AI CATEGORY

Improving People's Mental Models of AI Systems
Research category: AI, fairness, bias
Contact: cabrera@cmu.edu
Ideal Qualifications: HTML, CSS, JavaScript, databases, UX design

Most people collaborating with AI systems, for example in domains like
medical applications or spam detection, do not start with complete mental
models of the AI system's strengths and weaknesses. This can cause the user
to over or under-trust the AI system and make critical mistakes. We are
exploring how explicitly telling users the specifics of an AI systemís
behavior can improve overall human-AI team performance.

We are looking for undergraduate researchers for this project in Spring
2020. Preferred background includes experience with web technologies like
HTML, JavaScript, and Svelte/React/Vue, running crowdsourcing experiments
with Amazon Mechanical Turk, and running statistical analyses (chi-square,
t-test, etc.).

AI, FAIRNESS, BIAS, CROWDSOURCING

Organizing Crowd Audits to Detect Bias in Machine Learning
Research category: AI, fairness, bias, crowdsourcing
Contact: Hong Shen (hongs@andrew.cmu.edu)
Ideal Qualifications: Databases, web programming, basics of AI and ML,
UX/UI design, statistics, visualization

This research proposes to develop a crowd audit service that harnesses the power of volunteers
and crowd workers to identify and generalize cases of bias and unfairness in ML systems, and
synthesize their findings in a form that is readily actionable by ML teams. In
particular, we will focus on "representation harms" of ML biases, where ML systems serve to
reinforce harmful stereotypes or diminish particular groups (e.g., labelling African-Americans as
gorillas). Tackling this type of harm is particularly challenging since they
require knowledge of specific social, cultural, and historical contexts to identify.

We are looking for students to help conduct initial user tests to understand whether and how
well lay people can detect representational biases in ML systems as well as help build the initial
system.

Expecting students to average at least 10 hours a week on this
research, for pay or independent study. Send resume, GPA in primary
major(s), and links to any relevant projects.

AI, FAIRNESS, BIAS, CROWDSOURCING

Supporting Early Social Evaluation of Algorithmic Decision-making Systems
Research category: AI, fairness, bias, crowdsourcing
Contact: Hong Shen (hongs@andrew.cmu.edu)
Ideal Qualifications: Web programming, basics of AI and ML, UX/UI
design, statistics, visualization

Algorithmic decision-making systems powered by machine learning techniques have
been increasingly adopted in many critical domains in our society, in areas such as
policing, healthcare, education and child welfare. However, many of these systems are
developed in isolation of the impacted stakeholders and/or communities and often
being evaluated only after deployment. The goal of this project is to develop a method
to help machine learning practitioners collect and synthesize direct feedback -- in
particular, concerns related with Fairness, Accountability, Transparency and Ethics
(FATE) -- from a wide range of stakeholders in the early design process, when
problems
are less likely to cause significant harm.

We are looking for students to help conduct initial user studies to understand how to
better represent the design of a ML system to laypeople and how to better collect
effective feedback from different stakeholders.

Expecting students to average at least 10 hours a week on this
research, for pay or independent study. Send resume, GPA in primary
major(s), and links to any relevant projects.

RESPONSIBLE AI

**Calibrating Trust and Supporting More Responsible Decision-Making in
Human–Algorithm Collaborations**

Research Category:
Responsible AI, Design, Human–AI Collaboration, Cognitive Science, AI Ethics, Mental Health, Interaction Design and Children

Project description:
In this project, we will design new interaction techniques and decision support interfaces to help calibrate trust and leverage complementary knowledge within high-stakes human–algorithm collaborations (e.g., in mental health and child welfare contexts). We aim to design and evaluate tools that can help both practitioners and affected populations decide: (1) when and how much to adhere to algorithmic recommendations, and (2) how to act upon or communicate (dis)trust. This semester, the project team will conduct interviews, co-design activities, and prototyping studies with a range of stakeholders, including clinicians, social workers, children, and families.

Student requirements:
We are looking for undergraduate or master's students who have experience with any of the following: design research, UX for AI, or human subjects experiments. Familiarity with any of the following is a plus: participatory design, data visualization, statistics, decision-support, cognitive/decision sciences, HCI for mental health, human-AI interaction and collaboration.

Contacts:
If you are interested please send an email to Ken Holstein (kjholste@andrew.cmu.edu).

COMPUTATIONAL FABRICATION RESEARCH CATEGORY

Novel metamaterial structures and computational design tools
Contact: Alexandra Ion (alexandraion@cmu.edu)
Type of position: independent study (9-12h/week)
Always up to date opportunities: https://bit.ly/ISL-opportunities

Project Description:

Weare looking to push the boundaries of mechanical metamaterials by unifying material and device. Metamaterials are advanced materials that can be designed to exhibit unusual properties and complex behavior. Their function is defined by their cell structure, i.e., their geometry. Such materials can incorporate entire mechanisms, computation, or re-configurable properties within their compliant cell structure, and

have applications in product design, shape-changing interfaces, prosthetics, aerospace and many more.

In this project, we will develop design tools that allow novice users and makers to design their own complex materials and fabricate them using 3D printing or laser cutting. This may involve playfully exploring new cell designs, creating novel application examples by physical prototyping and developing open source software. Please check back for more opportunities here:

https://bit.ly/ISL-opportunities

Requirements:

You don't have to cover all skills, since this will likely be a group project. We are looking for diverse teams with complementary skills, preferred skills include:

- Computer Aided Manufacturing
- Enabling Technologies
- Tools

CYBER-PHYSICAL SYSTEMS

Cyber-Physical Systems: Robot Control

Description: Students will develop a swarm-robot system for social experiments. The system consists of autonomous toy cars that drive around a track with Javascript and Node.js, Raspberry Pi (for remote camera and visual sensing). Students will help to implement a cyber-physical system, robots' control, or/and UI for remote control with a social experiment platform Breadboard (https://breadboard.yale.edu/). Students will be working under Hirokazu Shirado at Carnegie Mellon University, Human-Computer Interaction Institute (http://www.shirado.net). This research activity is a part of the joint project by CMU HCII and Yale Human Nature Lab.

Requirements: Programming experience for web applications with Javascript and Node.js. Experience with Raspberry Pi and Mac OS a plus. Advanced robotics knowledge welcome and a passion for robots and social sciences is appreciated.

