Geography 575
Interactive Cartography & Geovisualization

Instructor:

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375 Science Hall
Office Hours: Tuesday 3:30-4:30pm; Thursday 2:30-3:30pm, or by appointment

Teaching Assistant:

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Office Hours: TBD (in Science Hall M376)

Lectures (444 Science Hall):

Tuesday/Thursday 11:00am-12:15pm

Labs (380 Science Hall):

Section 301: Wednesday 1:00-3:00pm
Section 302: Wednesday 3:15-5:15pm

Course Overview

Geography 575 (G575) provides a comprehensive overview of conceptual and technical design topics related to dynamic mapping, topics typically considered under the cartographic research thrusts of ***Interactive Cartography*** and ***Geovisualization***. Specifically, G575 discusses user interface (UI) and user experience (UX) design as applied for web maps, drawing from research and practice on Human-Computer Interaction, Information Visualization, Usability Engineering, and Visual Analytics, perspectives that you are unlikely to receive in other GIS courses. G575 emphasizes mapmaking over map use (compared to G170) and the design of interfaces to maps rather than the maps themselves (compared to G370 and G572). G575 is divided into two components: lectures and labs.

Lecture Overview:

The lecture component of the course covers contemporary design theories and prior success stories that are important for thinking critically about the creation of interactive maps. Lecture material is presented as a series of cartographic best practices and associated examples illustrating the range of potential interface design

solutions. Lectures are discriminated by largely theoretical topics related to ***cartographic interaction***—defined as the dialogue between a human and map through a computing device—and largely applied topics related to the design of ***cartographic interfaces*** that provide this interaction. As you will see as the course progresses, our understanding of cartographic interaction and cartographic interface design remains incomplete, meaning that the course is organized more around discussion of the larger questions facing Interactive Cartography and Geovisualization for the next 5, 10, and 50 years, and less around direct description of time-tested conventions or guidelines (as in G370).

Lab Overview:

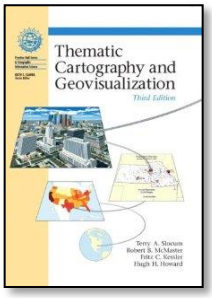
The laboratory component of the course emphasizes the practical skills needed to create cartographic interfaces. Following an introduction to the programming environment, each lab assignment requires you to grapple with topics previously discussed in lecture, with the final map deliverable representing your critical thinking and cartographic creativity regarding the topic. The labs leverage the Open Web Platform, the JavaScript language, and the Leaflet and D3 open source mapping libraries; 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 series of lab assignments, you are required to work in small groups on a ***final project*** map application on a topic of your choosing. Creativity and ingenuity are strongly encouraged in the conceptualization and execution of the final project map application.

Course Requirements

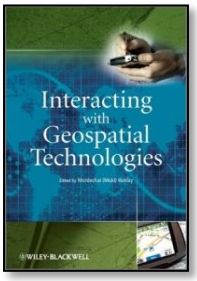
Prerequisites for G575 include G370 (Introduction to Cartography), and G378 (Geocomputing) or CS302 (Introduction to Programming). Accordingly, G575 assumes a basic understanding of two topics: (1) cartographic design, including basic reference and thematic map design principles (e.g., the knowledge and experience you would attain from G370) and (2) object-oriented programming (e.g., the knowledge and experience you would attain from G378 or CS302); the course does not assume any knowledge or experience with JavaScript. Please speak with Rob and Robin early in the semester if you are deficient in either skillset, as you will be graded on your anticipated understanding of these subjects.

There are two recommended texts for G575, although the lecture material draws from a diverse range of journal articles, book sections, and websites; a complete set of readings is available on Learn@UW. Readings are not required, but are highly recommended for students that are pursuing a career in cartography. The reading excerpts associated with each lecture are noted in a readings list posted to Learn@UW and in the lecture notes posted after each lecture.

