

Data-driven Web Applications

INFO 3300; CS 3300; INFO 5100

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Time & Location: TBD
Synchronous remote activities via Zoom

Course Prerequisites: CS 2110 & INFO 2300

Course Description

The web has become an outstanding environment for telling stories with data. This course will cover technologies for representing, modeling and displaying data in the context of interactive web pages. Practical skills for building web pages will be mixed with data mining algorithms and visualization design theory. We will use the D3 Javascript library to develop both static and dynamic visualizations, learn more about programming in Javascript, and explore web scalable vector graphics (SVG). Through design critique and formal study, we will identify the techniques visualization developers employ to create the “right” visualization for a given use case. This course introduces a number of popular data mining models and algorithms which we will incorporate into web visualizations.

Learning Objectives

- Develop competency in client-side visualization development
- Create static and interactive web visualizations using a visualization library
- Learn trade-offs and best practices for matching data to visual elements
- Get practical experience gathering and visualizing real-world data

Structure

This class contains **lectures** on visualization design concepts (30%) and **live coding demonstrations** (70%). You will complete **10 homework assignments** over the course of the term, which will involve both development and design content. All students will complete **two group projects in teams of 3**. Group projects will have milestones to check progress and solicit feedback. There are no assigned readings for this course.

All lectures, unless otherwise marked, are held in-person in a synchronous session. At several points during the term the class will not meet in-person and will instead **gather via Zoom to conduct design activities**. One key aspect of design learning is sketching and brainstorming as a group. While these activities do not work in an auditorium with fixed seating and 300 students, the affordances of web meetings allow for small group interactions. For this reason, activities will be held online. For these sessions (indicated on the class schedule), please be sure to attend via the Zoom link posted on Canvas prior to class. Bring materials for sketching your ideas or install a drawing app onto a tablet in order to be prepared to complete these activities.

Please be sure to follow all campus restrictions when attending class in-person. At the time this syllabus was updated, this included wearing masks at all times.

Attending class is important to your overall success in the class and is required.

While lecture slides will be posted to the course web site so that students can follow along during lectures, they tend to be sparse on text and might be hard to interpret without the context gained from attending class. Similarly, while all code will be published as reference for you throughout the term, it may be hard to parse without attending lectures and following along. Course staff will endeavor to provide video recordings of lectures via Canvas, however the auditorium is not configured for this. As a result, recordings may not capture all material covered or bugs may prevent some sessions from being recorded.

Instead of taking attendance in-class, each week there will be a **short quiz** which covers material discussed in lectures and activities. Quizzes are intended to be straightforward and simple to complete for those who have attended the weekly lecture content.

All coding demonstrations will make use of the **course repository on Github**. When recordings are released, both **prompts** and **notes** will be posted to the course repository. You are encouraged to clone the repository on your own computer at the start of class so that you can follow along and edit the prompt as the recording runs.

Students enrolled in INFO5100 will complete a third, more substantial group project. All others will have a **take-home exam**. There is **no prelim** for this course. **All slides will be removed from the course web site prior to the final examination.** Source code from demonstrations will remain in the repository for the final exam.

Course Attendance & Absences

Attendance will be taken through an online quiz. **Each week a quiz will be released on Friday, to be completed before 12:00PM on the following Monday. Quizzes are not intended to be challenging** – if you have followed along with weekly content, you should be able to answer all questions in under 5 minutes.

Assignments & Late Work

Homework assignments will be posted to CMS on Monday mornings and are generally due at 11:59PM ET on the following Wednesday (~10 days later). Please **refer to the course schedule for exact homework posting and due dates**. At times you may not immediately be able to complete all sections of a homework when it is assigned. All content in the homework will be covered during its week of classes. **You are not expected to work on homework or projects during university breaks;** due dates and assignments are already adjusted to accommodate this. Submit homework using CMS.

Any late work will receive a 0 score. Submissions that cannot be decompressed, contain incorrect files, or are missing key files will receive a 0 without exception. This includes cases where you believe you submitted correct files but in fact forgot a file or submitted a previous assignment. To avoid receiving a 0 score, please re-download your submissions on CMS to verify them.