Contact person: Hirokazu Shirado shirado@cmu.edu

DATA VISUALIZATION RESEARCH CATEGORY

Designing human-robot communication of robot anomalies (Paid position)
Research Category: Human-robot interaction, data visualization

Description: The Army Ground Vehicle System Center (GVSC) is looking to support ground troops with robots to help preform dirty, dangerous, and dull tasks. During operation, these robots will need to communicate their stye with operators and will need to signal when there is anomalous behaviors. This project is looking at how robots should communicate anomalies to to their operators. We will be exploring different data visualization and communication interfaces including screens, heads up displays, and haptics. During this semester we are doing a literature review of robot communication systems for field operations and developing a set of design ideas to build into prototype next year.
Student Requirements:
- US permanent residency / citizenship
- Attend all research meetings
- Have an understanding of basic data visualization techniques
- Comfortable reading and summarizing research papers
- Interest in human-robot interaction, anomaly detection, and/or user-centered design

Contact: Nikolas Martelaro (nikmart@cmu.edu)

DATA VISUALIZATION

Building interactive data displays and interfaces for user research data
Research Category: Design, data visualization, qualitative data analysis

Description: User researchers often collect large amounts of video and audio during interviews and user observations. Going through this data can be time consuming, especially as we interact with more people. How can we go through this data more efficiently without losing the richness of qualitative analysis? We are working on building tools to help user researchers find interesting moments in their qualitative data. We have an interfaces design based on user research and are now looking to implement the front-end. We are also looking to enhance the tool with better back-end data analysis techniques such as natural language processing on interview transcripts and computer vision on video of people or their interaction with a product.

Student Requirements
- Front-end development experience or motivation to self-learn front-end development

HCII Research/Independent Study: Spring 2021

- Python and/or Javascript programming
- Familiarity with user interface design
- Attend all research meetings
- Work with a cross-functional team including developers and designers

Contact: Nik Martelaro (nikmart@cmu.edu)

DATA VISUALIZATION

Vega-Lite is a high-level grammar of interactive graphics. It provides a concise, declarative JSON syntax to create an expressive range of visualizations for data analysis and presentation. It is used by thousands of data enthusiasts and companies around the world. We have a number of projects around adding new features to the visualization toolkits that are going to be part of the open source tool. Please take a look at the Roadmap at https://bit.ly/vega-roadmap and the issue trackers (e.g. at https://github.com/vega/vega-lite/issues) to see what projects excite you.

We are looking for student with a design or tool building background.

We encourage students to sign up via https://forms.gle/6tHMesK3Yv8tkYtv5.
Contact: Dominik Moritz domoritz@cmu.edu

DATA VISUALIZATION

This person will explore and help support the data visualization needs of users of a young product focused on creating a community/social network around online product comparisons and reviews.
Responsibilities may include user research, storyboards, personas, data vis, conceptual mockups, UI design, and animation. Experience with current data visualization software is highly recommended but not required.
Learn more about the tool at
app.skeema.com.
Contact: Brad Breneisen

bbreneis@andrew.cmu.edu

DESIGN RESEARCH CATEGORY

Understanding how maker entrepreneurs make money
Research Category: Design, user research, entrepreneurship and business

Description: Makers are creative and capable of building products but making money from what they build can be challenging. However, many makers would like to become entrepreneurs and run successful small businesses doing their craft. This project is exploring how makers run successful business, what challenges they have, and what kinds of new technologies could help them run successful businesses. We are planning to conduct user-center interviews with maker entrepreneurs to help guide our design of new business support tools.

Student Requirements
- Basic user research experience (user interviews, analyzing interview data, defining user needs)
- Creating documents to share user research results (slides, concept maps, user journey maps)
- Analyzing survey data - primarily qualitative some qualitative
- Researching and benchmarking technologies for use in new product ideas
- Sketching design concepts for user interfaces and/or services
- Atten all research meetings

Contact: Nikolas Martelaro (nikmart@cmu.edu)

DESIGN RESEARCH

Accessible Autonomous Cars
Research Category: Design, Accessibility
Project description:
Autonomous vehicles have the potential to be designed to increase the mobility of those who have physical, sensory, or cognitive disabilities. We are working to develop new design ideas for how to make autonomous cars best serve those with disabilities. To develop new solutions, we are working with members of the disability community and transportation advocates to understand people's mobility needs, current challenges, and hopes for the future. We are looking for 3 student researchers interested in conducting user research and design around making autonomous cars accessible. This will include conducting user interviews, hosting community meetings, creating user experience

research artifacts, and sketching design ideas. This work is being done in part for the Department of Transportation Inclusive Design Challenge (https://www.transportation.gov/accessibility/inclusivedesign) and we will be submitting a proposal on October 30th (though continuing work after this deadline).

Student requirements:

- Attend all team meetings and help facilitate community meetings
- Conduct interviews with community members
- Synthesize qualitative data from interviews and community meetings into design recommendations

- Work with a cross-functional team to understand people and generate solutions for accessible autonomous cars

Contacts (Please email all of us):
Patrick Carrington (pcarrington@cmu.edu), Sarah Fox (sarahf@andrew.cmu.edu), Nikolas Martelaro (nikmart@cmu.edu)

DESIGN RESEARCH

Designing to Support Effective Collaborations around Fairness within Machine Learning Product Teams

Research Category:
FATE, Participatory Design, Fair Machine Learning, Social Computing, Data Visualization, Human-AI Interaction

Project description:
Machine learning (ML) product teams in industry often fail to detect unfair or harmfully biased behaviors in their systems prior to deployment in real-world settings. Among many other causes, ineffective communication across team members in different roles (e.g., ML engineers, data scientists, UX practitioners, product managers, and social scientists) appears to contribute to these challenges. The designs of existing software tools for assessing and addressing unfairness in ML systems may serve to calcify

divisions between roles. These tools tend to be designed for use by ML developers, providing little opportunity for interpretation or input from other team members. However, in practice fair ML efforts require deep collaboration across team members spanning diverse expertise and levels of organizational power.

In this project, we seek to promote more collaborative work practices around fair ML, where UX researchers, social scientists, and others with relevant expertise for thinking about fairness have a seat at the table. Building upon prior research, we are working with industry ML product teams to better understand current barriers to collaboration, and to co-design new tools and interventions that help them overcome these barriers. This project is conducted in partnership with researchers in the FATE (Fairness, Accountability, Transparency, and Ethics in AI) group at Microsoft Research.

Student requirements:

We are looking for undergraduate or master's students with experience conducting design research, interviews, and UI/UX design. Familiarity with FATE topics, fair ML, participatory design, data visualization, and/or social computing is a plus!

Students participating in any of these projects will be expected to:

  - Attend regular research team meetings
  - Review related research literature and existing software toolkits for fair ML
  - Help conduct multi-stakeholder interviews and co-design workshops with members of industry product teams
  - Help analyze and synthesize qualitative data from interviews
  - Ideate with team members to create sketches, mockups, data visualizations, or other design artifacts based on research findings

Contacts:

If you are interested please send an email to Ken Holstein (kjholste@andrew.cmu.edu).

