Geography 575
Interactive Cartography & Geovisualization

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

Teaching Assistant:
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>Office Hours: TBD (in Science Hall M376)

Lectures (1217 Humanities):
>Tuesday/Thursday 1:00-2:15pm

Labs (380 Science Hall):
>Section 301: Monday 1:00-3:00pm
>Section 302: Tuesday 3:00-5:00pm

Course Overview

Geography 575 (G575) provides a comprehensive overview of topics related to dynamic mapping, topics typically considered under the cartographic research thrusts of *Interactive Cartography* and *Geovisualization*. G575 focuses on the design and development of user interfaces to geographic information and associated map-centered representations of these information, 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. Specifically, 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 the extant cartographic theories and prior cartographic success stories that are important for thinking critically about the design and development 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 will be 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 with G370).

Lab Overview:

The laboratory component of the course emphasizes the practical skills needed to design 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 JavaScript programming language and the Leaflet and D3 open source mapping libraries; by the end of the course, it is expected that you will have operational-to-proficient 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 either 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 Carl 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. 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)
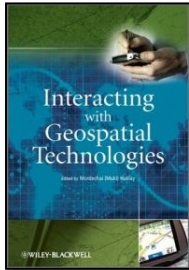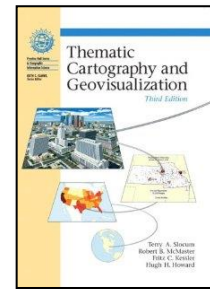
Interacting with Geospatial Technologies **(2010)** edited by Mordechai (Muki) Haklay. West Sussex, UK: Wiley-Blackwell. (on course reserve in the Geography Library and *free* as an e-Book through MADCAT)

*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.

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.

	Item	Weight	Description	Date(s)
Lecture	**Exam #1**	20%	75-minute midterm (primarily short-answer questions)	**10/16**
	Exam #2	20%	75-minute final (non-cumulative; primarily short-answer)	**11/25**
	Quizzes	5%	8-10 in-class quizzes covering topics from lab or lecture	**throughout**
Labs	**Lab Assignments**	30%	Two mapping assignments	**Week #8 & #12**
	Final Project	25%	Group (3-4 students) interactive mapping project	**12/16 (noon)**

Graduate Credit: If you are taking this course for graduate level credit, you are required to submit a revision of both labs based on graded feedback along with your final project (see below) on December 16th at Noon.

Exams (40% total; 20% per exam) and Quizzes (5%)

Exams (40%): 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 (5%): In non-exam weeks, quizzes will be 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. 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 Exams and Quizzes:
- **October 16th:** Exam #1 (in 1217 Humanities)
- **November 25th:** Exam #2 (in 1217 Humanities)

Lab Assignments (30%)

Assignments (30%): 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. The week in lab builds on the last, meaning that you are responsible for properly applying previously learned interactive mapping design and development principles (therefore, the lab assignments **are** cumulative); a rubric is provided for each lab assignment to indicate how it is marked. 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.

Grading: 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. Plagiarism is not tolerated; each lab assignment has an 'Easter Egg' in it to ensure you are not using work from prior semesters. As with

