

Computer Science 5093 — Visual Analytics

Instructor: Chris Weaver

Fall 2023

Overview

Analytic reasoning is a process that encompasses perception, cognition, discourse, and collaboration. This course considers methods and tools that support analytic reasoning by combining human visual capabilities with computational devices and algorithms. Topics include data representation and transformation, visual representation and interaction, production, presentation, and dissemination of knowledge, sense-making, and the challenges that information complexity and scalability pose for the very human process of reasoning.

The goals of this course are for students to: (1) develop a comprehensive understanding of this emerging, multidisciplinary field; (2) apply that understanding to a tightly focused research problem in a domain of personal interest (computational, geospatial, meteorological, historical, etc.) Course research projects may involve: advancing the theory of visually-enabled analytical reasoning, developing new methods to support analytic tasks in specific domains, applying existing methods and tools to analytic challenges in these domains, or evaluating and improving the usefulness and usability of applications.

The seminar format will include reading, discussion, and application of existing software environments to problems in visual analytics. Class meetings will typically include: (1) discussion of one or two journal or conference publications that cover a range of topics from information visualization, geographic information systems, visual data mining, cognitive science, user-centered design, and the semantic web; (2) learning about, applying, extending, or assessing aspects of visual analysis tools and techniques. Students will be expected to take an active role in discussions, with selected students assigned the role of organizing and leading most discussions. Meetings will often include written assignments such as to formally critique the reading assignments, or to compose a set of questions to discuss. Teams of 2–3 students will carry out a term project focused on building, applying, or assessing visual analytics methods and tools. Teams will present their results and submit a paper with content, style, length, and quality typical of current conference proceedings.

Prerequisites: Permission of instructor

General Information

Place: P0207 Sarkeys Energy Center (SEC)

Days: Tuesday+Thursday

Time: 4:30pm–5:45pm (Important: Due to travel, there may be irregularly scheduled meeting times.)

Instructor: Chris Weaver

Office: 241 Devon Energy Hall

Email: cweaver {at} ou {dot} edu

Phone: 405.325.3380 (OU or Canvas email strongly preferred)

Office Hours: Tuesday 3:15pm–4:15pm, Friday 11:00am–12:00pm, and by appointment.

Materials

Class Web Pages:

- [Canvas \[5093\]](#)
- <http://www.cs.ou.edu/~weaver/academic/teaching/2023-B-Fall-CS5093/> (basic information only)

Class Schedule: Refer to the *File/Schedule* folder in Canvas for the current version of the schedule. The schedule may change occasionally due to campus closures or other unforeseen circumstances.

Required Textbooks:

James J. Thomas and Kristin A. Cook. *Illuminating the Path: The Research and Development Agenda for Visual Analytics*. IEEE Computer Society, 2005. ISBN: 0-7695-2323-4. **[Available online as a free PDF at <https://www.hSDL.org/c/abstract/?docid=485291>]**

Required Papers:

We will read a mix of theory, system, and application papers from visual analytics and information visualization. We will also read a couple of interesting meta papers, one on writing good information visualization papers and one on teaching visualization. Each student will also be asked to suggest one additional paper from their area of academic interest. We will cover roughly 50 papers total.

Suggested Readings:

- Jacques Bertin. *Semiology of Graphics: Diagrams, Networks, Maps*. University of Wisconsin Press, Ltd., 1983. **[Quintessential classic. If you work at all with graphics, consider buying a copy.]**
- William Cleveland. *Visualizing Data*. Hobart Press, 1993.
- Richard J. Heuer. *Psychology of Intelligence Analysis*. Central Intelligence Agency: Center for the Study of Intelligence, 1999. **[We might read a chapter or two as part of our required readings, depending on availability of time in our schedule. Available online as free HTML or PDF at <https://www.hSDL.org/c/abstract/?docid=2899>]**
- Alan M. MacEachren. *How Maps Work: Representation, Visualization, And Design*. The Guilford Press, 2004.
- Tamara Munzner. *Visualization Analysis And Design*. CRC Press, 2014.
- Donna J. Pequet. *Representations of Space and Time*. The Guilford Press, 2002.
- Ben Shneiderman and Catherine Plaisant. *Designing the User Interface: Strategies for Effective Human-Computer Interaction (6th Edition)*. Addison-Wesley, 2017.
- Edward Tufte. *The Visual Display of Quantitative Information*. Graphics Press, 1983.
- Colin Ware. *Information Visualization: Perception for Design (2nd Edition)*. Morgan Kaufmann, 2004.
- Leland Wilkinson. *The Grammar of Graphics*. Springer-Verlag, 1999.