DESIGN RESEARCH

Co-Designing Technologies to Support In-Home Care Workers

Research Category:
Participatory Design, Worker-Centered Design, Human-AI Interaction, Social Computing

Project description:
In-home health care workers work long hours to ensure the well-being of their clients, yet face major burdens such as low wages and inconsistent schedules. Recent policy proposals have sought to remedy these issues by calling for workplace protections such as pay transparency and access to benefits. In this project, we build on such initiatives by co-designing algorithmic systems to support and empower in-home care workers. We will work with care workers to co-design novel technologies that center their needs, with particular attention to challenges that have been created or amplified by the pandemic.

Students will have the option to focus on one of three specific projects:
1. Project 1 will investigate care workers' experiences using existing online care platforms such as Care.com, CareLinx, HomeHero, or Honor. Through interviews and design activities with care workers, families, and other relevant stakeholders, we will explore how workers experience algorithmic management and mediation of worker-client relationships on these platforms. We will then explore the design of alternative platforms, or add-ons to existing platforms.
2. Project 2 will explore how interactive voice assistants (IVAs) might be designed to support in-home care workers vital work, ranging from medication management, providing on-demand assistance and support, help with medical/wellbeing tasks, reminders, and more. This project will be conducted in partnership with collaborators at Cornell Tech, Weill Cornell, and the 1199 SEIU United Homecare Workers East.
3. Project 3 will explore how in-home care workers can capture and report on-the-ground knowledge to which they have unique access as direct caregivers, in order to help improve patient care, the status of in-home care workers, and the efficiency of the healthcare system. This project will be in partnership with Cornell Tech, Weill Cornell, and home care agency partners.

Within any of the above projects: students will begin by reviewing relevant research literature, examples of existing policies (and policy proposals) focused on care labor, and existing

technologies for care workers. Students will then conduct research studies with care workers, to understand their experiences around current technologies and/or to guide the design of novel systems. Deliverables will take the form of slide decks or blog posts that convey findings and insights from the literature review and research, as well as highlight emerging design directions.

Student requirements:

We are looking for master's students with experience conducting design research, interviews, and UI/UX design. For project 2, familiarity with conversational agents, IoT, and relevant prototyping methods are a plus. For project 3, familiarity with data visualization and the design of data collection pipelines are a plus.

Students participating in any of these projects will be expected to:

- Attend regular research team meetings
- Review related scholarship, relevant policy, and existing technologies intended to support care workers
- Conduct interviews with care workers, providers, clients, and other key stakeholders
- Analyze and synthesize qualitative data from interviews
- Ideate with team members based on qualitative findings, converging on a set of design directions

Contacts:

If you are interested please send an email to Sarah Fox, Ken Holstein, and Alex Ahmed (sarahf@andrew.cmu.edu, kjholste@andrew.cmu.edu, alexahme@andrew.cmu.edu).

DESIGN RESEARCH

Justice, Equity, Diversity, and Inclusion (JEDI) in HCI

Research Category:

Social Justice, Design Justice, DEI, Identity and Intersectionality, Accessibility, Social Movements and Activism, Worker-Centered Design, Participatory Design, Community-Based Design, FATE

Project description:

This introductory course will present fundamental concepts, theories, and approaches related to social justice and equity in HCI. This course aims to help students think critically about how our work as HCI practitioners and researchers is tied to power and oppression, as well as how we

might contribute to dismantling structural inequities. We will collectively consider how our research and practice could responsibly serve social movements and community-based organizing, while putting forward more liberatory systems and policy.

This course is organized by members of the HCII's OutsideIn research group and Anti-Bias Learning Committee. The course will be module-based, consisting of 1-2 week modules led by various researchers, practitioners, and faculty across the HCII community. In addition to lectures, we will hold regular discussion and hands-on activity sessions.

Examples of topics we will discuss include, but are not limited to:

- Social movements and activism
- Design justice approaches
- Disability activism and accessibility
- Implicit and systemic bias
- Identity and Intersectionality (e.g., Critical Race Theory and HCI, Critical Disability Studies, Feminist Theory, Queer Theory)
- Labor, tech organizing, and worker-centered design
- Historical perspectives on technology and social power
- Participatory and community-based research approaches
- Designing counterspaces, or safe havens, for marginalized groups
- Fairness, accountability, transparency, and ethics in HCI

Student requirements:
Enrollment for credit is open to both **undergraduate and graduate students**, who can sign up for the course as an Independent Study. In addition, lectures will be **open to any HCII community members** who are interested (e.g., staff, postdocs, and faculty).

Contacts:
To express your interest in taking this course please send a note to cmuoutsidein@gmail.com.

DESIGN RESEARCH

Auditing and Building Equitable Public-Sector AI Infrastructures

Research Category:
Participatory Design, Auditing AI, Human-AI Interaction

Project description:
Research has shown that an overreliance on "efficiency" and the lack of equitable practices and policies around AI use in the public-sector can deemphasize accountability to constituents and cause harm to minoritized communities. For example, in recent years, predictive policing AI systems in the U.S. have been shown to rely on biased historical data, which serves to amplify racialized disparities in patrolling. In this project, we aim to **investigate how public sector AI infrastructures are formed and lead to disparate municipal service provision, as well as how they might be redesigned to address the inequities they inadvertently reinforce.** The site for this work is Allegheny County, Pennsylvania, where we are collaborating with the Gender Equity Commission of the Mayor's Office to conduct an equity-centered audit across municipal departments. We will take a multidisciplinary approach, drawing on audit methodologies from AI ethics literature and community-based design approaches. First, in *auditing existing AI practices*, we seek to evaluate bias in municipal data collection techniques and trace its effects. We will start by examining the life cycle of data—from a design review of interfaces used to administer department-level surveys and application platforms to statistical analysis of publicly available data sets. This phase will include interviews with government stakeholders to deepen our understanding of how they analyze and make use of this data in determining service provisions. Drawing on this analysis and partnering with grassroots community organizations such as Pittsburghers for Public Transit (PPT), we will then facilitate a series of public workshops to engage residents on topics of bias and accountability in municipal systems and *co-design policies to reinforce equity* in public AI infrastructure.

Student requirements:
We are looking for master's or undergraduate students with experience conducting design research, interviews, and UI/UX design.

Students participating in this project will be expected to:
- Attend regular research team meetings

- Review related scholarship, relevant policy, and literature about ethics and equity in AI, particularly in public-sector
- Conduct interviews with stakeholders in the public sector and affected communities
- Analyze and synthesize qualitative data from interviews
- Ideate with team members based on qualitative findings, converging on a set of design directions and policy guidelines.

