696D: Advanced Topics in Visualization and Graphics
Tuesdays & Thursday 9:30 AM to 10:45 AM online

Description of Course

This is a research-oriented seminar course addressing the integration of humans in discovery and evaluation of computing topics. This includes empirical studies or "user studies" but other methodologies will also be explored. While examples and suggested papers will focus on visualization, such methods are applicable to other areas of computer science and are welcome in this class. Students may propose alternative papers or projects as long as human methods are involved.

The course format will be a mix of instructor led lecture/discussion and student-led presentation of methodologies and papers with student-led discussion.

Course Prerequisites or Co-requisites

No specific pre-requisites but this course assumes facility with computer science on par with an undergraduate degree. In particular, this course will assume (1) the ability to program as well as learn new technologies and languages as needed and (2) comfort with entry level statistics and the algebra needed to compute them.

Instructor and Contact Information

Kate Isaacs, online, kisaacs@cs.arizona.edu

The instructor uses the pronouns: she/her/hers. Graduate students and other students in this class are welcome to call her "Kate." The instructor recognizes some students may not feel comfortable calling her by her given name, in which case she also responds to "Dr. Isaacs", "Professor Isaacs", or "Professor Kate."

Office Hours to be determined the first week of class and will be held online via zoom
Piazza site (discussion, files): http://piazza.com/arizona/fall2020/csc696d
D2L site (quizzes, grades): https://d2l.arizona.edu/d2l/home/947585
Google Classroom Site (assignments): https://github.com/uacsc696dfall2020/assignments

Instructor Home page: http://hdc.cs.arizona.edu/people/kisaacs/ (not class specific)
(Note my office is Gould-Simpson 712, ph: 520-621-4632 but I will not be in due to the pandemic. Please contact me via email or Piazza.)

CSC COVID 19 Policy:

All Fall 2020 CSC courses, whether In-Person, In-Person Flex, or Live Online, will provide recorded lectures for students along with office hour accommodations via Zoom. Additionally, In-Person and In-Person Flex courses will accommodate students who cannot attend class to take midterm exams and attendance will not be factored into final grades.

Course Format and Teaching Methods

This is a seminar course which will have some lecture, conference presentations, some student led discussions, and some student presentations. There is a course project that is done individually or in groups.

This class is scheduled to be taught in the **LIVE ONLINE** modality.

- **Meeting Times:** The class will meet Tuesdays & Thursdays at 9:30 AM via Zoom. Our synchronous meetings will give us the opportunity to present and discuss research papers and our research projects. Students will be expected to create presentations (possibly pre-recorded) and be prepared to lead discussion (possibly creating discussion plans). They will also allow the instructor to lecture on some material and students to participate in instructor led discussions.
- **Class attendance:**
  - If you feel sick, or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.
  - Campus Health is testing for COVID-19. Please call (520) 621-9202 before you visit in person.
  - Visit the UArizona COVID-19 page for regular updates.

Pandemic-Related Information for All Modalities

- **Advising:** If you have questions about your academic progress this semester, or your chosen degree program, consider contacting your graduate program coordinator and faculty advisor. Your program coordinator, faculty advisor, and the Graduate Center can guide you toward university resources to help you succeed.**Computer Science students** are encouraged to email gradadvising@cs.arizona.edu for advising related questions.
- **Life challenges:** If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.
- **Physical and mental-health challenges**: If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.
- **Exams**: This course will have a final project in lieu of the exam. It will not use the ffinal exam slot.
- **Equipment and software requirements**: For this class you will need daily access to the following hardware: web-enabled device with camera and microphone; regular access to reliable internet signal; ability to download and run the following software: make, pdflatex, a PDF reader, git, presentation software (e.g., powerpoint, Google Slides, Keynote), a web browser, D2L's quiz software.
- **Staying current:** You are required to complete the assignments and quizzes in the time frames outlined by the assignment site and this syllabus. If you miss class, you are also required to watch the video and post your response to Piazza by the next class unless other arrangements are made.
- **Remote / online only after Thanksgiving:** After the Thanksgiving holiday, we are scheduled to move to remote teaching. As this is a live online class, it will proceed as normal.
- **Class Recordings:** For lecture recordings, students must access content in D2L only. Students may not modify content or re-use content for any purpose other than personal educational reasons. All recordings are subject to government and university regulations. Therefore, students accessing

unauthorized recordings or using them in a manner inconsistent with UArizona values and educational policies are subject to suspension or civil action.