Evaluation

This course will follow a small seminar format. Every student will be expected to participate **actively** in class, to keep up with the readings, and to make clear and steady progress on a team project. The interrelatedness of visual analysis topics makes keeping up even more essential. You will be required to give a 20 minute presentation of and lead discussion on one or two papers. You will also be required to write a brief summary plus 2–3 discussion questions (at the beginning of the semester) or a full review (at the end of the semester) of each paper. The contributions to your grade are as follows:

- Team project: 40%
- Individual paper presentations: 20%
- Individual paper summaries/reviews: 20%
- Class participation: 20%

Borderlines grades will be determined by class participation.

Slack Days: You have three slack days for summaries/questions/reviews. Using a slack day will entitle you to skip the summaries/questions/reviews for the reading assignment for that day. *You need not notify me that you want to use a slack day. I set up Canvas to track the missing assignments automatically.* You are still responsible for the readings themselves, as ongoing discussion will draw from past readings.

Due Dates: All assigned materials are due at the beginning of the corresponding class meeting. For summaries/questions/reviews there will be no leeway beyond your three allowed slack days. Use them wisely.

Project: Teams of 2–3 students will carry out a term project focused on building, applying, or assessing visual analytics methods and tools. At the beginning of the semester, teams will be formed and projects chosen as a function of the development skills and domain analysis expertise of team members. Teams will present their results and submit a paper with content, style, length, and quality typical of current conference proceedings. Your final project will be due on the day of the final exam.

Grade Summary: I will store all of your grades in the Canvas online grade book. It is your responsibility to verify that the grades on Canvas are correct. If an error is found, bring the graded item to me and I will correct the online entry.

Course Policies

The following set of rules will help keep us all on the same page all semester and help to ensure fair treatment for all students.

Course Web Page: Access the Canvas website using your 4+4 (first four letters of your last name followed by the last four digits of your student number) and your standard OU password. If you have general difficulty with Canvas, please read the online OU IT documentation or call them at 325-HELP. All handouts and assignments will be made available in Canvas. You should check the site regularly. When I update the site with something important, I will post an announcement telling you what has been added and where it is located. You are responsible for things posted on the site after a 24 hour delay or the end of the first following class meeting, whichever occurs first.

Course Announcements: Announcements will be posted in Canvas. It is your responsibility to:

- Set up Canvas to receive notification of course announcements, class and group forum messages, and updates to course content including posting of assignments.
- Make sure that your contact info in Canvas includes an email address that you read regularly. I'll send out at least one class-wide message during the first week of class. If you do not receive this message, it is your responsibility to get the problem resolved immediately.
- Have your email program set up properly so that replying to your email will work correctly the first time. You can send email to yourself and reply to yourself to test this.

If you need assistance in accomplishing any of these tasks, contact [OU IT](#).

Course Communications: The *General Discussion* in Canvas should be the primary method of communication outside of class. This allows everyone in the class to benefit from the answer to your question. If you email me a question of general interest, I may post your question and my answer to the discussion. Matters of personal interest should be directed to email instead of to the discussion, e.g. informing me of an extended personal illness.

Classroom Conduct: Disruptions of class are not permitted. No electronic devices may be used during class except to take notes or as a direct part of class exercises. Examples of disruptive behavior include:

- Allowing a cell phone or pager to repeatedly beep audibly.
- Browsing, listening to music, or playing computer games, regardless of whether they are visible or audible to other class members. (Such activities disrupt YOUR ability to pay attention and participate.)
- Exhibiting erratic or irrational behavior.
- Behavior that distracts the class from the subject matter or discussion.
- Making physical or verbal threats to a faculty member, teaching assistant, or class member.
- Refusal to comply with faculty direction.

In the case of disruptive behavior, I may ask that you leave the classroom and may charge you with a violation of the [Student Rights and Responsibilities Code](#).

Project Code: Your project code and write ups must be written exclusively by you or your group. *Use of any downloaded code or code taken from a book (whether documented or undocumented) is considered academic misconduct and will be treated as such.* Exceptions to this policy (such as a course project that builds on an existing open-source project) may be granted but you **MUST** obtain approval from me first.

Evaluating the Course: The College of Engineering utilizes student ratings as one of the bases for evaluating the teaching effectiveness of each of its faculty members. The results of these forms are important data used in the process of awarding tenure, making promotions, and giving salary increases. In addition, the faculty uses these forms to improve their own teaching effectiveness. The original request for the use of these forms came from students, and it is students who eventually benefit most from their use. Please take this task seriously and respond as honestly and precisely as possible, both to the machine-scored items and to the open-ended questions.

Incompletes: The grade of *I* is intended for the rare circumstance when a student who has been successful in a course has an unexpected event occur shortly before the end of the course. I will not consider giving a student a grade of *I* unless all three of the following conditions have been met: (1) it is within two weeks of the end of the semester; (2) the student has a grade of *C* or better in the class; (3) the reason that the student cannot complete the class is properly documented and compelling.