Recommended Texts:



***Thematic Cartography and Geographic Visualization, Third Edition* (2009)** by Terry A. Slocum, Robert B. McMaster, Fritz C. Kessler, and Hugh H. Howard. Upper Saddle River, NJ: Pearson Prentice Hall. (on course reserve in the Geography Library)



Interacting with Geospatial Technologies* (2010)** edited by Mordechai (Muki) Haklay. West Sussex, UK: Wiley-Blackwell. (on course reserve in the Geography Library and ***free as an e-Book through MADCAT)

Evaluation

Grade Weighting: Each evaluated item represents a percentage of the total course weight; final grades are assigned according to your composite percentage across all evaluated items. Under university policy, final grades are assigned to graduate/honors and undergraduate students using separate curves.

	Item	Weight	Description	Date(s)
Lecture	**Exam #1**	15%	75-minute midterm (TF, MC, & short answer)	**3/1**
	Exam #2	15%	75-minute final (non-cumulative; TF, MC, & short answer)	**4/26**
	Quizzes	10%	8-10 in-class quizzes on conceptual, lecture material	**throughout**
Labs	**Lab Assignments**	20%	Two mapping assignments	**Week #8 & #12**
	Lab Activities	15%	10 weekly active learning exercises supporting labs	**Weeks #1-7; #9-11**
	Final Project	25%	Group (3-4 students) interactive mapping project	**TBD**

*UW-Madison encourages persons with disabilities to participate in its programs and activities; contact Rob at the outset of the course if you need any type of accommodation.

Exams and Quizzes (40% of total)

Exams (30%; 15% per exam): Your understanding of the lecture material is evaluated through a pair of examinations and a series of quizzes. Exams constitute the majority of the lecture points and include a combination of multiple choice, true/false, 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 Department and University. Make-up exams require a doctor's note or, in the event of planned travel, must be rescheduled **4 weeks** in advance. Make-up exams are in an essay format, rather than primarily short answer.

Quizzes (10%): In non-exam weeks, quizzes are proctored at the beginning of lecture covering material from the prior lecture. In-class quizzes are designed to promote active learning and attentive note-taking, as well as class attendance; attendance is **mandatory** for both lecture and lab. 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 **4 weeks** in advance; you may not complete the quiz after class if you arrive late. Lecture notes for the week will be posted after the weekly quiz is administered.

Important Dates for Lecture Evaluation:

- **March 1st:** Exam #1 (in 444 Science Hall)
- **April 26th:** Exam #2 (in 444 Science Hall)

Lab Assignments and Activities (35% of total)

Lab Assignments (20%; 10% per lab): Your ability to apply the interactive mapping principles learned in lecture is evaluated through two lab assignments, the first using the Leaflet library and the second using the D3 library. Each assignment represents a mapping "challenge", in which you need to design a map for a specific mapping purpose. All labs assignments must be published online, with the link, source code, and data sources submitted to the Learn@UW dropbox **1 hour** prior to the lab period meeting on the due date.

Lab Assignment Grading: A rubric is provided for each lab assignment to indicate how it is marked. 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 **4 weeks** in advance. Technical complications (e.g., disk errors, printing problems) are not reason for extension; be sure to back up copies of all of your work and version meticulously, as forgetting to save and back up your interactive map is the easiest way to lose your work and subsequently fall behind in the course. Requests for grade changes must be submitted in writing (via email) within **24 hours** of receiving your feedback.

Lab Activities (15%; 1.5% per activity): The two lab assignments are supported by a series of ten weekly lab modules. Each lab module includes a series of lessons, which are introduced during class and can be assessed for reference and review, and a final activity. Early in this semester, 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 activities represent check-in progress deliverables for the two lab assignments. Each lab module builds on the last, meaning that the lab assignments and activities **are** cumulative. All labs activities must be committed to GitHub or submitted to the Learn@UW dropbox **1 hour** prior to the lab period meeting on the due date (delivery format indicated in Activity Schedule document).

Lab Activity Grading: Lab activities are graded as "completed" or "not" across each component of the activity. The penalty for a late lab activity 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 lab assignments must be arranged **4 weeks** in advance. As with lab assignments, technical complications (e.g., disk errors, printing problems) are not reason for extension. Requests for grade changes must be submitted in writing (via email) within **24 hours** of receiving your feedback.