Course Objectives and Expected Learning Outcomes

Students will:
- Become familiar with methods of discovery and evaluation involving human subjects.
- Understand how these methods are used in visualization research.
- Improve their proficiency in technical writing and presentation.
- Improve their proficiency in reading and evaluating academic papers.
- Demonstrate their skills through presentations, quizzes, and a course project.

Upon completing this course students should be able to:
- Recall human subjects methods of evaluation and select an appropriate evaluation method for their scientific inquiry.
- Discuss the strengths and drawbacks of human subjects techniques.
- Evaluate the use of human subjects methods in the research of others.

Absence and Class Participation Policy

Participating in the course and attending lectures and other course events are vital to the learning process. In particular, CSC 696DD is a *research seminar*, a discussion-focused class. As such, attendance is *encouraged* at all class meetings. However, we recognize attending class live may be unduly burdensome during the pandemic. As such, *alternatives* to participation will be provided. These alternatives require watching the recorded class videos and responding in a written form. See the course assignments site for details.

Students are to make the determination themselves whether they are unduly burdened by attending any one or more class sessions. They need **not** explain their reasoning to the instructor. Reasons for undue burden **include but are not limited to** illness, family emergency, time zone differences, and poor internet connectivity.

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at
http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop
The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable: http://policy.arizona.edu/human-resources/religious-accommodation-policy.
Absences pre-approved by the UA Dean of Students (or dean's designee) will be honored. See
https://deanofstudents.arizona.edu/absences

Makeup Policy for Students Who Register Late

Students registering late will have one week from their registration date to make up any missed assignments, quizzes, and participation. Participation can be made up by following the guidelines for those who are unduly burdened by attending live online sessions.

Course Communications

Please use your official UA email address when emailing the instructor and for Piazza and Zoom. You may add a secondary address that will also receive update. Official announcements will come as announcements through Piazza to your Piazza email addresses.

Grades which will be posted to D2L. The syllabus will be available on both Piazza and D2L. Github and Github Classroom will be used for assignment details and submission respectively. D2L will be used for paper quizzes.

Required Texts or Readings

Course readings will primarily be academic papers available online from UA servers, including through VPN. See Course Schedule for specific academic papers.

Suggested References:
- *Experimental Human-Computer Interaction: A Practical Guide with Visual Examples,* by Helen C. Purchase. Cambridge University Press, 2012.
- *Modern Statistical Methods for HCI*, editors: Judy Robertson and Maurits Kaptein. Springer. 2016.
- *Evaluation in the Crowd: Crowd-sourcing and Human-centered experiments,* editors: Daniel Archambault, Helen C. Purchase, Tobias Hoßfeld. Springer. 2017.

All suggested references are available as eBooks through the campus library.

Assignments and Examinations: Schedule/Due Dates

See Schedule Table below (under "Scheduled Topics/Activities") for Due Dates for the following graded material:

CITI Course Completion: 5%

Project Milestones (PM) (5): 34% total

- PM1 5%: Project Proposal including background, description, related work, and milestone plan
- PM2 8%: IRB Proposal draft, initial designs of study, or other work based on previous milestones and milestone plan
- PM3 8%: Coding/artifact creation to support study and/or piloting based on previous milestones and milestone plan
- PM4 8%: Coding/artifact creation to support study and/or piloting based on previous milestones and milestone plan
- PM5 5%: Revisions and/or analysis based on previous milestones and milestone plan

(Note: General project idea should be cleared with instructor before PM1.)

Project Presentations (2): 3% each

Presenting and leading paper discussions: 25%

Participation in paper discussions: 30% total

- Direct participation in discussion, including being prepared with one question or comment

for class: 15%

- Quizzes on assigned reading & subsequent discussion: 15%

If you are unable to attend class, you will still have access to the quizzes through D2L. As an alternative to the direct participation in discussion, you should watch the video of the class discussion and then make a post to Piazza responding at least three points of discussion from class and posting your own question or comment you would have prepared had you attended class.