As the late policy is harsh, **you will receive a total of 5 slip days for use as deadline extensions** (see below in document). **We will also drop the lowest two homework scores when computing final class grades (including 0 grades).**

Getting Help

Please make use of the following channels of communication:

- The course web site and policy documentation for basic procedures and rules
- Office hours for individual help on assignments (see [here](#) for a schedule)
- Posting on course Discord for quick clarifications in-class and peer support
- Posting on the [course discussion forum](#) for longer, more involved questions – please search for similar questions before you post a new one
- For personal concerns, use the course email info3300staff@gmail.com
- Do not email the TAs or instructor unless they reach out to you directly
- Do not email about late homework or absences.

Grading

This year we will be offering **two grading options**. Your final grade will be computed automatically based on the **better of these two options**:

	Exam Bias	HW Bias
Class Attendance Quizzes	8%	8%
Weekly Homework	32%	40%
Project 1 & 2	30%	30%
Project 3 OR Take-home Exam	30%	22%

Letter grades will be assigned using the **integer part of your final %**. For example, 96.01 and 96.99 both resolve to 96%, which would be an A- on the grade scale.

Note that **we will be using an adjusted grade point scale for this course**. Due to the large amount of extra credit that you can earn, **it is entirely possible for your final grade to total higher than 100%**.

>=100%: A+	80.0%-82.9%: C+
97.0%-100%: A	77.0%-79.9%: C
93.0%-96.9%: A-	73.0%-76.9%: C-
90.0%-92.9%: B+	70.0%-72.9%: D+
87.0%-89.9%: B	66.0%-69.9%: D
83.0%-86.9%: B-	60.0%-65.9%: D-

Extra Credit

There are several opportunities for extra credit this term. A 1% bonus will be offered to students who **post a neat visualization example** from the web to the "Visualization Examples" tag on Ed Discussions. Alternatively, you can post an interesting dataset to the "Datasets" tag (no Kaggle or other major data repositories). If **75% of the class completes the mid-semester survey**, then the entire class will receive a 0.5% bonus to their grade. No duplicates allowed, so do this earlier rather than later. 2% can be earned via **SONA credits** (see below for more details). **Each remaining slip-day at the end of the term will earn 0.4% of extra credit** (up to 2%). Additional extra credit opportunities may be offered at the discretion of course staff.

Academic Integrity

All students are expected to abide by the University's [Code of Academic Integrity](#). Each term there are cases where students receive a failing grade because they duplicate in-class demo code or plagiarize the work of other students. Please do not do this. Additional details are provided in the policy document below.

In-class work

Class will often involve a programming problem that we will work on together. **You are allowed to bring a laptop to class, but please sit on the left and right sides of the auditorium if you choose to use it during lectures.** Cell phone use is not permitted. **Please do not take photographs or recordings of lecture content without explicit permission.** Any technological or behavioral disruptions will result in grade penalties.

Course Discord

To facilitate question-asking in a large class, this term we will be **experimenting with an in-class Discord discussion**. During class a TA will be **monitoring the #inclass channel for questions**. For instance, if you are confused by terminology or need to clarify something said during class, feel free to ask on Discord to receive more immediate help. The professor will still take breaks for Q&A during lessons, but Discord can offer an additional, low pressure way to get help.

The Discord channel can also be used as a locus for group collaboration, finding homework buddies, asking short questions after lectures, and communicating with staff about logistics (e.g. errata on homework). **Discord is intended for general communication and not private communication with course staff. Please use email and Ed Discussion for direct communication with course staff.** Use Ed Discussions for more detail-oriented questions that may involve code snippets or screenshots of buggy visualizations. On both Discord and ED, please do not publicly post answers to homework questions.