Week	Date	Lecture/Lab Topic	Assignment	
W1	9/2	Course Introduction: Organization & Influences		Cartographic Interaction
	9/4	Elements: *What?* HCI and UI versus UX Design	H: Ch1	
		No Lab: Labor Day (Complete Online Tutorials)		
W2	9/9	Elements: *Why?* Geovisualization, Exploration, and Insight	S: Ch1	
	9/11	Elements: *When?* Productivity, Complexity, and Constraint	H: Ch1	
		HTML/CSS/JS Boilerplate	*Tutorial Sheet Due*	
W3	9/16	Elements: *Who?* User Ability, Experience, Motivation	H: Ch2; S: 26.2	
	9/18	Elements: *Where?* Input, Display, Processing/Bandwidth Constraints	H: Ch11; S: Ch25	
		Data, AJAX, & the DOM; Assign Leaflet Lab	*Comment Exer. Due*	
W4	9/23	How? Stages of Interaction **w/ Carl Sack**		
	9/25	Elements: *How?* Objectives	H: Ch7	
		Leaflet, Slippy Maps, & JS Debugging	*Leaflet Data Due*	
W5	9/30	Elements: How? Operators I	S: Ch22	
	10/2	Elements: How? Operators II	S: Ch22	
		Retrieve, Popups, and More Help with Leaflet	*Slippy Map Due*	
W6	10/7	Open Source Mapping @ the SCO **w/ AJ Wortley & Howard Veregin**		
	10/9	**No Class: AutoCarto/NACIS Week (Go to Pittsburgh!)**		
		No Lab: AutoCarto/NACIS Week (Go to Pittsburgh!)		
W7	10/14	Elements: *How?* Operators III	S: Ch22	
	10/16	**EXAM #1: 75-minute midterm**	*Exam #1*	
		Sequencing, SVG, and UI Controls; *Pitch Ideas*	*Popups Due*	
W8	10/21	Elements: *How?* Operands I & Spatiotemporal Visualization	S: Ch21	
	10/23	Elements: *How?* Operands II & Interacting with Time	S: Ch21	
		Introduce D3; Assign D3 Lab	*Leaflet Lab Due*	
W9	10/28	Interactive Maps & UI I: Interface Styles	H: Ch9	Cartographic Interfaces
	10/30	Interactive Maps & UI II: Interface Design & Design Heuristics	H: Ch9	
		Mapping in D3; Finalize Final Project Groups	*D3 Data Due*	
W10	11/4	Interactive Maps & Information Visualization	S: 26.1, 26.5	
	11/6	Interactive Maps & Usability Engineering I: Usability vs. Utility	H: Ch6	
		Carl Workshop Proposal Ideas; *Proposal Due 11/7*	*Basemap Due*	
W11	11/11	Interactive Maps & Usability Engineering II: User-Centered Design	H: Ch5	
	11/13	Interactive Maps & Usability Engineering III: Interface Evaluation	H: Ch10	
		Coordinated Visualization in D3	*Interactive D3 Map*	
W12	11/18	Interactive Maps & Visual Analytics I: Analytical Reasoning	S: 26.7	
	11/20	Interactive Maps & Visual Analytics II: GeoCollaboration	H: Ch4; S: 26.3	
		Final Project Consultation; Carl Meet with Groups	*D3 Lab Due*	
W13	**11/25**	**EXAM #2: 75-minute final (non-cumulative)**	*Exam #2*	
	11/27	**No Lecture: Thanksgiving**		
		Final Project Consultation; Carl Meet with Groups		
W14	12/2	Final Project Consultation: College Library		
	12/4	Final Project Consultation: College Library		
		Final Project Consultation		
W15	12/9	Final Project Presentations in Lecture	*Presentations*	
	12/11	Final Project Presentations in Lecture	*Presentations*	
		Final Project Consultation		
	12/16	**Final Projects Due by Noon**	*Projects Due*	

other evaluated items, any offense results in a zero for the lab assignment and disclosure of the impropriety to the Department and University. Requests for grade changes must be submitted in writing (via email) within **24 hours** of receiving your feedback.

Important Dates for Lab Assignments:
- **October 20-21st:** Lab #1 Due (Leaflet)
- **November 17-18th:** Lab #2 Due (D3)

Final Project (30%)

Final Project: The final project is the cornerstone of G575, affording you the opportunity to apply the theoretical 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 final project is submitted along with a video demonstration of the application formatted for posting to YouTube.

Get Inspired! It is never too early to begin thinking about your final project topic, and, once selected, to begin assembling the represented geographic information. It is recommended to choose a topic that aligns closely with your area of study (particularly if you work in one of the other sub-disciplines of Geography) or a personal interest; your enthusiasm for the mapped topic is sure to shine through to the final interactive mapping application. The best final projects from G575 often are competitive in national and international 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 (particularly those from your UW colleagues), as they are excellent examples of 'A+' final projects.

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:
- **October 13-14 (In Lab):** Pitch final project ideas
- **October 27-28th (In Lab):** Form 3-4 student teams in lab
- **November 7th (5pm):** Two-page final project proposal due
- **December 9th & 11th (In Lecture):** 80% complete draft due, presented in lecture
- **December 16th (Noon):** Final project due to a Learn@UW dropbox by **Noon**.