Important Dates for Lab Assignments and Activities:

- **January 20th:** Activity #0 Due (GitHub Repo; submit to Learn@UW)
- **January 27th:** Activity #1 Due (Online Tutorials; submit to Learn@UW)
- **February 3rd:** Activity #2 Due (Debugging Practice #1; commit to GitHub)
- **February 10th:** Activity #3 Due (Debugging Practice #2; commit to GitHub)
- **February 17th:** Activity #4 Due (Leaflet Tutorials & Dataset; commit to GitHub)
- **February 24th:** Activity #5 Due (Leaflet Tiles & Prop Symbols; commit to GitHub)
- **March 2nd:** Activity #6 Due (Leaflet Operators; commit to GitHub)
- **March 9th:** Lab #1 Due (commit to GitHub; source to Learn@UW)
- **March 16th:** Activity #7 Due (D3 Demo & Dataset; commit to GitHub)
- **March 30th:** Activity #8 Due (D3 Basemap; commit to GitHub)
- **April 6th:** Activity #9 Due (D3 Choropleth + Chart; commit to GitHub)
- **April 13th:** Lab #2 Due (commit to GitHub; source to Learn@UW)

Statement on Academic Integrity and Misconduct: Plagiarism has a different meaning regarding design and development on the Open Web Platform, as the ability to integrate and modify the open source code of others is an important skill for web mapping. Your creative interface design solutions must be your own, and each lab assignment has an 'Easter Egg' in it to ensure you are not using work from prior semesters. You are required to provide attribution for any data sources, code libraries, plugins, etc., that you use for development. You also are required to complete the assignments and activities on your own (i.e., you may not directly copy code solutions from others), although you are encouraged to seek and provide help from your colleagues. As with other evaluated items, any offense results in a zero for the lab assignment and disclosure of the impropriety to the Department and University.

Final Project (25%)

Final Project (20%): The final project is the cornerstone of G575, affording you the opportunity to apply the conceptual and practical knowledge acquired throughout the course on an interactive mapping project of your choosing. The benefit of such a significant undertaking is a deep understanding of course material gained through the process of moving conceptual ideas into plans and plans into products. Plus, the finished products are very helpful in landing jobs and look great in your online portfolio. Each project will be carried out in a group of **3-4** students; graduate students are allowed to work alone only if the project is a component of their thesis research. The best final projects from G575 often are competitive in student interactive mapping competitions, including the CaGIS Map Design Competition and NACIS Student Dynamic Map Competition. You are encouraged to look at past winners of these competitions for inspiration.

Final Project Proposal (3%; 1% draft and 2% final): Conceptual design of your final project begins with proposal. Unlike G370, the G575 final project proposal mimics as 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.

Final Project Video (1%): Because of the pace of technical change in web mapping, the final project is submitted along with a video demonstration of the final interactive map for provenance. The final project video should be about 2 minutes in length, providing a narrated overview of the interactive map and a walkthrough of one of the use case scenarios. The final project video should be formatted for posting to YouTube; prior videos can be viewed at: https://www.youtube.com/channel/UCMH3wZ0dzF-XMtqlCdt8-6g.

Final Project Presentation (1%): You will present your final project on the dedicated final exam period. The final project must be published online, with the link, source code, and data sources submitted to the Learn@UW dropbox **1 hour** to presentations.

Final Project Grading: Late final projects will not be accepted; you must submit the current state of your project (however complete it is) at 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.

