CS 416: Data Visualization

Course Description

Welcome to CS 498: Data Visualization! In this course, you will be introduced to and learn to effectively use tools like Tableau and D3 to connect to data sources and effectively display data.

During the first half of the course, you will learn how to make more effective visualizations of data. Not only will you gain deeper insight into the data, but you will also learn how to better communicate that insight to others. You will learn new ways to display data, applying some fundamental principles of design and human cognition to choose the most effective way to display different kinds of data. The programming will be fairly simple during the first half of the course, when you will learn how to use popular applications like Tableau and Excel to connect to data warehouses, how to extract and visualize relevant data, and how sophisticated visualization systems like Tableau work.

In the second half of the course, we'll shift our focus to interactive storytelling. You'll set up interactive web pages similar to those featured on the New York Times website, create visualizations that allow viewers from all backgrounds to interact with data, and gain insight into data through the data's presentation. You will learn about interactive web graphics programming in the Scalable Vector Graphics (SVG) format, as well as some fundamentals of 2-D and some 3-D graphics. In addition to this, you'll learn about human visual perception and how user interface design makes for more effective visualization, manipulation, and understanding. You will also learn some advanced methods for interacting with data through immersive virtual reality interfaces.

The second half of the course will require web programming using HTML and JavaScript. If you are unfamiliar with these, you might want to get a headstart and work through the tutorials on HTML and JavaScript programming at https://www.w3schools.com.

Course Goals and Objectives

Upon successful completion of this course, you will be able to:

- Make more effective visualizations for data.

- Understand how fundamental principles of design and human cognition inform effective visualizations.

- Utilize popular visualization applications such as Tableau and Excel.

- Develop web pages that allow others to interact with data.

- Create visualizations using interactive web graphics programming in SVG format, javascript, and D3.js.

- Describe the fundamentals of 2-D and 3-D graphics.

- Summarize advanced methods for interacting with data through immersive virtual reality interfaces.

Prerequisites

Data visualization requires CS 225 Data Structures or equivalent knowledge and skills for object-oriented programming with external library implementations of data structures.

Textbook and Readings

There is no textbook required for this course. All necessary content will be available in the lectures. See the Data Visualization Resources page for information on data visualization books and software available to students.

Course Outline

This course consists of material from two Coursera MOOCs as well as additional assignments, projects and a proctored final exam. Office hours will be offered each week by the instructor and the TA's to help with these additional assessments.

The course runs weekly, from 12:01 AM CDT Monday to 11:59pm CDT Sunday for each of the 12 weeks of the summer term. There are two projects that have hard deadlines, as shown below. There are two proctored exams that each must be completed by the end of their assigned week (but can be taken a week earlier if need be). The remaining assignments have soft deadlines set to one week past the Sunday at the end of the week they are assigned, to keep everyone on track toward finishing the course.

Module	Topics	Grading
Week 1	The Data (includes course orientation)	5%
Week 2	The Human	5%
Week 3	The Chart	5%
Week 4	The System	5%
Week 5)	Dashboard Project - **hard deadline at the end of this week!**	15%
Week 6)	Midterm Exam (Also available to be taken in Week 5)	15%
Week 7	Integrating Data into Web Pages	5%
Week 8	Interactive Visualization with Web Pages	5%
Week 9	Narrative Visualization	5%

Week 10	Declarative Visualization	5%
Week 11)	Narrative Visualization Project - **hard deadline at the end of this week!**	15%
Week 12)	Final Exam (also available to be taken in Week 11)	15%

Grading Scale

Cutoffs for each grade are as follows.

A+: 98%	A: 92%	A-: 90%
B+: 88%	B: 82%	B-: 80%
C+: 78%	C: 72%	C-: 70%
D+: 65%	D: 60%	F

Elements of This Course

This is a four-credit graduate-level course over a condensed 12-week schedule. You should expect to spend 15 hours per week on this course. The course is comprised of the following elements:

- **Lecture Videos.** In each week, the concepts you need to know will be presented through a collection of short video lectures. You may stream these videos for playback within the browser by clicking on their titles or you may download the videos. You may also download the slides that go along with the videos. **There are 1-2 hours each week of short video lessons with condensed, fast-paced, densely-packed material.** You generally should spend at least the same amount of time reviewing and digesting the content in these videos. The actual amount of time needed to comprehend and retain the content will vary based on your background. It may be helpful to create your own notes on the videos. The videos are organized by "week#-lesson#-video#" to make it easier to reference in your notes and discussions.

- **Office Hours.** Office hours will be offered by the Instructor and the TA's throughout each week.

- **Weekly Quizzes.** There is a quiz on the material at the end of each week. These quizzes for weeks 1-4 must be completed by the end of week 5, and the quizzes for weeks 7-10 must be completed by the end of week 11. These quizzes are designed to be repeated as a formative learning and studying activity, and your highest score will be retained for the final grade.

- **Weekly Assignments.** There will be one or more assignments each week. The course is divided into 8 weekly modules, with each week running from Monday to Sunday, and each assignment should be completed no later than one week from the Sunday at the end of the week it was assigned.

- **Projects.** The course requires completion of two major projects: a visualization dashboard implemented in Tableau, and a narrative visualization implemented as a web page. The visualzation dashboard project will be due at the end of Week 5 and the narrative visualization project will be due at the end of Week 11. These projects are staff graded and will require time from the TA's to complete their grading. **These deadlines are strict and projects handed in after their deadline will be penalized at the rate of 10% per day with a limit of 7 days.** The syllabus provides students with the entire week up to the deadline to complete the assignment, but students are urged to begin and complete the assignment much earlier in case unforeseen circumstances arise near the deadline. ***Unfortunately, there are no extensions to these project deadlines.***

- **Midterm and Final Exams.** The midterm and final exams can be taken early, as soon as each one is announced, but must be completed no later than their availability window allows. Students are responsible for scheduling proctoring through ProctorU to ensure fair completion of the exam. Students are encouraged to schedule the exam early to ensure timely completion. See the readings on ProctorU Exams and How to Schedule and Take the ProctorU exams for more detail.

As a condensed summer course, the deadlines have been set very leniently, especially to provide student flexibility during the summer months.

Academic Integrity

- These assessments are carefully designed to not only measure the knowledge and skills acquired in this course, but to also help you acquire the knowledge and skills needed to complete them.

- You can discuss course material with classmates, but your work on all assessments must be solely your original work, and must not contain any portion that can be attributed to anyone other than yourself.

- Any publicly-available code segments unrelated to the assigned work can be used but must be credited.

- In addition to the Student Code, we will follow the procedures and hold the expectations of the CS Honor Code. Cheating on any assignment can lead to a zero on the assignment, and for multiple instances, can lead to failure of the course and possibly eventual dismissal from the University of Illinois.

Academic Calendar

- The Graduate College at the University of Illinois maintains a Graduate College calendar. The calendar includes important dates such as final exam dates, course registration and cancellation, and holidays.

- There is also a campus-wide calendar available.

- The CS Department also sends reminders about upcoming deadlines. You will also receive the Graduate College newsletter in your Exchange email account.

Course Withdrawal and Refund

For course withdrawal-related questions, please refer to the Academic Calendars. Be sure to select the current term on that page.

This summer course falls under GRAD POT (Part of Term) 1, which is a full 12-week semester course. GRAD POT 1 only refers to summer courses. Spring and fall semester courses do not have multiple sessions.

For course refund information, please refer to the Office of the Registrar refunds website and select the current term. You can also refer to this website for the pro-rate refund schedule if you plan to withdraw from the course after the first day of classes for any given semester.