Contacts:

If you are interested please send an email to Sarah Fox (sarahf@andrew.cmu.edu), Motahhare Eslami (meslami@andrew.cmu.edu), and John Zimmerman (johnz@andrew.cmu.edu).

EDUCATION RESEARCH CATEGORY

Education / IoT / Design-Based Learning Research

Multiple positions are open for research assistants on an NSF-funded project Smart Spaces for Making: Networked Physical Tools to Support Process Documentation and Learning.

Candidates are sought for the following roles:

- *Backend Developer*—assist with the development of a web-platform that integrates with NFC tags, QR codes and other smart tools to help students discover and share knowledge in a physical computing classes and other maker-based learning contexts. Practical experience with Ruby on Rails and Postgres ideal, familiarity with HAML, JS, SASS and, database management helpful.
- *Qualitative Research Coder* - assist in the analysis and synthesis of research data including interviews with educators and research participants, artifacts analysis from codesign workshops, and other qualitative outcomes. Will help with preparation of written reports, publications and research communications. Prior experience with qualitative research coding is desirable.

Research assistants will work with an interdisciplinary team of design researchers, technology developers and learning scientists from CMU's HCII, School of Architecture and the University of Pittsburgh's Learning Research and Development Center (LRDC).

HCII Research/Independent Study: Spring 2021

Partners on this project include Quaker Valley High School, CMU's IDeATe program, and AlphaLab Gear's Startable youth program. Ideal candidates should have exposure to human-centered design methods and experience in collaboratively developing, testing and refining solutions within an interdisciplinary team. Students should have a genuine interest in inclusive education and the design of learning technologies.

Student Requirements:

Part-time positions (up to 15 hours/week) for the Spring 2021 term with the potential to continue into a full time summer internship. Positions can be paid or for independent study credit. Research duties can be completed remotely, but if the position is paid the student must be located within the U.S. Funded positions are supported by the National Science Foundation's Research Experience for Undergraduates (REU) fellowship program so preferred candidates should be U.S. citizens, U.S. nationals, or permanent residents of the United States.

Contact:

If interested, upload your resume to the following Box folder: http://bit.ly/2zKGsZk

Contact Marti Louw (mrlouw@andrew.cmu.edu) or Daragh Byrne (daragh@cmu.edu) with questions.

EDUCATIONAL RESEARCH

Educational Mobile App / Citizen Science / Biology

The Learning Media Design Center (HCII) is leading an interdisciplinary team of entomologists, educators, software engineers, designers, and learning scientists to improve identification practices and training supports in citizen-science based water quality biomonitoring projects. Undergraduate research assistants on this NSF funded project *Learning to See, Seeing to Learn* will participate in design research and development activities related to the expansion of this online teaching collection and explorable image guide to freshwater insects Macroinvertebrates.org to a mobile format to support citizen science water quality monitoring and related environmental education.

HCII Research/Independent Study: Spring 2021

This semester we are looking for a designer researcher to support prototyping, user testing and design refinements for an innovative mobile-based visual field guide to support learning to recognize and ID insects through play, practice and guided classification. Candidates should have experience with game or mobile application design for Android, iOS cross-platform development. Solid solid graphic and interaction design skills with prior work in interface mockups, user testing, and refining mobile applications with complex content and navigation that could inform interactive keys, field guide identification tasks, and gaming elements. A genuine interest in photography, insects, informal science learning, and citizen science is desirable.

The HCII faculty mentor will be Marti Louw, Director of the Learning Media Design Center, and the student(s) will be working closely with Chris Bartley, Sr. Software Engineer at the CREATE Lab. This NSF-funded Research Experience for Undergraduates (REU) fellowship is a part-time position (up to 15 hours/week) with the potential to continue into a summer internship. Interested students should email a cover introduction letter and resume and/or description of experience and a portfolio link <martil@cmu.edu>.

EDUCATIONAL TECHNOLOGY RESEARCH CATEGORY

Title: Supporting online collaborative learning activities for middle school students.
Category: Educational Technology Research

In previous research, we created the Adaptive Peer Tutoring Assistant (APTA), an intelligent peer tutoring system that supports pairs of middle school students tutoring one another to solve equations. The goal is that the students both learn math and become better at tutoring. While APTA has been tested in face-to-face classrooms, it has not been demonstrated in an online context, where even getting both students in a pair online at the same time is a challenge. Therefore, we are looking for students who are interested in implementing new features in APTA for engaging students in productive *online* peer tutoring activities.

We are looking for students with some or all of the following skills:

- Programming experience with HTML and JavaScript

- Experience with HCI Methods

- Interaction design skills

To learn more about this project, contact: Prof. Vincent Aleven, HCII, aleven@cs.cmu.edu

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EDUCATIONAL TECHNOLOGY RESEARCH

Title: Collaborative, browser-based authoring tools for intelligent tutoring software
Category: Educational Technology Research

Intelligent tutoring systems (ITSs) are very effective in helping students learn. How can we make them super easy to create? Our CTAT authoring tools support non-programmers in creating ITSs. In order to make it easier to build tutors in teams—so that developers or teachers could share work on them, we want to move the authoring tools into the browser, using the Vue.js framework. We are looking for students who can help us implement an initial version of a browser-based version of CTAT.

We are looking for students with some or all of the following skills:

- HCI methods
- Interaction design
- Programming experience with HTML and JavaScript is essential.
- Experience with Vue.js is desirable, but not a strict requirement.

To learn more about this project, contact: Prof. Vincent Aleven, HCII, aleven@cs.cmu.edu

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EDUCATIONAL TECHNOLOGY RESEARCH

Title: Replay for intelligent tutoring software so teachers can help students with online learning
Category: Educational Technology Research

Intelligent tutoring systems are very effective in helping students learn, but when used in online learning environments (as opposed to in the classroom), it can be really difficult for teachers to know how well their students are doing, and what specifically they might be struggling with. We are working to create a dashboard to help teachers keep track of student progress and struggle. To gain insight into student struggle, it may help to provide the teacher with a tool to replay student work on one or more problems (i.e., their correct and incorrect solution steps, hint requests, and so forth). The back-end largely exists, but the front-end does not. We are looking for a student who can design, prototype, and implement a first version of such a tool. The student

will be able to take advantage of existing data from interviews with teachers and will be able to work with teachers in participatory design activities.

We are looking for students with some or all of the following skills:

- HCI methods
- Interaction design
- Programming experience with HTML and JavaScript is essential.
- Experience with Vue.js is desirable, but not strictly required.