If you cannot attend a class with your assigned presentation, you will need to provide a pre-recorded presentation to the instructor by 9AM of the day of your presentation along with prepared discussion points for the ensuing discussion.

Final Examination or Project

The final milestone for the project is due December 8, 2020. The final project presentation will occur in the last three class meetings. The exact date will be assigned randomly and depend on the number of enrolled students and project groups.

Final Exam Regulations: https://www.registrar.arizona.edu/courses/final-examination-regulations-and-information,

Final Exam Schedule: http://www.registrar.arizona.edu/schedules/finals.htm

Grading Scale and Policies

The final grade will be based on the percentage of all available points weighted as described above. Percentages translate into letter grades as described by the following intervals: A: [90-100], B: [80-90), C: [70-80), D: [60-70), E: [0-60). University policy regarding grades and grading systems is available at http://catalog.arizona.edu/policy/grades-and-grading-system

Assignments and Project Milestones are to be submitted via Github Classroom unless otherwise stated. This includes written assignments and project milestones.

Quizzes are conducted via D2L.

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal, respectively.

Dispute of Grade Policy: Any disputes of grading must be emailed to the instructor within one week of the assignment being graded. The dispute must include specific instances of points being missed and the rationale for why those points were earned.

Scheduled Topics/Activities

 Note: Every time a paper is discussed in class, presented by the student, instructor, or from a conference video, students are expected to **R**ead, prepare for **D**iscussion, and take a short **Q**uiz. Students will be assigned **P**resentation slots based on their paper choices. **Paper RDPQ** refers to these assessments which are due at the beginning of class for R, D, and P, and at the end of class for Q.

| **Week 1 – 8/25 & 8/27** | Introduction to Research, Course Motivation, Area Overview, Ethics in Human Subjects Research | |

Week 2 – 9/1 & 9/3	Basics of Quantitative Experiments and Analysis	**CITI Due 9/3 at 23:59**
Week 3 – 9/8 & 9/10	Student Paper Presentations & Discussion *** Note the instructor will present these as if they were a student paper presentation.** 9/8: *Empirical Studies in Information Visualization: Seven Scenarios*, Lam et al. 9/10: *Patterns for Visualization Evaluation*, Elmqvist & Yi	**Paper RDPQ**
Week 4 – 9/15 & 9/17	Student Paper Presentations & Discussion [Carina] 9/15: *Crowdsourcing User Studies with Mechanical Turk*, Kittur et al. & *Are your participants gaming the system? Screening Mechanical Turk Workers*, Downs et al. [Bohan]. 9/17: *Crowdsourcing Graphical Perception: Using Mechanical Turk to Assess Visualization Design*, Heer & Bostock	**Paper RDPQ, PM1 Due 9/17 at 23:59**
Week 5 – 9/22 & 9/24	Student Paper Presentations & Discussion [Tito] 9/22: *An Insight-Based Longitudinal Study of Visual Analytics*, Saraiya et al. [Sayef] 9/24: *Evaluating Visual Analytics Systems for Investigative Analysis: Deriving Design Principles from a Case Study*, Kang et al.	**Paper RDPQ**
Week 6 – 9/29 & 10/1	Student Paper Presentations & Discussion [Dilshad] 9/29: *The Effects of Interactive Latency on Exploratory Visual Analysis*, Liu & Heer [Bohan] 10/1: *Pair Analytics: Capturing Processes in Collaborative Visual Analytics*, Arias-Hernandez et al.	**Paper RDPQ**
Week 7 – 10/6 & 10/8	Student Paper Presentations & Discussion [Sayef] 10/6: *A Survey on Interactive Log Analysis for Evaluating Exploratory Visualizations*, ElTaybey & Dou [Tito] 10/8: *A Case Study Using Visualization Interaction Logs and Insight Metrics to Understand How Analysts Arrive at Insights*, Guo et al.	**Paper RDPQ, PM2 Due 10/8 at 23:59**
Week 8 –	Project In-Progress Presentations	**Presentations**