University Policies

Reasonable Accommodation Policy: Students requiring academic accommodation should contact the Accessibility and Disability Resource Center (<https://www.ou.edu/adrc>, 405/325-3852, adrc@ou.edu). Any student in this course who has a disability that may prevent the full demonstration of his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

COVID-19 and Masking: Please go to <https://www.ou.edu/together> for information about current OU COVID-19 policies including recommendations regarding vaccination and masking.

Copyright Syllabus Statement for In-Person or Online Courses: Sessions of this course may be recorded or live-streamed. These recordings are the intellectual property of the individual faculty member and may not be shared or reproduced without the explicit, written consent of the faculty member. In addition, privacy rights of others such as students, guest lecturers, and providers of copyrighted material displayed in the recording may be of concern. Students may not share any course recordings with individuals not enrolled in the class, or upload them to any other online environment.

Academic Integrity: Cheating is strictly prohibited at OU because it devalues the degree you are working hard to get. As a member of the OU community it is your responsibility to protect your educational investment by knowing and following the rules. For specific definitions on what constitutes cheating, review the *Student's Guide to Academic Integrity* at <https://www.ou.edu/integrity/students>.

All work submitted for an individual grade (or group grade), such as a homework or project assignment, should be the work of that single individual (or group), not their friends, a tutor, or other form of outside help. On examinations and quizzes you will never be permitted to use your notes, textbooks, calculators, or any other study aids. Should you see someone else engaging in this behavior, I encourage you to report it to myself or directly to the Office of Academic Integrity Programs. That student is devaluing not only their degree, but yours, too. Be aware that it is my professional obligation to report academic misconduct, which I will not hesitate to do. Sanctions for academic misconduct can include expulsion from the University and an F in this course, so don't cheat. It's simply not worth it.

Religious Observance: It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required class work that may fall on religious holidays.

Title IX Resources and Reporting Requirement: For any concerns regarding gender-based discrimination, sexual harassment, sexual misconduct, stalking, or intimate partner violence, the University offers a variety of resources, including advocates on-call 24/7, counseling services, mutual no contact orders, scheduling adjustments and disciplinary sanctions against the perpetrator. Please contact the [Institutional Equity Office \(ieo@ou.edu\)](mailto:ieo@ou.edu), available 8-5 M-F at 405-325-3546) or [OU Advocates](#) (available 24/7 at 405-615-0013) to learn more or to report an incident.

Adjustments for Pregnancy/Childbirth Related Issues: Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact me as soon as possible to discuss. Generally, modifications will be made where medically necessary and similar in scope to accommodations based on temporary disability. Please see <http://www.ou.edu/eoo/faqs/pregnancy-faqs.html> for answers to commonly asked questions.

Mental Health Support Services: If you are experiencing any mental health issues that are impacting your academic performance, counseling is available at the University Counseling Center (UCC). The Center is located on the second floor of the Goddard Health Center, at 620 Elm Rm. 201, Norman, OK 73019. To schedule an appointment call 405/325-2911. For more information go to <http://www.ou.edu/ucc>.

Emergency Protocol: During an emergency, there are official university [procedures](#) that will maximize your safety:

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather 1. LOOK for severe weather refuge location maps located inside most OU buildings near the entrances 2. SEEK refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building. 3. GO to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows. 4. GET IN, GET DOWN, COVER UP. 5. WAIT for official notice to resume normal activities. [[Severe Weather Refuge Areas - Spreadsheet](#)] [[Severe Weather Preparedness - Video](#)]

Armed Subject/Campus Intruder: If you receive an OU Alert to shelter-in-place due to an active shooter or armed intruder situation or you hear what you perceive to be gunshots: (1) GET OUT: If you believe you can get out of the area WITHOUT encountering the armed individual, move quickly towards the nearest building exit, move away from the building, and call 911. (2) HIDE OUT: If you cannot flee, move to an area that can be locked or barricaded, turn off lights, silence devices, spread out, and formulate a plan of attack if the shooter enters the room. (3) TAKE OUT: As a last resort fight to defend yourself. For more information, visit [OU Emergency Preparedness](#). [[Shots Fired on Campus Procedure - Video](#)]

Fire Alarm/General Emergency: If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates: (1) LEAVE the building. Do not use the elevators. (2) KNOW at least two building exits. (3) ASSIST those that may need help. (4)

PROCEED to the emergency assembly area. (5) ONCE safely outside, NOTIFY first responders of anyone that may still be inside building due to mobility issues. (6) WAIT for official notice before attempting to re-enter the building. [[OU Fire Safety on Campus - Video](#)]

Final Exam Preparation Period: Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to the [OU Final Exam Policies](#). Note the provision that "All University laboratory classes and graduate courses are exempt from this policy."

I reserve the right to add, remove, or change any element or policy of this course, including evaluation percentages, at any time and for any reason, within the limits of University policy.