To learn more about this project, contact: Prof. Vincent Aleven, HCII, aleven@cs.cmu.edu

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EDUCATIONAL TECHNOLOGY RESEARCH

Title: Gamified tutoring system for middle school students with drag-and-drop equation solving
Category: Educational Technology Research

Our tutoring software for equation solving (Lynnette) has been very effective in helping middle school students learn in over a dozen classroom studies, but students would prefer that it be more engaging. We are working to make the tutor more game-like, though without fully converting it to an educational game. In one approach, we try to support students' thinking about equation transformations with smooth and efficient drag-and-drop manipulations of the equation. An initial classroom study with the new prototype showed the promise of the approach, but also revealed the need for additional design iterations. We are looking for a student who can help make the tutor even more engaging and effective.

We are looking for students with some or all of the following skills:

- HCI methods
- Interaction design
- Programming experience with HTML and JavaScript is essential.
- Experience with Svelte is desirable, but not strictly required.

To learn more about this project, contact: Prof. Vincent Aleven, HCII, aleven@cs.cmu.edu

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EDUCATIONAL TECHNOLOGY RESEARCH

Title: A dashboard to help middle school teachers keep track of student progress and struggle
Category: Educational Technology Research

Intelligent tutoring systems are very effective in helping students learn, but it can be difficult for teachers to know how well their students are doing, and what specifically they might be struggling with. We have created a teacher awareness tool for use in classrooms; it has been very successful when used in middle school classrooms. The tool however is not well-designed for use in online learning environments, when students are using the tutoring software at home. We are working to redesign the teacher tool for use in online learning. It will run within our CTAT+Tutorshop infrastructure for intelligent tutoring systems development. We are looking for a student who can design, prototype, and implement a first version of such a tool. The students will be able to use information gleaned from teacher interviews that we have conducted already.

We are looking for students with some or all of the following skills:

- HCI methods
- Interaction design
- Programming experience with HTML and JavaScript is essential.
- Experience with Vue.js is desirable, but not strictly required.

To learn more about this project, contact: Prof. Vincent Aleven, HCII, aleven@cs.cmu.edu

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HUMAN-AI COLLABORATION, PERCEPTION, DECISION-MAKING, TRUST, HEALTH, EX

Understanding and Supporting Human-AI Collaboration in Radiology
Research Categories:
Human–AI Collaboration, Perception, Decision-Making, Trust, Health, Explainability, Visualization

Project description:
In this project, we are investigating the relative strengths of human and AI perception in diagnostic radiology, and exploring how these strengths might be effectively combined

in practice. Through contextual inquiries and experimental studies, we will study the following questions:

(1) How do radiologists perceive and account for cases where an AI system disagrees with their own assessment of an image?

(2) In cases of disagreement, what factors determine when radiologists are willing or unwilling to consider that the AI system's assessment may be correct?

(3) How do various forms of AI explanations and visualizations influence radiologists' trust and agreement with the AI system's assessments?

Student requirements:

We are looking for master's students who have experience with one or more of the following: contextual inquiry, human subjects experiments, AI explainability and visualization, or front-end design/development. Familiarity and interest in any of the following is a plus, but not required: decision-support, human-AI interaction and collaboration, cognitive/decision sciences, healthcare, machine learning, computer vision.

Contacts:

If you are interested please send an email to Adam Perer and Ken Holstein (adamperer@cmu.edu,kjholste@andrew.cmu.edu).

InfoVis, NATURAL LANGUAGE PROCESSING, WEB APPLICATIONS

Title. Accelerating Scientific Innovation with Computational Analogy
Research Category. InfoVis, Natural Language Processing, Web applications

Project Description. The ability to find useful analogies is central to problem solving and innovation. Many important discoveries in science were driven by analogies: the Greek philosopher Chrysippus made a connection between observable water waves and sound waves; an analogy between bacteria and slot machines helped Salvador Luria advance the theory of bacterial mutation. Innovation is often spurred by analogy as well: an analogy to a bicycle allowed the Wright brothers to design a steerable aircraft. Whether architecture, design, technology, art, or mathematics, the ability to find and apply patterns from previous work or other domains is fundamental to human achievement.

In this project, students will work on designing and developing interactive web-based interfaces to support searching and interacting with analogies from a corpus of research papers. Under the guidance from their mentor, students will develop prototypical information visualization interfaces that leverage machine learning and natural language processing techniques to quickly find non-conventional ideas that existing search engines fail to find.

Expected background. Interest in HCI research and technical experience with any of the following: HTML/Javascript/CSS, Node.js, D3.js, Flask, Tensorflow, Huggingface transformers, PyTorch, spaCy, any neural networks built and trained for natural language processing

Contact person. Hyeonsu Kang, hyeonsuk@andrew.cmu.edu

INTERACTION DESIGN RESEARCH CATEGORY

Social cybersecurity mini-games and everyday interventions

Area: Interaction design, security and privacy

Contact: Isadora Krsek, Laura Dabbish, Jason Hong

Research on the human factors of cybersecurity often treats people as isolated individuals rather than as social actors within a web of relationships and social influences. This project leverages known social influence principles to improve cybersecurity behavior and enhance security tool adoption. There are two independent study opportunities associated with this research effort:

1. Cybersecurity mini-games: The independent study student on this project will work on designing and developing web-based security-related mini games. The student may also have an opportunity to conduct evaluations of these mini games.
2. Everyday micro-intervention app: The independent study student on this project will work on designing and developing an app to help people adopt better cybersecurity behaviors through a 30-day adulting challenge.

Student requirements: We are looking for students who are interested in interaction design and web programming (front-end or back-end). Familiarity with (or interested in learning) Python or Ruby a plus. Javascript also a plus.

Interested students should send their resume, major GPA and links any relevant projects to ikrsek@andrew.cmu.edu

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INTERACTION DESIGN

Interactive Negotiation Toolkit for Empowering Women and Girls

Area: Interaction design, social computing

Contact: Laura Dabbish, Ayana Ledford

Research shows women negotiate less often than men across a variety of situations and this tendency perpetuates inequality such as the leadership and wage gap between men and women. One way to work towards equity is by teaching and providing scalable access to training tools that will empower women to advocate on behalf of themselves.

This independent study will involve working to enhance the design of an online toolkit for learning about and practicing everyday negotiation skills and developing design ideas . In this project, we will work with PROGRESS (Program for Research and Outreach on Gender Equity in Society) a CMU founded organization which addresses gender inequity by providing negotiation tools to empower women and girls. Students will work through a user-centered design process, conducting research on experiences with the current toolkit, creating design concepts, developing low and high fidelity prototypes, and conducting evaluation sessions with women.

Student requirements: Experience and/or coursework in interaction design, user research, and ability to use Figma, inVision, Sketch, or other visual design and prototyping tools. Strong organizational and interpersonal skills.

