard, 100-point grading scale:

93.0% and above: A
90.0%–92.9%: A-
87.0%–89.9%: B+
83.0%–86.9%: B
80.0%–82.9%: B-
77.0%–79.9%: C+
73.0%–76.9%: C
70.0%–72.9%: C-
67.0%–69.9%: D+
63.0%–66.9%: D
60.0%–62.9%: D
Below 60.0%: F

Information Science Teaching Pledge:

I pledge to give feedback to students constructively and quickly, specifically within 7 days of an assignment. I pledge to treat each student with respect. I invite constructive feedback if a student feels that I could improve my instruction or conduct in the classroom. I will do my best to respond to your emails within 1 business day. If you have not heard from me by then, I welcome follow-ups either in-class or over email.

Technology Requirements:

Students in this course will benefit from having a laptop or tablet available for notetaking, in-class work, homework, and presentations. If you do not have access to a laptop or tablet, please consult with me. However,

students and the instructor alike are encouraged to quit mail and other applications that may be distracting; to turn off notifications and ringers; and to put nonessential equipment away.

Open Discussion & Debate:

(adapted from Prof. Casey Fiesler's statement, with permission and thanks). In the classroom, students and instructors need to feel comfortable sharing their opinions and questions openly, even when we disagree. Disagreement is expected, but must be respectful and civil at all times. Students should feel welcome to share thoughts during class discussion without any fear of being disparaged for their opinions. Like yourselves, I also have opinions, and I will attempt to surface my own biases when appropriate. These disagreements or differences of opinion will not impact grades, as long as students are respectful. I invite students to meet with me to discuss concerns and ideas about how to make our learning community a positive experience for all.

This policy extends to topics in the course. Please feel free to reach out to me should there be any topics you'd like to discuss more deeply in class or that are not currently part of the course but you would like to see integrated. While I cannot guarantee that every request will be accommodated, I will do my best to make sure the curriculum and topics align with the needs of all of the students in the course.

Accommodation for Disabilities:

The classroom is an environment where everyone should be presented with equal opportunities to succeed. As such, I am happy to make any reasonable accommodations necessary due to disability. If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website (www.colorado.edu/disabilityservices/students). Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see Temporary Medical Conditions under the Students tab on the Disability Services website and discuss your needs with your professor.

Religious Holidays:

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Please alert me of any such situations at least one week before any potentially conflicting deadlines. See the campus policy regarding religious observances for full details.

Classroom Behavior:

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on classroom behavior and the Student Code of Conduct.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation:

The University of Colorado Boulder (CU Boulder) is committed to maintaining a positive learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related

retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at the OIEC website.

Honor Code:

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the academic integrity policy. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible for violating the academic integrity policy will be subject to non-academic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at the Honor Code Office website.

The first instance of academic dishonesty will result in a grade of 0 on the assignment in question. Subsequent violations will result in a failing grade for the course.