Stay on topic. While a bit of casual conversation is acceptable on Discord, this is a course resource and not an informal forum. Antisocial behavior such as bullying, trolling, hate speech, and cheating are not acceptable and will be submitted as a university disciplinary issue. Course staff encourage students to create a separate account for course Discord use. This will help to avoid any accidental spillover or over-sharing from other Discord communities in which one may participate. **Any breakdown in the collegiality of discourse on Discord will likely result in the end of this experiment.**

Graduate Requirements for INFO5100

Students in INFO5100 have additional expectations in the course:

- INFO5100 homework will at times be graded against a more stringent rubric.
- INFO5100 students will be grouped together for all course projects.
- Project rubric line items have more stringent criteria for INFO5100 students.
- INFO5100 students will complete a rigorous final group project in lieu of the shorter take-home final exam for INFO3300 students.

Additional course policies:

Most if not all items in this document are based on events in class or student emails concerning rule adherence. The Instructor advises students that while it is their right to argue about small rule deviations with course staff, it is rarely in their best interest to do so when fractions of a percent of a grade are on the line. Take note that [sea lawyers](#) were often the first to be thrown overboard during a 19th century nautical mutiny, and many Dungeons & Dragons sessions have been ruined by [battles over rules](#) instead of against fictional monsters. When possible, obey the “reasonable person principle”.

Academic Integrity

tl;dr version: All students are expected to abide by the University’s [Code of Academic Integrity](#). Please make sure that you submit your own work.

We will follow university policies as outlined in the Academic Integrity Handbook. You are encouraged to discuss homework, but each student will complete assignments alone. TAs are present to assist in your learning process but are not expected to offer specific code suggestions. Learning from other individuals’ code is an important part of programming, but for group projects the code should be the work of the group members except for standard libraries such as D3, lodash, and jQuery. Any code used in projects that was not written by the group members should be placed in separate files and clearly labeled with their source URLs. If you have benefitted from online resources (such as examples or StackOverflow answers), list the URLs in comments in your own code, even if you did not directly copy anything. Recall that some workplaces ban StackOverflow outright to avoid diluting their IP. Project work that relates to your other classes or research is encouraged, but you may not recycle assignments. There must be no doubt that the work you turn in for this class was done for this class and this class alone. **This includes lecture notes and code!** Integrity issues will be adjudicated at the discretion of Professor Rzeszotarski and course staff and include penalties such as referral to the Academic Integrity Board.

Blatant instances of copying lecture notes into homework will be considered integrity violations. This is a zero-tolerance policy. If you are concerned about inadvertently duplicating course code in your submissions, try reading the course notes first, closing them out, and then coding yourself in a new environment or editor. If you get stuck, switch back again but avoid having both open at the same time.

Citing Sources

This section is based on an excellent [citation guide](#) created by Prof. Kyle Harms. We will largely be following these guidelines.

Any code that you did not write specifically for this class is considered to be external code. This includes example code from class, code from other classes at Cornell you wrote, and external code from web sites (e.g. StackOverflow). All code submitted for projects and homework assignments, unless otherwise indicated, must be your own. No external code will be permitted. This includes importing helper libraries like jQuery. Standards for projects will be looser in terms of importing libraries - refer to assignments for specific instructions.

Any external code used must be cited within the source code with comments.

Late or Missing Work

[The following rules apply under normal circumstances. If you have experienced a personal crisis or a medical condition contact the Instructor as soon as possible. The earlier we hear from you, the more we can help. We can only provide assistance if we are made aware of the problem in a timely fashion. Do not wait until the end of term to disclose issues which might have affected your grades.]

If you do not submit work before the stated deadline, then we will record a zero. There will be no exceptions. This policy is harsh, but it is necessary for a class of this size. All assignment deadlines are known in advance. For most students with accommodations, you should plan ahead and complete your assignment before the deadline.

Submitted files will be graded as-is and absolutely no excuses for mistaken submissions will be accepted. Verify on CMS that you have provided the correct files after submission. Any archive files must be in a format that can be opened by recent Windows and Apple OS X computers. Unopenable submissions will receive no credit. It is your duty to submit the correct files in a timely manner and verify that Canvas has properly stored your submission before the deadline.

