Geography 575
Interactive Cartography & Geovisualization

Instructor:
Robert Roth, PhD | reroth@wisc.edu
Office: 375 Science Hall
Office Hours: Tuesday 2:30-3:30pm; Friday 11:00-12:00pm, or by appointment

Teaching Assistants:
Yuying Chen | chen449@wisc.edu
Office Hours: Tuesday 2:30-4:30pm (M376 Science Hall)

Lecture (444 Science Hall):
Tuesday/Thursday 1:00-2:15pm

Labs (380 Science Hall):
Section 301: Wednesday 1:30-3:30pm
Section 302: Wednesday 3:45-5:45pm

Course Overview

Course Description:
Geography 575 (G575) provides a deep examination of interactive, online, and mobile mapping, topics falling under the design thrusts of Interactive Cartography and Geovisualization. Specifically, G575 focuses on **UX** (user experience) and **UI** (user interface) design as applied to web maps, drawing from human-computer interaction, information visualization, and usability engineering. G575 emphasizes map design over map use (compared to G170) and the design of interfaces to maps rather than maps themselves (compared to G370 and G572).

Prerequisites:
Geography 370 **_and_** 378 (or equivalents), or consent of instructor.

Programs/Breadth:
G575 serves undergraduate and graduate programs in Cartography/GIS, and is Physical Science breadth for L&S majors. Under university policy, undergraduates and graduates are graded on separate curves.

Credit Load:
G575 is a 4-credit course, and therefore assumes ~4 hours of classroom contact per week plus ~8 hours of self-directed study and design outside of class per week.
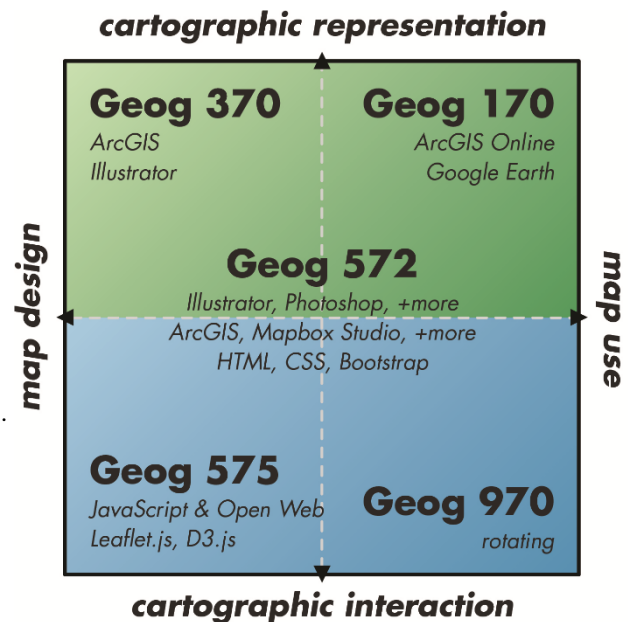
Lecture Summary (2-credits):

The lecture component of the course covers contemporary UX principles, best practices, and success stories that are important for ***thinking critically*** about interactive map design. Lecture material is presented as a series of design considerations for interactive, online, and mobile maps with associated examples illustrating the range of potential interface solutions. Lectures are organized by the largely conceptual topics related to ***interaction***—defined as the dialogue between a human and map through a computing device—and largely applied topics related to the design of ***interfaces*** that provide this interaction. As you will see as the course progresses, our understanding of map-based UX and UI design remains incomplete, and therefore the course is organized more around discussion of the larger questions facing Interactive Cartography and Geovisualization for the next 5, 10, and 50 years, rather than time-tested conventions or guidelines (as in G370).

Lab Summary (2-credits):

The laboratory component of the course structures the practical skills needed to ***develop*** interactive, online, and mobile maps into ten weekly modules, with each week building towards one of two lab assignments. While weekly modules primary focus on technical programming skills, the lab assignments themselves integrate lecture design concepts with lab coding, building towards portfolio level interactive maps. The lab modules leverage the ***JavaScript language***, the ***Leaflet.js*** and ***D3.js*** web mapping libraries and the ***Github*** code versioning platform; by the end of the course, it is expected that you will have operational knowledge of JavaScript as applied for web map design, and that you can indicate such on a résumé. Following the lab modules and assignments, you are required to work in small groups on a ***final project*** web map on a topic of your choosing. Creativity and ingenuity are strongly encouraged in the conceptualization and execution of the final project map application.