10/13 & 10/15		due 10/13 at 9AM
Week 9 – 10/20 & 10/22	Student Paper Presentations & Discussion [Jackson] 10/20: *Perceptual Proxies for Extracting Averages in Data Visualizations*, Yuan et al. [Dilshad] 10/22: *Evaluating Visualizations: Do Expert Reviews Work?*, Tory & Möller & *Questionnaires for Evaluation in Information Visualization*, Forsell & Cooper & *Methodologies for the Analysts of Usage Patterns in Information Visualization*, Pohl	**Paper RDPQ**
Week 10 – 10/27 & 10/29	IEEE VIS 2020 Presentations & Discussion	**Paper RDQ (no P) PM3 Due 10/29 at 23:59**
Week 11 – 11/3 & 11/5	Student Paper Presentations & Discussion [Jackson] 11/3: *Do What I Mean, Not What I Say! Design Considerations for Supporting Intent and Context in Analytical Conversation*, Tory & Setlur [Carina] 11/5: *Revealing Tensions in Autobiographical Design in HCI*, Desjardins & Ball	**Paper RDPQ**
Week 12 – 11/10 & 12	Student Paper Presentations & Discussion [Dilshad] 11/10: Pre-cleared student choice [Jackson] 11/12: Pre-cleared student choice	**Paper RDPQ**
Week 13 – 11/17 & 11/19	Student Paper Presentations & Discussion [Sayef] 11/17: Pre-cleared student choice [Tito] 11/19: Pre-cleared student choice	**Paper RDPQ, PM4 due 11/19 at 23:59**
Week 14 – 11/24	Student Paper Presentations & Discussion [Carina] 11/24: Pre-cleared student choice No Class Thursday, Thanksgiving Recess	**Paper RDPQ**
Week 15 – 12/1 & 12/3	Student Paper Presentations & Discussion [Bohan] 12/1: Pre-cleared student choice	**Presentations due 12/3 at 9AM**

	12/3: Project Final Presentations	
Week 16 – 12/8	Project Final Presentations	**PM5 due 12/9 at 23:59**

Each student will present during one of the "pre-cleared student choice" days. The student may choose a paper of their interest to present as long as it is cleared by the instructor. A list of possible pre-approved papers is as follows:

- *Protovis: A Graphical Toolkit for Visualization*, Bostock & Heer
- *Does an Eye Tracker Tell the Truth about Visualizations?: Findings while Investigating Visualizations for Decision Making*, Kim et. Al.
- *Gamification as a Paradigm for the Evaluation of Visual Analytics Systems*, Ahmed & Mueller
- *Blinded with Science or Informed by Charts? A Replication Study*, Dragicevic & Jansen

- *Grounded Evaluation of Information Visualizations*, Isenberg et al.
- *A Comparative Evaluation of Animation and Small Multiples for Trend Visualization on Mobile Phones*, Brehmer et al.
- *An Exploratory Study of Visual Information Analysis*, Isenberg et al.

Other good sources for papers are the last few years of conferences such as IEEE VIS, EuroVis, PacificVis, ACM CHI, and UIST. However, the choice need not be a visualization or human-computer interaction conference. You may also choose a paper with human methods from the background research of your project. However, any of these papers must be cleared first by the instructor.

Department of Computer Science Code of Conduct

The Department of Computer Science is committed to providing and maintaining a supportive educational environment for all. We strive to be welcoming and inclusive, respect privacy and confidentiality, behave respectfully and courteously, and practice intellectual honesty. Disruptive behaviors (such as physical or emotional harassment, dismissive attitudes, and abuse of department resources) will not be tolerated. The complete Code of Conduct is available on our department web site. We expect that you will adhere to this code, as well as the UA Student Code of Conduct, while you are a member of this class.

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.). Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Notification of Objectionable Materials

This course will contain discussions of human subjects experiments, including the history of unethical experiments, some of which may be disturbing. Furthermore, this course may use real world examples of websites, apps, and other digital content. Though the focus is on the methods involving humans, the subject matter of this content could be mature or political in nature. Finally, this course may discuss human perceptive systems such as vision, touch, and hearing. It is possible a student may discover during class facets of their personal systems they were previously unaware of, such as color-blindness. Students are not automatically excused from interacting with such materials, but they are encouraged to speak with the instructor to voice concerns and to provide feedback.