Interested students should send their resume, major GPA and links any relevant projects to dabbish@cmu.edu and ledford@andrew.cmu.edu

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INTERACTION DESIGN

Supporting Peer and Novice Therapists

Area: Interaction design, social computing

Contact: Laura Dabbish, Robert Kraut, Tianying Chen

In this project we are developing an interactive prototype for motivational interviewing training using a human-centered design approach. Motivational Interviewing (MI) is an effective therapeutic technique to support behavior change, but training is often time consuming and its effectiveness diminishes over time.

Students on this project will work in a team to design and develop a prototype for time effective interactive MI training useful both for initial training and refreshers. Our prototype will build on our research to identify the unique challenges nurses face in learning MI and that MI newcomers struggle with building rapport, analyzing the problem, and promoting readiness for change during therapeutic interactions.

Student requirements: Experience and/or coursework in psychology, research methods, interaction design, user research, and ability to use Figma, inVision, Sketch, or other visual design and prototyping tools. Strong organizational and interpersonal skills.

Interested students should send their resume, major GPA and links any relevant projects to dabbish@cmu.edu and ledford@andrew.cmu.edu

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MIXED REALITY / COMPUTATIONAL INTERACTION CATEGORY

Mixed Reality / Computational Interaction

Augmented Reality and Virtual Reality offer interesting platforms to re-define how users interact with the digital world. It is unclear, however, what the requirements in terms of usability and interaction are to avoid overloading users with unnecessary information. In this project, we will build on existing machine learning approaches such as saliency prediction that leverage insights into human visual perception. The goal is to create computational approaches to improve the applicability and usefulness of AR and VR systems.

There are multiple routes to take in the project which can be tailored towards individual skills and interests, from building VR systems to run experiments, via integrating live camera feeds into a large-scale MR / VR environment, to integrating computer vision approaches for context sensing. Please reach out if you have questions and to talk about the project.

Student requirements
Strong technical background
Some experience with 3D editors and programming (e.g., Unity, Unreal)
Optional: Some familiarity with Computer Vision

Contact

David Lindlbauer (davidlindlbauer@cmu.edu)

https://hcii.cmu.edu/people/david-lindlbauer

Projects are available as paid opportunities or for credits.

OTHER POSITIONS

Twitch Streamer

Jessica Hammer / OH!Lab

Contact: Noor Hammad (nhammad@andrew.cmu.edu)

Our lab is working to build a live streaming channel around CMU's game research, game design, and game development communities.

We will be evaluating students for this position based on a short pitch. Please send us a pitch that is *no more than one page*. You should describe two different Twitch shows that you would be willing to coordinate and host weekly. These shows should be of two different types, e.g. one that is focused on gameplay and one that includes interviews.

If your pitch is accepted, we will contact you about options for further participation, including paid and independent study positions.

Project Documentation Coordinator

Jessica Hammer / OH!Lab

Contact: hammerj@andrew.cmu.edu

Our lab has tons of cool projects! We want to make sure that we are creating easily share-able materials (e.g. videos) and that our website stays up to date. We would also love your help creating press releases and otherwise bringing media attention to our work.

There are a range of skills that would make you a good fit for this position. You must be highly organized and willing to interview people about their projects. We would also like you to have at least one of the following skills:
- Writing
- Video production
- Art/graphic design
- Web design

This position is available as a paid position, 8-10 hours per week. If you would prefer to do it as an independent study, we can adjust the position goals to be relevant to your interests.

OTHER POSITIONS

- Research Category: Any – student choice
- Paragraph - Willing to support an independent study of any student (or group of students) interested in pursuing their own topics within the human-centered research space. Students are responsible for defining their problem statement, planning and conducting the research, recruiting participants and defining final deliverables. At the start of the project, students will write their own rubric against which the project grade will be based. The instructor will support the student through weekly meetings providing guidance, reviewing materials, and making professional connections as appropriate.
- Student Requirements – Must have taken User-Centered Research and Evaluation
- Contact - Raelin Musuraca, raelin@cmu.edu

PRIVACY CATEGORY

PRIVACY, DESIGN, SYSTEMS PROTOTYPING

Designing developer tools to facilitate opportunistic learning for privacy engineering

Research category: Privacy, Design, System prototyping
Contact: Tianshi Li (tianshil@andrew.cmu.edu)
Ideal qualifications: Genuine interest in privacy and HCI research, strong programming skills, prior experience in UI/UX design, prior experience in qualitative/quantitative studies, independent and strong problem-solving skills, reliable, self-motivated, quick learner

The wide use of user data in todayís digital products has made protecting privacy an extremely challenging task for end-users. Developers are supposed to help protect their usersí privacy, while most of them failed to do a good job in this task because they never received formal training in how to design and implement a privacy-preserving system. Our prior research has demonstrated

the potential of providing real-time feedback to Android developers while they are programming to reduce the learning cost and help them stay more aware of potential privacy issues and solutions to these issues at an early stage.

We are looking for research assistants to help with a project that explores the design space of developer tools (e.g., IDE plugins, libraries, web browser extensions, etc.) to show developers contextualized privacy-related learning materials and actionable suggestions at opportune times. In this project, you will help conduct formative studies to inform the design ideas, create lo-fi/hi-fi prototypes of the features of the tools, and implement working prototypes and evaluating them with developers.

Send resume, GPA in primary major(s), and links to any relevant projects.

PRIVACY, IoT, SPEECH ASSISTANT

Making always-listening Alexa transparent and controllable.

Research category: Privacy, IoT, Speech assistant
Contact: haojian@cs.cmu.edu
Ideal Qualifications: Interests in hacking Raspberry PI. Good programming skills with C++. Good knowledge of network programming. Experiences with NodeJS is a big plus.

Privacy is a major barrier to the adoption of always-on listening devices like Alexa speakers. We have built Peekaboo, a new IoT app development framework to help developers build privacy-sensitive smart home apps. Peekaboo offers a hybrid architecture, where a local user-controlled hub pre-processes smart home data in a structured manner before relaying it to external cloud servers.

We are looking for a research assistant to build a Peekaboo version of Alexa, which routes the microphone data through a local hub. We will work with you to create a working Alexa using open source hardware (i.e., Raspberry PI). Through this project, you will have hands-on experience building an Alexa Built-in product using Alexa AVS (https://developer.amazon.com/en-US/docs/alexa/avs-device-sdk/overview.html).

PRIVACY, CROWDSOURDING, WEB DEVELOPMENT

Improving the PrivacyIO crowdsourcing web site
Research category: Privacy, crowdsourcing, web development
Contact: haojian@cs.cmu.edu
Ideal Qualifications: React, NodeJS, Python. Experience with UX design
is a big plus.