In the very unlikely event that CMS is down or you experience computer problems, you may email submissions to the course staff email address using your Cornell email account. You must email the file to the course staff email address before the homework due date - screenshots, file metadata, and git commit logs are too easy to modify.

Slip Days / Extending Deadlines

You can spend slip days in order to extend the deadline for a specific homework assignment. Slip days are specifically intended for legitimate reasons for needing an extension. This includes accommodations (e.g. medical issues, family emergencies, religious observance, athletic participation, etc.).

Each slip day will allow you to submit a homework assignment 24 hours after the deadline. You can use up to 3 slip days for an assignment, delaying submission for a total of 72 hours.

1 slip day	2 slip days	3 slip days
Extra 24 hours	Extra 48 hours	Extra 72 hours

Slip days will be automatically used when assignments are graded. It is your responsibility to tracking your current slip day usage. If you have insufficient slip days to cover a late submission, it will receive a 0 but no slip days will be consumed. Should you run out of slip days, any late assignments will automatically receive a 0.

Here are several example scenarios: A) You submit a homework 25 hours after the deadline. Our automatic script deducts 2 slip days from your total, leaving you with 3 days left. B) You currently have 2 slip days and decide to submit a homework 52 hours late. This would require 3 slip days, which you do not have. As a result, you receive a 0 and keep your current 2 slip days for future use.

Please do not notify the instructor if you intend to use slip days. Course staff use an automated script to compute and maintain slip day usage. **Staff may supply CMS comments explaining your current slip day usage, but ultimately it is your job to track your use of slip days.**

Regrade Requests

You may request a regrade, which will be granted on a case-by-case basis. Regrade requests must be submitted by email to the staff email address. **Please refer to the specific instructions on the form available [here](#). Include the relevant fields in your email.** No new files will be accepted. As the instructions indicate, please wait 24 hours before submitting a regrade after receiving new grades. Requests received prior to that point will be discarded.

We want to give grades that accurately represent our assessment of your learning. Hence, if you are given a lower score than you should have received, you should absolutely bring it to our attention via the mechanism just described. However, we must explicitly mention an additional consequence of the importance of grade accuracy: if we notice that you have been assigned more points than you should have been, we are duty-bound to correct such scores downward to the correct value.

Regrades must be submitted within one week of the time in which homework was returned (no exceptions). For example, if homework was marked as "Graded" on Canvas at noon on Thursday, then regrades must be emailed before noon on Thursday of the following week. No late regrade requests will be accepted.

On Decorum

Though it should go without saying, please observe respectful behavior while in class lectures. This includes following campus health rules, avoiding noise and interruptions during lectures, making appropriate comments in course chat, answering questions posed to the class, and refraining from leaving during the middle of the lecture.

Should you have issues with an undergraduate or graduate teaching assistant, please reach out to the Instructor directly. Though it once again ought to go without saying, please avoid posting about "stupid TAs" on the course forum, pitting TAs against other course staff members, or calling a graduate TA "useless" to their face (all of which have happened in the past and make the instructor very sad).

Note on Inclusiveness

This course involves both self-directed assignments as well as in-class exercises. It is possible that in the course of this class you will encounter datasets, visualizations, or arguments that do not match your worldview or perhaps might even be upsetting. Course staff cannot guarantee such events will not occur, and do not want to hamstring the potential projects that teams can complete with a set of content requirements. Students must be respectful throughout the critique process and in-class activities, acknowledging that at times discussion can be fraught or argumentative. Course staff will not tolerate intentional displays of disrespect or marginalization during class time and out of class project work. Penalties will range from loss of participation grade to failure of projects/assignments to referral to university officials on a case-by-case basis.

Having experienced environments lacking in tolerance and inclusivity earlier in life, the Instructor will try their best to be mindful of potential issues with course content throughout the term. However, they might miss something objectionable,

inadvertently encounter an instance of implicit bias, or misspeak. If during the semester you have concerns about the way the course is going or are having a negative experience, please reach out to the Instructor directly.

