Learning Objectives

The increasing amounts of data that we are exposed to is simultaneously creating an increase in cognitive load. Information Visualization (InfoVis) systems and techniques are intended to aid in dealing with this deluge, serving as external cognition “amplifiers” that expand memory, ease comprehension, and support decision making. Note that though there are different uses of the term “information visualization” in different communities, for the purposes of this class, we will treat information visualization as the use of (possibly interactive) interfaces to visually represent abstract data. The course is intended for students interested in understanding and utilizing information visualization in their own work.

The objective of this course is to introduce students to information visualization. Students will learn the visualization pipeline, processing data for visualization, visual representations, the design of interaction in visualization systems, and the impact of perception. Students will also develop the skills necessary to solve visualization problems and critique and evaluate InfoVis systems. This material will be covered through lectures, readings, and a number of assignments.
and projects. The assignments and large group project will provide students with practical experience in the construction of visualization systems.

The course will be taught at a graduate level and will include written and programming work. As such, students should be comfortable with a basic level of programming and be willing to work with and learn graphics APIs and analysis tools.

Schedule

See here: https://docs.google.com/spreadsheets/d/1PF8t-Bk7iOtxCJ6EGUQJbnR5l0v0qEMD1nFNB8h2-XaY/edit#gid=0

Class format

Class time will be spent as a mixture of discussions, lab activities, quizzes, presentations, peer round robins, and lectures.

My goal is to provide you with significant opportunity to apply what you have learned and receive critique in class. To do so with a large group of students requires that we leave plenty of class time for discussion/critique/feedback, which requires everyone to come to class prepared.

While I will make an effort to provide a high level summary of the material at the start of every class, my expectation is that you will be prepared to leverage the material from readings for the various activities we will have in class. Put another way, I will expect you to have read the assigned readings before class. Material in the readings (see below) may be topics of frequent in-class quizzes.

In-Class Quizzes

We will have frequent, 1-2 question quizzes. These will be administered at the start of class (if you show up late to class you will not be allowed to take the quiz). They will be scored on a 3 point scale.

These are not intended to be trick questions or difficult. In fact, the questions will be directly drawn from the learning objectives document (e.g., “list 3 things ‘expressed’ in this visualization” or “given these parameters, what is the data-ink ratio for this plot?”). The questions will take no more than 5-10 minutes but they will allow me to make sure we’re making progress in the material and you’re picking up key concepts. They will also ensure that we are all on the same page during class discussion sessions.

If you need to be away from class (and know in advance), you may take the quiz before the class lecture time. There will be no makeup quizzes after the class, as we review the
answers immediately. If the reason for missing class is a medical issue please let the course staff know and we will make some accommodation.

Attendance

Attendance in the class and participation in labs is mandatory. Repeatedly missing class (> 3 times, unexcused) or failing to participate will lead to a failing grade. See note above on quizzes.

Readings

There will be readings assigned for each lecture which you'll be expected to complete (see note on learning objectives above). The amount will vary from topic to topic but might include 1-2 chapters, and/or some research papers (all will be provided to you as handouts or PDF files). The readings will come in useful for the design section of the classroom and as such will be part of your class participation grade. The required readings will all be in Canvas the day after the first lecture (they'll be the pdf files or links in the lecture directories). I may add additional optional readings to provide more details.

Reading list is here:
https://docs.google.com/spreadsheets/d/1PF8t-Bk7iOtxCJ6EGUQJbnR5lv0gEMD1nFNB8h2-XAY/edit#gid=1451019492

Labs + Critique Sessions

We will have labs and critique sessions nearly every time we meet. Specifically, you will encounter:

Programming labs – The first few weeks will be programming labs where you will work in pairs to work on a lab assignment. You will complete these labs either in class or on your own time and return the finished lab by the following week (if you finish in class, that’s great, but don’t always count on being able to do so). You may work individually or with your lab partner to complete the lab. Partners will be randomly assigned and possibly switched between labs. There may be a few non-programming questions in there too. General guidelines for the programming labs:
https://docs.google.com/document/d/1K-PYyWMhI4fJhbfン8Ja8EJP1CbomgwWFoLROfZWV1kQ/edit?usp=sharing

Critiques/peer-to-peer – We will have sessions where you or your group are presenting your current work on your individual and group assignments. Depending on the number of groups, this will be done in a "round-robin" fashion where you will present to other groups for a short period and then rotate or will be done
in front of the class. You will be told what to bring in preparation for these sessions. Often it will be a few slides and your prototypes, but some preparation will be required.

Design labs – The last type of lab will be a design lab. This will feature a specific problem related to the lecture of the day. The problems are designed to be somewhat open-ended but are based on situations where a "professional" created a solution. You will get to read about the professional solution for the next class and will be asked to generate a reading response (see below). The class will be broken apart into groups and each group will have a short amount of time to come up with a proposed design, creating a lo-fi or mid-fi design to address the problem. Groups will then have a few minutes to present their solution to the class and get critiqued on their proposal and critique the work of others.

Group activities – In addition to labs we will have small (2-4 person) group activities that are intended to expand on the materials. I may provide a high level question and then have groups discuss. You will often be taking notes and answering these questions into a shared Google Doc.

Attendance/participation for all labs is mandatory.

Assignments
There will be additional details for each of these on the Website, but here are short descriptions.

Programming Labs
The first several lectures will feature labs that you will need to complete and turn on Monday the following week.