Accessibility and Accommodations

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, https://drc.arizona.edu/) to establish reasonable accommodations.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity.

The University Libraries have some excellent tips for avoiding plagiarism, available at http://www.library.arizona.edu/help/tutorials/plagiarism/index.html.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

UA Academic policies and procedures are available at http://catalog.arizona.edu/policies

Student Assistance and Advocacy information is available at http://deanofstudents.arizona.edu/student-assistance/students/student-assistance

Campus Pantry

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. In addition, the University of Arizona Campus Pantry is open for students to receive supplemental groceries at no cost. Please see their website at: *campuspantry.arizona.edu* for open times.

Furthermore, please notify me if you are comfortable in doing so. This will enable me to provide any resources that I may possess.

Title IX

The University of Arizona is committed to removing educational barriers created by sex discrimination and sexual harassment. Sex discrimination under Title IX can include acts of violence based on sex, such as sexual assault, domestic violence, dating violence, and stalking. If you (or someone you know) has experienced or experiences any of these incidents, you have options for help at the University. The University of Arizona has staff members trained to support you in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more.

Please be aware that UA faculty and instructors who work with students are required to report allegations of sex discrimination to the Title IX Office. This means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking that involves another student or employee, or that happens on campus or in a UA program, I **must** share that information with the Title IX Coordinator. Although I have to make that notification, you will have choices regarding whether or not you want to pursue a formal complaint against anyone on campus. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

If you wish to speak to someone privately, you can contact any of the following on-campus resources:

- Counseling & Psych Services (CAPS), https://health.arizona.edu/counseling-psych-services, 520-621-6490, 520-570-7898 (after hours)
- Oasis Sexual Assault, Relationship Violence, and Trauma Services, https://health.arizona.edu/counseling-oasis (same phone as CAPS)
- Campus Health, https://health.arizona.edu/home, (520) 621-6490
- University of Arizona Ombuds, https://ombuds.arizona.edu/, (520)-626-5589
- Title IX section on sexual assault support & resources (https://titleix.arizona.edu/titl-ix/sexual-harassment-violence) has more information, as well as a link explaining options if you have a concern, need assistance/support, or would like to file a complaint.

Preferred Gender Pronoun

This course affirms people of all gender expressions and gender identities. If you prefer to be called a different name than what is on the class roster, please let me know. Feel free to correct instructors on your preferred gender pronoun. If you have any questions or concerns, please do not hesitate to contact me directly in class or via email (instructor email). If you wish to change your preferred name or pronoun in the UAccess system, please use the following guidelines:

Preferred name: University of Arizona students may choose to identify themselves within the University community using a preferred first name that differs from their official/legal name. A student's preferred name will appear instead of the person's official/legal first name in select University-related systems and documents, provided that the name is not being used for the purpose of misrepresentation. Students are able to update their preferred names in UAccess.

Pronouns: Students may designate pronouns they use to identify themselves. Instructors and staff are encouraged to use pronouns for people that they use for themselves as a sign of respect and inclusion. Students are able to update and edit their pronouns in UAccess.

More information on updating your preferred name and pronouns is available on the Office of the Registrar site at https://www.registrar.arizona.edu/.

Please let the instructor know if you have preferred names or pronouns that are not yet in UAccess.
The instructor uses the pronouns: she/her/hers. Graduate students and other students in this class are welcome to call her "Kate." The instructor recognizes some students may not feel comfortable doing so, in which case she also responds to "Dr. Isaacs", "Professor Isaacs", or "Professor Kate."

Confidentiality of Student Records
> http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa

Subject to Change Statement
Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Land Acknowledgement Statement
The University of Arizona sits on the original homelands of indigenous peoples who have stewarded this land since time immemorial. Aligning with the university's core value of a diverse and inclusive community, it is an institutional responsibility to recognize and acknowledge the people, culture, and history that make up the Wildcat community. At the institutional level, it is important to be proactive in broadening awareness throughout campus to ensure our students feel represented and valued.