Imagine a data scientist in Uber finds that users are more likely to accept
a high surge price if their smartphone battery level is low. Incorporating
this insight into the system may improve corporate profit; however, it may
also lead to negative headlines in the news media. We are building a
crowdsourcing web platform to help practitioners to collect such feedback
in a cheap and fast manner in the early stages of design.

We are looking for one research assistant to help us improve an existing
website. Tasks will include a) integrating Qualtrics into the platform;
b) refining the workflow for the crowdsourcing pipelines. Expecting students
to average at least 10 hours a week on this research, for pay or independent
study. Send resume, GPA in primary major(s), and links to any relevant projects.

PRIVACY, SMARTPHONE, WEB IMPLEMENTATION

Building out the Android Network Traces Web Site
Research category: Privacy, smartphone, web implementation
Contact: jasonh@cs.cmu.edu
Ideal Qualifications: HTML, CSS, JavaScript, databases, UX design

Many smartphone apps collect potentially sensitive personal data and send it to cloud servers.
We are building a web site that can showcase what data is being collected by apps and where it
is going. You can see an early version of the site here:
https://android-analytics.azurewebsites.net/home

We have designed more of the pages and done some initial implementation. We are looking to
hire 2 people to continue to implement those pages, including interactive visualization and
backend database. Expecting students to average at least 10 hours a week on this research, for
pay or independent study. Send resume, GPA in primary major(s), and links to any relevant
projects.

PRIVACY, IoT

Paper prototyping Smart Home Privacy Interface
Research category: Privacy, IoT
Ideal Skills: Figma prototyping, User interface design, Survey design, Interface evaluation.
Contact: Haojian Jin (haojian@cs.cmu.edu)

It is clear that privacy will be a future requirement of all system software. While smart home vision has attracted significant attention from major companies (e.g., Google Home, Apple Home, Samsung Smartthings), the privacy interfaces inside these apps are still quite limited.

We are looking for one research assistant to help us iterate and co-design the next-generation privacy management interface for the smart home. Tasks will include a) designing surveys to collect feedback from users; b) prototyping through Figma and refine it iteratively; c) running user studies to evaluate the paper prototypes. Send resume, GPA in primary major(s), and links to any relevant projects.

RESEARCH AND DESIGN

VR Environment Design (Research Assistants, VR Developers)

Jessica Hammer / OH!Lab
Contact: Erica Principe Cruz (ecruz@cs.cmu.edu)

We are interested in exploring how VR workspaces can be designed to augment group collaboration in Relationship-Building Meetings, Presentations for Decision-Making, and Co-creation Sessions. Research Assistants will help with literature review and internal prototyping and testing. VR developers will assist in creating prototypes. All work will be done remotely.

We are looking for people with the following skills:
- One or more research assistants: You should be highly organized with good communication skills. Interest in / experience with VR is a plus.
- One or more VR developers. You should have prior experience with Unity. 3D art / environment design skills are a plus.

- One or more 3D artists. Prior experience with Unity and/or VR is a plus.

These positions are available as an independent study (9-12 units). There is also the option of paid work over winter break.

Counterspace Games for BIWOC (Research Assistants, Game Designers)

Jessica Hammer / OH!Lab
Contact: Erica Principe Cruz (ecruz@cs.cmu.edu)

We are co-designing games with BIWOC studying STEM to enable playful experiences to counter marginalizing experiences, and this project is led by a Pilipina PhD Student. This project operates under the idea that practicing joy can combat oppression as personal playful methods of resistance and that this can be facilitated by counterspaces. Counterspaces can be physical or virtual gatherings for support of marginalized groups at the periphery of a dominant culture.

This research will explore designs of *playful* counterspaces as games with BIWOC in STEM to combat experiences of oppression such students have experienced within the larger dominant culture. Research Assistants would run a co-design remote mini game jam, perform data organization and analysis, and research existing counterspaces and playful resistance methods related to play and games. Game Designers would help translate previous insights into game design strategies and iterative digital prototyping, including but not limited to storyboarding and working in Unity.

We are looking for people with the following skills:
- One or more research assistants: You should be highly organized with good communication skills. Prior experience with marginalized communities is a bonus (particularly lived experience as a BIWOC).
- One or more game designers. When you apply, please indicate what prototyping and game design skills you can contribute. Experience with C# and Unity is a bonus. Prior experience with marginalized communities, including lived experience as a BIWOC, is also a bonus.

These positions are available as an independent study (9-12 hours per week). There is also the option of paid work over winter break.

All of Us (Assorted Game Positions)

Jessica Hammer / OH!Lab
Contact: Morgan Evans (morganev@cs.cmu.edu)

We are creating an educational game to help players learn more about genetic databases and increase their health literacy. We are specifically targeting groups who are underrepresented in gene therapy and other genetic health initiatives. We will be developing a game, and playtesting it with our stakeholders.

We are looking for people with the following skills:
- One or more game designers. Familiarity with visual novels and/or strategy sim games is a bonus.
- One or more game artists. You should be able to work in an isometric 2D format. Please note whether you can work on character/asset design, UI/UX, or both.
- One or more game developers. You should be familiar with Unity and be able to follow best practices for code and asset modularization.
- One or more game writers. You will be expected to test your dialogue with stakeholder groups and edit to make it more culturally relevant.

This position is available as an independent study (9-12 hours per week). There is also the option of paid work over winter break.

Robotics Game Design (Research Assistants)

Jessica Hammer / OH!Lab & Marti Louw
Contact: Marti Louw (marti@cmu.edu)

We are creating a game for middle-school students to introduce them to concepts in co-robotics. As part of our research, we are documenting our game design process and capturing how our designers make decisions. We are looking for research assistants to interview members of the design team, and to help analyze interviews and game artifact materials.

We are looking for people who are highly organized and have great communication skills. An interest in game development is a plus, as is experience with interviewing or other qualitative research. If you don't have a background in either, we'll train you!

This position is available as an independent study (9-12 credits).

SOCIAL COMPUTING CATEGORY

Diversity and Inclusion in Open Source Software Development

Area: Social computing

HCII Research/Independent Study: Spring 2021

Contact: Laura Dabbish

Open source software is important to sustaining the world's infrastructure, and millions of volunteers help maintain it. However, growing evidence shows that people of different genders, particularly women, face particular barriers when contributing to open source software. Our research interviews people of diverse genders, races and ethnicities who have made significant open source contributions to understand how they became highly involved in open source, the barriers they face, and how they overcome them. We will also perform statistical analysis using data science on GitHub trace data to understand the extent to which our findings generalize, and the wider effects of barriers we uncover.