Important Dates for the Final Project:

- **March 3rd:** Final Project Assigned
- **March 16th:** Finalize Final Project Groups
- **April 1st:** Draft Proposal Due (submit to Learn@UW)
- **April 4th-6th**: Consult with Rob about Final Project Proposal
- **April 8th:** Revised Proposal Due (submit to Learn@UW)
- **May TBD:** Final Project Presentations during Exam Period (commit to GitHub; submit source and video to Learn@UW)

Week	Date	Lecture/Lab Topic	Deliverable	
W1	1/19	Course Introduction: Organization & Influences	R: 2013b; 2014	Cartographic Interaction
	1/21	Elements: *What?* HCI and UI versus UX Design	H: Ch1	
	1/20	Module #1: Setting Up Your Workspace	***Initial GitHub Repo***	
W2	1/26	Elements: *Why?* Geovisualization, Exploration, and Insight	S: Ch1	
	1/28	Elements: *When?* Productivity, Complexity, and Constraint	H: Ch1	
	1/27	Module #2: Scripting and Debugging	***Online Tutorials***	
W3	2/2	Elements: *Who?* User Ability, Experience, Motivation	H: Ch2; S: 26.2	
	2/4	Elements: *Where?* Input, Display, Processing/Bandwidth, Mobile	H: Ch11; S: Ch25	
	2/3	Module #3: Data and AJAX	***Debug Practice #1***	
W4	2/9	Learning to Code Guest Lecture w/ **Carl Sack**		
	2/11	Elements: *How* ? Stages of Interaction	R: 2012	
	2/10	Module #4: Using Online Resources; ***Leaflet Lab Assigned***	***Debug Practice #2***	
W5	2/16	Elements: *How?* Objectives	H: Ch7	
	2/18	Elements: *How?* Operators I	R: 2013a	
	2/17	Module #5: Leaflet Interactions	***Leaflet: Tut & Dataset***	
W6	2/23	Elements: *How?* Operators II	R: 2013a	
	2/25	Elements: *How?* Operators III	R: 2013a	
	2/24	Work Period for Lab #1	***Leaflet: Tiles & Prop***	
W7	**3/1**	**EXAM #1: 75-minute midterm**	***Exam #1***	
	3/3	Elements: *How?* Operands I; ***Assign Final Project***	S: Ch21	
	3/2	Module #6: Internal Logic of Leaflet	***Leaflet: Operators***	
W8	3/8	Elements: *How?* Operands II	S: Ch21	
	3/10	Interactive Maps & Usability Engineering I: Usability vs. Utility	H: Ch6	
	3/9	Module #7: D3 Foundations; ***D3 Lab Assigned***	***Leaflet Lab Due***	
W9	3/15	Interactive Maps & Usability Engineering II: User-Centered Design	R 2015; H: Ch5	Cartographic Interfaces
	3/17	Interactive Maps & Usability Engineering III: Interface Evaluation	R 2015; H: Ch10	
	3/16	Module #8: Mapping in D3; ***Finalize Final Project Groups***	***D3: Demo & Dataset***	
	3/21-3/25	**No Class: Spring Break**		
W10	**3/29**	**No Class: AAG Meeting; Work on Proposals**		
	3/31	Open Source Mapping w/ **AJ Wortley & the SCO**		
	3/30	Module #9: Coordinated Visualization; ***Proposal Drafts Due 4/1***	***D3: Basemap***	
W11	4/5	Interactive Maps & Information Visualization	S: 26.1, 26.5	
	4/7	**No Class: Meet w/Rob to Discuss Proposals**		
	4/6	Module #10: Coordinated Interactions; ***Final Proposal Due 4/8***	***D3: Choro & Chart***	
W12	4/12	Interactive Maps & UI I: Interface Styles	H: Ch9	
	4/14	Interactive Maps & UI II: Interface Design & Design Heuristics	H: Ch9	
	4/13	Final Project Consultation	***D3 Lab Due***	
W13	4/19	Interactive Maps & Visual Analytics I: Analytical Reasoning	S: 26.7	
	4/21	Interactive Maps & Visual Analytics II: GeoCollaboration	H: Ch4; S: 26.3	
	4/20	Final Project Consultation;		
W14	**4/26**	**EXAM #2: 75-minute final (non-cumulative)**	***Exam #2***	
	4/28	Final Project Consultation		
	4/27	Final Project Check-in w/ Robin		
W15	5/3	Final Project Consultation		
	5/5	Final Project Consultation	***Presentations***	
	5/4	Final Project Check-in w/ Rob	***Presentations***	
	TBD	**Final Project Presentations During Exam Period**	***Projects Due***	