You may work individually to complete the labs (whatever you didn't finish in class) or with your assigned partner (both of you will need to turn in your answers). You may consult other students in class for high level advice regarding solutions (and of course you may use whatever online resources). You may not copy code from your classmates (in this iteration of the class or any previous instance). Any form of cheating (sharing solutions or copying solutions) will be turned over to the academic advising office.

Lab Reflections
Later in the semester, we will have several “design jam” labs, each with a different topic. You will be asked to submit lab reflections, critical reflections on the design you came up with in the lab. Instead of a few paragraphs, or one pager about the paper, we’re going to use a presentation format. Each student is responsible for creating a 3-5 slide deck (we will provide a template) and be ready to lead a short discussion.
**What to turn in:** I expect your slide deck by 7pm EST on Sunday. This is to give me enough time to look at the materials.

**If you are randomly selected to present but are not present you will receive a 0 for that reflection.**

**Why this format?** I think that lots of classes require you to write short responses to readings and this is a great exercise that forces you to read the papers and think about the materials. However, I also believe that it’s important to be able to present information to an audience and this is something we don’t do enough of. I hope that most of you will consider this fun and useful. Realistically, it might mean less work for you. If you have some debilitating fear of public speaking come talk to me and we’ll work something out.

**Bonus for presenting:** If you volunteer (and are selected) to present I will give you 3 quiz points (so a “perfect” on one quiz). Whether you volunteer or not and are selected to present, you will not have to present again.

**Individual assignment**

Rather than having you struggle with data for this first assignment, I will provide you with a dataset to to build a communicative visualization around. For this project, you can use whatever tools you like: JavaScript/d3, Tableau, R/ggplot2, Illustrator, etc. It must be a single, static image.

The assignment has two deadlines. Submit your best work to the first deadline. Immediately after the first deadline, I will grade all assignments and then take one lecture for the course staff to give you all feedback on everyone’s assignments. This will let you learn not only from the design you came up with, but also everyone else’s designs. Afterwards, you will have the option of revising your submission and submitting a new version. If you do, your grade on the new version will replace your old grade.

Because we are allowing you to resubmit to the second deadline without penalty, we will be very strict in grading. Based on your first submission and the feedback we give in class, you should have a very good idea of what kinds of things we are looking for.

If you do not submit the first version of your individual assignment, you can still submit to the second round, but there will be a 15% deduction from your grade on the individual assignment. So make sure you submit something in the first round.
Final Project - Group Project

This is an open-ended project intended to give you an experience with designing, implementing and evaluating a visualization method or system. You will work in groups of 3-5 (talk to me if you want to propose something that’s bigger or smaller, but unless there is a really good reason, I probably won’t allow it). There will be several milestones for this project:

1) a proposal
2) an initial exploration of your data
3) a high-fidelity mockup
4) an initial implementation
5) a final submission (presentation + implementation + report)

Although it is my expectation that most projects have a working artifact at the end, you can propose other projects (i.e., an evaluation of visualization techniques, etc.). There will be a couple of peer round-robins and critique sessions from the instructors to get feedback.

Grading

10%  Quizzes
5%  Class Participation (attendance required)
15%  Technical Labs
10%  Design Labs
15%  Design Lab reflections, peer reviews
20%  Individual Assignment
25%  Final Project

Lateness Policy

A late turn-in within 24 hours will cost you one letter grade or equivalent (so the best you’ll be able to get is a “B”). A later turn in between 24 and 48 hours will cost you 2 letter grades. Nothing will be accepted after the 48 hour “grace” period.

The (final) final project report will be due on time since I need to get grades in.

Commercial Systems

In the past, Tableau has kindly offered us a licensed version of their application for the semester and I’m going to try to get a similar arrangement again. I’ll also try to set up a tutorial section for these systems. It is a powerful (and expensive) commercial visualization/visual analytics system that is used in industry so you should definitely take the opportunity to play with it.
Original Work

Unless otherwise specified in an assignment, all submitted work must be your own, original work. You may discuss general approaches with others on individual assignments, but may not copy code or other work and must indicate on your turned-in assignment who you worked with. You may not provide your solutions to other students. Any excerpts from the work of others must be clearly identified as a quotation, and a proper citation provided. Any violation of the School’s policy on Academic and Professional Integrity (stated in the Master's and Doctoral Student Handbooks) will result in severe penalties, which might range from failing an assignment, to failing a course, to being expelled from the program, at the discretion of the instructor and the Associate Dean for Academic Affairs.

Accommodations for Students with Disabilities

If you think you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course, the assignments, the in-class activities, and the way we teach may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with the Office of Services for Students with Disabilities (SSD) to help us determine appropriate accommodations. SSD (734-763-3000; http://www.umich.edu/sswd/) typically recommends accommodations through a Verified Individualized Services and Accommodations (VISA) form. I will treat any information you provide as private and confidential.

Student Mental Health and Wellbeing

The University of Michigan is committed to advancing the mental health and wellbeing of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact Counseling and Psychological Services (CAPS) at (734) 764-8312 and https://caps.umich.edu/ during and after hours, on weekends and holidays, or through its counselors physically located in schools on both North and Central Campus. You may also consult University Health Service (UHS) at (734) 764-8320 and https://www.uhs.umich.edu/mentalhealthsvcs, or for alcohol or drug concerns, see www.uhs.umich.edu/aodresources.

For a listing of other mental health resources available on and off campus, visit: http://umich.edu/~mhealth/