Special Accommodations

We will make every effort possible to ensure that the class works for all students. Students who have self-identified to Cornell SDS as needing special accommodations in the classroom should contact the professor at the time of enrollment or during the first two weeks of class so that any course materials can be adapted, and other appropriate arrangements made. Failure to do so may prevent us from making the proper accommodations. Lectures will not be recorded unless SDS requires it. If there is a specific event that you are concerned about (such as an exam), please inform us at least two weeks in advance so that we have time to make arrangements.

SONA Credits

Many researchers on campus need participants for user studies and other types of experiments. The SONA system allows you to register for studies. You will receive 0.5% extra credit for each SONA credit, up to a maximum of 2.0% for the term. Participating in studies is a great way to find out what real research looks like. To register, please visit: <https://cornell-comm.sona-systems.com>

Note: The COMM SONA pool is different from the PSYCH SONA pool. Please verify that the URL of the pool you are using matches the one listed above. No credit can be awarded from participation in the PSYCH pool.

Example schedule:

Week 0	Introduction	
27-Aug	Introduction	
Week 1	JS Basics	
30-Aug	Javascript (coerced into a snafu)	HW1 assigned
1-Sep	JS Events & Functions	
3-Sep	Visual Channels	
Week 2	Drawing & Visual Analytics	
6-Sep	-No class-	
8-Sep	Intro to SVG	HW1 due & HW2 assigned
10-Sep	Brief history of datavis	
Week 3	Hello, Chart	
13-Sep	Intro to d3	HW3 assigned
15-Sep	d3 simple bar chart (scales in d3)	HW2 due
17-Sep	Color theory + models	P1 assigned
Week 4	Scatterplots	
20-Sep	d3 basic scatterplot (importing data)	HW4 assigned
22-Sep	d3 fancy scatterplot (labels & hover)	HW3 due
24-Sep	Activity - Visualization Brainstorming	
Week 5	Joins and Shapes	
27-Sep	d3 joins (old & new style)	HW5 assigned
29-Sep	d3 line plots	HW4 due
1-Oct	Visual Perception	
Week 6	Advanced Joins	
4-Oct	d3 interactive bar chart	
6-Oct	d3 lollipop chart	HW5 due
8-Oct	Activity - Project Critique	P1 due
Week 7	Geo Data	
11-Oct	-No class-	
13-Oct	d3 choropleth (hooray geoJSON)	HW6 assigned
15-Oct	Geographic visualizations	P1 late deadline

Week 8	Choropleth Maps	
18-Oct	d3 choropleth (adding data)	
20-Oct	d3 choropleth (more dots)	HW6 due
22-Oct	Human-Visualization Interaction	HW7 assigned P2 assigned
Week 9	Adding Interactivity	
25-Oct	d3 pan+zoom	HW8 assigned
27-Oct	d3 raster vis	HW7 due
29-Oct	Activity - Interaction Brainstorm	
Week 10	Network Diagrams	
1-Nov	Network Layouts	HW9 assigned
3-Nov	d3 emergent layouts	HW8 due
5-Nov	d3 network layouts	
Week 11	Recreating Homefinder	
8-Nov	client-server patterns	
10-Nov	d3 homefinder (query manip)	HW9 due
12-Nov	d3 homefinder (direct manip)	
Week 12	Multivariate Visualizations	
15-Nov	d3 density vis (contour, density)	P3 assigned (5100 students)
17-Nov	3D d3 day (a.k.a. 3-don't)	P2 due
19-Nov	Activity - Project Critique	
Week 13	Animation	
22-Nov	Animations & narrative	
24-Nov	-No class-	
26-Nov	-No class-	
Week 14	Challenging Visualizations / Make-up days	
29-Nov	d3 chord diagrams	
1-Dec	d3 text vis	
3-Dec	Activity - Designing Under Constraints	
Week 15	Wrap up	

6-Dec Physicalization & Access

Final Exam/Project Submission

**For students in
INFO/CS 3300** Final take-home exam

**For students in
INFO 5100** Complete Project 3