Preliminary Syllabus, Fall 2012

SI649 Information Visualization

Fall 2012
Instructor: Eytan Adar, Office hours: Thursday 10 AM-noon, NQ4368
Monday, 1:00-4:00PM, North Quad 1255

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 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.

Tentative Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 10th</td>
<td>Introduction to Visualization, Javascript for infovis</td>
</tr>
<tr>
<td>September 17th</td>
<td>Data and Image Models, Protovis</td>
</tr>
<tr>
<td>September 24th</td>
<td>Perception</td>
</tr>
<tr>
<td>October 1st</td>
<td>Design principles</td>
</tr>
<tr>
<td>October 8th</td>
<td>Multidimensional and multivariate data</td>
</tr>
<tr>
<td>October 22nd</td>
<td>Hierarchical Visualization</td>
</tr>
<tr>
<td>October 29th</td>
<td>Temporal Visualization</td>
</tr>
<tr>
<td>November 5th</td>
<td>Network Visualization</td>
</tr>
<tr>
<td>November 12th</td>
<td>Text Visualization</td>
</tr>
</tbody>
</table>
Readings

There will be a number of readings assigned for each lecture which you’ll be expected to complete. The amount will vary from topic to topic but might include 1-2 chapters, and 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.

One of the readings for the class will be designated as a response reading. The response reading will be on the topic of the in-class project from the last class (so if we worked on the social network vis. problem last time, we’ll read about one solution this time). Instead of a few paragraphs, or one pager about the paper, we’re going to try something a little different. Each student is responsible for creating a 3-5 slide deck (or some equivalent if you’re a Tufte fan) and be ready to lead a short discussion. I will pick one student at random the day of the presentation to talk for ~5 minutes and then help to lead the discussion about it (I will enforce a time limit). Once you’ve presented, you’ll never have to present again (but you’ll still have to turn in the deck). I’ll pick from volunteers before I pick someone at random.

What to turn in: I expect your “deck” or whatever prepared materials you’d use for your presentation by 7pm EST on Sunday. This is to give me enough time to look at the materials. You should at minimum have:

- one slide describing the system/visualization in the reading,
- one slide of pros/cons, and
- one slide about extensions/discussion points.

The last slide could be motivated by the designs from the previous class. Make your deck something you can work with, but if I won’t be able to understand where you’re going just by looking at it (e.g., you only have pictures), then please also give me at least an outline with some key bullet points.

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.

Class format
Each class will (generally) be divided into roughly three parts.

- Part 1 will be a short presentation or two by someone in class on the response reading (see below).
- Part 2 will generally be a lecture (by me or a guest lecturer) about the topic of the day.
- For part 3, I’ll usually describe some visualization problem which will be worked on, and presented in-class by groups.

**In Class Design**

Most days I’ll pick a visualization design problem related to the day’s lecture materials (e.g., the design of a social network visualization application on the day we talk about network visualization). The problem will be the topic addressed by the response reading (see above) for the subsequent class (so we’re going to come up with possible solutions first, before seeing how someone else did it). 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.

**Course Projects**

There will be additional details for each of these on the Website, but here are short descriptions. Note that I tried to make deadlines on Wednesdays so you won’t have to do everything before class.

**Assignment 1**

**Individual mini-project, programming assignment**

You will be given a set of problems that involve programming (likely in Processing/Processing.js). The goal is to get you to walk through the tools, in the process understanding the features of the systems. You should consider this a learning exercise where by the end you’ll have some comfort with the tools so that you’re able to use the system for your own visualization projects. You will be required to turn in working code for this project.

**Due: Oct 17th, 11:59pm**

**Assignment 2**

**individual mini-project**

This is an open-ended project though I will offer some of my own suggestions (with associated data). You will need to turn in a proposal of what you want to do. I also expect a 1-2 page “sketch” as you make progress describing your idea (actual sketch/prototypes/wireframes can go beyond the 1-2 pages). Finally, you will turn in a short (2-3 page) report on your working system. Additional details, and example projects, will be made available on the course Website.
Assignment 2 proposal: October 8th, 11:59pm

Assignment 2 sketch: October 22nd, 11:59pm

Final Assignment 2 Due: November 5th, 11:59pm

Final Project (option 1)

**Group Project**

This is also 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). There will be 3 milestones for this project: 1) a proposal, 2) a lo-fi prototype, 3) a hi-fi prototype/implementation report (probably more of a mid-fi). At milestone 2 we will have a short in class presentation of your project, where you are so-far, etc. 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.). I’m going to try and set up 1-2 individual meetings with each group for intermediate status checks and to make sure you’re not having any problems.

Your project should address a specific visualization problem and provide a novel and creative solution. A final report of 6-8 pages (in conference format) will be turned in at the end of the semester (you may use additional space for extra images). With the report, you will be expected to turn in any code you create. Of course, you will also present your final work in class. It would be beneficial (but not required) for your group to create a Web page tracking your progress. You will be asked to evaluate your team members and that feedback will be part of the final project grade.

**Final Exam/Report (option 2)**

**individual**

This year I will give you the option of doing an individual report/exam instead of the group project. The report will be a deep analysis of a visualization system using the literature and design principles we will cover in class. The exam will be a single hour in-class exam covering the reading materials.

**Dates: TBA**

**Grading**

5% Class participation
10% Response Decks
15% Assignment 1
   Assignment 2
20% (Proposal – 2%, Sketch/lo-fi – 9%,
   Final – 9%)
50% Final Project or Exam/Report
   (35% – report, 15% – exam)

**Lateness Policy**

All reading responses must be turned in by 7pm EST on the Sunday before class. I recognize that the Flu season is hard sometimes and that emergencies happen. As such, you can miss one reading response. Use it wisely.

The due dates for Assignments 1 and 2 and the final project milestones are above. 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”). Projects will not be accepted after the 24 hour “grace” period.

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

**Office Hours & E-mail policy**

TBD (based on when works for most students). I will do my best to answer questions by e-mail within ~48 hours (just don’t count on a response an hour before a deadline). A discussion board will be set up on CTools. You might be better off posting your questions there (especially programming questions).

**Commercial Systems**

In the past, Tableau and Spotfire have 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. Both are powerful (and expensive) commercial visualization/visual analytics systems that are used in industry so you should definitely take the opportunity to play with them.

**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. 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.