Learning Outcomes

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

Design interactive maps. Specifically, you will be to understand and apply principles of:
- User experience (UX) and user interface (UI) design.
- Interface complexity, constraint, flexibility, and freedom.
- User- and technology-based constraints on UI/UX design.
- Interaction operators (e.g., pan, zoom, search, filter) and web map UI solutions.
- Non-map visualization techniques.
- Direct and indirect map-based interface styles.
- Coordinated big data visualization and interactive highlighting techniques.

Develop interactive maps. Specifically, you will be able to:
- Follow and deviate from a cartographic workflow using HTML, CSS, and JavaScript.
- Construct spatiotemporal and multivariate visualizations using Leaflet.js and D3.js.
- Think computationally to consult web resources and debug source code.
- Deploy web maps on the Open Web Platform using Github code repositories.

Produce interactive maps. Specifically, you will be able to:
- Plan and execute a user-centered design process from needs assessment to transition.
- Acquire and prepare geographic datasets.
- Design within user-defined and technology-defined functional constraints.
- Evaluate and improve prototoypes and application releases.
- Work in small groups using Github versioning and collaboration tools.

Assessment Summary

	Item	Weight	Description	Date(s)
Lecture	Exam #1	15%	75-minute midterm	2/26
	Exam #2	15%	75-minute final (non-cumulative)	4/11
	Quizzes	8%	Eight 5-minute in-class quizzes covering topics since prior quiz	throughout
Labs	Lab Assignments	20%	Two multi-week mapping assignments	Weeks #8 & #12
	Lab Activities	10%	Ten weekly active learning exercises supporting labs	Weeks #1-7; 9-11
	Final Project	32%	Group (~three students) interactive mapping project	3/28, 4/4, 5/1, 5/10

*All course materials, deliverables, and assessments are managed via the G575 Canvas site.

Lecture-based Assessments (38%)

Reading (Optional):
Course lectures draw heavily from Rob's research on interactive, online, and mobile map design, with supplemental readings available from an eclectic set of papers, book chapters, and online materials. Readings are not required, but are **_highly recommended_** for students that are pursuing a career in Cartography and/or students struggling with specific lecture topics. Reading materials are posted to the Canvas course website and are best reviewed before class. **_Learning Outcomes:_** Design, Produce.

Exams (30%):
Your understanding of interactive, online, and mobile map design is evaluated through two exams and a series of quizzes. Exams include a combination of true/false, multiple choice, and short answer questions. The exams are **_closed_** book/notes and must be completed within 75 minutes. The exams are **_not_** cumulative. Cheating during the exam is not tolerated and results in a zero for the exam and disclosure of the impropriety to the University. Make-up exams are **_not_** allowed unless arranged in Week #1 due to known academic travel. **_Learning Outcomes:_** Design, Produce.

Quizzes (8%):
In non-exam weeks, quizzes are proctored at the beginning of lecture covering material since the last quiz. In-class quizzes are designed to promote active learning and attentive note-taking, as well as class attendance. Quizzes are **_open_** book/notes and must be completed within 5 minutes. Make-up quizzes require a doctor's note or, in the event of planned travel, must be rescheduled in Week #1; you may not complete the quiz following class if you arrive late. Lecture notes are posted after the quiz is administered. **_Learning Outcome:_** Design.

Lab Assignments and Activities (30%)

Lab Assignments:
Your ability to apply the interactive mapping principles learned in lecture is evaluated through two multi-week lab assignments. Both assignments represent a mapping "challenge" in which you need to design an interactive web map for a specific mapping purpose:

1. Spatiotemporal Visualization Challenge
2. Multivariate Visualization Challenge

Each lab assignment builds on the last, meaning that you are responsible for applying previously learned mapping principles; thus, lab assignments **_are_** cumulative. **_Learning Outcomes_**: Design, Develop, Produce.

Lab Modules and Activities:
The two lab assignments are supported by ten weekly lab modules and associated weekly activities focusing on development. Each lab module includes multiple technical lessons—which you are **_required to read for homework_** prior to the week's lab period—and a concluding activity that tracks your progress as a developer. Reviewing each module prior to lab will help you learn the technical terminology and concepts before classroom demos, as well as give you more room to flex your design creativity during free time in the lab periods. Early in this semester, lab modules and activities are oriented towards understanding the Open Web Platform (JavaScript basics, the DOM, AJAX, etc.) and building computational thinking (e.g., scripting and debugging). As the semester progresses, lab modules and activities represent check-in progress deliverables for the two lab assignments to avoid falling behind. As with lab assignments, lab modules **_are_** cumulative. **_Learning Outcome_**: Develop, Produce.

Lab Assignment & Activity Submission:
All lab assignments must be committed online to the course Github group **_and_** submitted as a zipped directory to Canvas for provenance. We will grade the version committed online, using the zipped directory to determine if substantial additional work was completed after the deadline (although you are encouraged to continue to polish your labs after submission!).

Instructions for submitting lab activities are included at the end of each weekly module. Most activities require Github commits with Canvas backups, with several requiring additional data uploads. Aside from Activity #1, which is due at the end of the first lab period, all lab activities are due **_1 hour_** prior to the next lab period, providing **_1 week_** of work time on each activity.

Lab Assignment & Activity Grading:
Lab assignments are graded on a 50 point rubric. The penalty for a late lab assignment is **_10%_** of the total score per day late. Submission of an assignment the day it is due, but after the deadline (e.g., following your lab that day), counts as one day late. Extensions for labs must be arranged in Week #1. Technical complications (e.g., disk errors, printing problems) are not reason for extension, so be sure to make use of Github versioning and store a local copy when in doubt. Requests for grade changes must be submitted in writing (via email) within **_24 hours_** of receiving your feedback.

Lab activities are graded as "completed" or "not" to mark weekly progress. Thus, activities are intended to keep you on track with course deliverables and late activities are not accepted. Instead, you are encouraged to commit what you have at the time of the activity deadline to receive partial points.

Final Project (32%)

Final Project Assignment (20%):
The final project is the cornerstone of G575, affording you the opportunity to integrate your understanding of design and development on a collaborative mapping project. Each project is completed by a group of **~3** students, presenting an opportunity to add a project of significant collective scope and merit for your design portfolio while also learning the collaborative development features of Github.

It is never too early to begin thinking about your final project topic, and, once selected, to begin assembling the needed geographic datasets to tell your place-based story product. The best final projects from G575 often are competitive in national and international student mapping competitions, including the CaGIS Map Design Competition and the NACIS Student Dynamic Map Competition. **Learning Outcomes:** Design, Develop, Produce.

Final Project Proposal (6%; 2% draft and 4% final):
Conceptual design of your final project begins with the proposal. Like G370, the G575 final project proposal parallels a response to a client RfP (request for proposals), and includes as a formal requirements document scoping the work, and use case scenarios relating user needs to functionality, and pen-and-paper prototypes providing an overview of UI layout, navigation, and design. Additional information about the final project proposal is provided after the first exam.

Final Project Draft (4%):
You will discuss a **~75%** complete draft of your final project during your Week #14 lab. "75%" is defined as the beta release, signifying v0.2 of the application that is functional, but buggy. Final project drafts are graded on their degree of reaching the 75% threshold.

Final Project Video (2%):
You are required to capture a **90-120 second** narrated video introducing your final project and demonstrating its functionality by working through a use case scenario. The video, therefore, should be a polished overview of your application and a walk through of your use case scenario. The video should make use of the fully featured application rather than a draft, and thus should be the last deliverable that you complete.

Final Project Submission:
Final project proposals (draft and final) must be uploaded to Canvas by **_midnight_** on the due date. Final project drafts must be committed to the course Github group **_1 hour_** prior to lab on the due date for in-class discussion and progress grading. The final project and video are due at **_12pm Noon_** on the due date. The final project must be committed online to the course Github group **_and_** submitted as a zipped directory to Canvas for provenance.

Final Project Grading:
Late final projects will not be accepted; you must submit the current state of your project (however complete it is) on the deadline to avoid a zero for the deliverables. Plagiarism is not tolerated; final project topics are researched to ensure you did not directly copy an existing interactive map. As with other evaluated items, any offense results in a zero for that activity and disclosure of the impropriety to the Department and University. Additional information about the final project grading is provided after Exam #1.