Student requirements: Strong organizational and interpersonal skills are important, other skills can be learned. Any of the following skills helpful: experience conducting interviews, experience with data science pipelines (eg, using python, SQL or R)

Interested students should send their resume, major GPA and links any relevant projects to dabbish@cmu.edu

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SOCIAL COMPUTING

Career Trajectories in Online Freelance Platforms

Area: Social Computing
Contact: Laura Dabbish

The global market for online labor has grown by approximately 50% in the last three years, as millions of workers turn to online freelance platforms (e.g. Upwork, Fiverr), in varying degrees and periods throughout their careers. Our research focuses on understanding and designing to support online freelancers' career trajectories. There are two independent study opportunities related to this project:

- **Survey of Career Trajectories in Online Freelance Platforms:** The independent study student on this project will assist with survey design and deployment including cognitive testing, recruitment and distribution. The student may also have an opportunity to assist

with survey analysis in R and Python. Students will ideally have some knowledge of descriptive and inferential statistics.

● **Designing tools for supporting online freelancers:** The independent study student on this project will ideate on methods for supporting new online freelancers based on our foundational research on transition challenges. You will work to prototype and evaluate design ideas for helping manage the financial, social, and client management challenges of gig work.

Interested students should send their resume and major GPA, as well as their project preference to dabbish@cmu.edu

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SOCIAL COMPUTING

Self-directed Career Development and Exploration on Video-Sharing Social Platforms

Area: Social Computing
Contact: Laura Dabbish

This independent study project seeks to understand how creators and viewers leverage popular video-sharing social platforms (e.g. YouTube and TikTok) to engage in self-directed career development and exploration. We will investigate a range of topics, including but not limited to the affordances enabled by these platforms for learning and mentorship, career exploratory behaviors and self-efficacy. We will focus primarily on the experiences of creators and viewers who are underrepresented in STEM. The independent study student will assist in conducting literature reviews, analyzing videos, tags and comments using user experience research methods (e.g. thematic analysis, personas, storyboarding). The student may also have the opportunity to conduct interviews through this project.

Interested students should send their resume and major GPA to dabbish@cmu.edu

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SOCIAL COMPUTING

UX Research and Ethical Design in Practice

Area: Social Computing
Contact: Laura Dabbish

HCII Research/Independent Study: Spring 2021

As technology corporations work to incorporate ethics into their design process, the HCII is working to understand how to best prepare our students to be responsible product designers and developers. The independent study students on this project will work with two faculty to understand how the HCII curriculum is preparing students for the challenges they face in industry today. We will create and deploy a survey to alumni and hiring managers to understand key skills the technology industry is emphasizing in its day to day and hiring process, and identify gaps in our curriculum. We will examine what design research and engineering methods are used to assess and anticipate potentially harmful uses of technology and what barriers UX professionals face in doing so.

Student requirements: User research methods interest, coursework or experience (interviews, survey design), organizational skills, survey design interest, coursework or experience. Statistical analysis skills or interest (experience with R, python or other statistical packages).

Interested students should send their resume and major GPA and a brief description of what they hope to get out of working on this project to dabbish@cmu.edu

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SOCIAL COMPUTING

Category: social computing
Project description:
The gig economy is characterized by short-term contract work performed by independent workers who are paid in return for the "gigs" they perform. Example gig platforms include Uber, Lyft, Postmates, Instacart, UpWork, and TaskRabbit. Gig economy platforms bring about more job opportunities, lower barriers to entry, and improve worker flexibility. However, growing evidence suggests that worker wellbeing and systematic biases on the gig economy platforms have become significant societal problems. The project involves three major research activities. (1) Working with gig workers and local policymakers to understand their concerns, challenges, and considerations related to gig worker wellbeing, as well as the current practices, problems, and biases of existing gig economy platforms. (2) Developing a data-driven and human-centered decision-assistance environment to help gig workers make "smart" decisions in navigating and selecting gigs,and provide a macrolevel perspective for policymakers working to balance their diverse set of objectives and constraints. (3) Deploying and evaluating whether and how the above environment addresses the fundamental problems of worker wellbeing and systematic biases in the gig economy.

Requirements:

Preferred but not required: Working with the project team to plan and conduct research studies, including interviews, user studies, surveys, design workshops, or behavioral experiments.

Preferred but not required: Analyzing and interpreting data collected from research studies, in collaboration with other project team members.

Contact person:

haiyiz@andrew.cmu.edu

Category: social computing, applied machine learning, Artificial Intelligence

Project description:

Artificial intelligence (AI) systems are increasingly used to assist humans in making high-stakes decisions, such as online information curation, resume screening, mortgage lending, police surveillance, public resource allocation, and pretrial detention. While the hope is that the use of algorithms will improve societal outcomes and economic efficiency, concerns have been raised that algorithmic systems might inherit human biases from historical data, perpetuate discrimination against already vulnerable populations, and generally fail to embody a given community's important values. Recent work on algorithmic fairness has characterized the manner in which unfairness can arise at different steps along the development pipeline, produced dozens of quantitative notions of fairness, and provided methods for enforcing these notions. However, there is a significant gap between the over-simplified algorithmic objectives and the complications of real-world decision-making contexts. This project aims to close the gap by explicitly accounting for the context-specific fairness principles of actual stakeholders, their acceptable fairness-utility trade-offs, and the cognitive strengths and limitations of human decision-makers throughout the development and deployment of the algorithmic system.

Requirements:

Preferred but not required: Working with the project team to plan and conduct research studies, including interviews, user studies, surveys, design workshops, or behavioral experiments.

Preferred but not required: Analyzing and interpreting data collected from research studies, in collaboration with other project team members.

Preferred but not required: Ideating and designing new tools to improve fairness in machine learning practice.

Contact person:

haiyiz@andrew.cmu.edu

UI / UX DESIGN RESEARCH CATEGORY

Title: Autonomous System Design for Human-Machine Teaming

Project Description:Autonomous vehicles have the potential to enhance soldiers capabilities and protect them. However, most software interfaces designed for soldiers focus on training rather than on usability. This work will give developer's guidance to shift the emphasis from training soldiers and relying on recall to measurably improving designs of soldier's interactions with autonomous systems. We will focus on differences presented by autonomous systems and the soldier's experience receiving information and communicating with the systems. This work will be investigating best practices for displays (screens), tactile/haptic and potentially additional interfaces. We will build on existing standards and best practices including those from human-machine interaction practice, user experience, and design. New autonomy guidance will be created such as: communication with vehicles; vehicle status and the vehicle's confidence in the next movement; object detection; and management of multiple vehicles. We will experiment to learn about the contextualized operator perspective by conducting a series of usability studies with prototypes that our team develops.

Student Requirements:

- US Citizen or permanent resident
- Located within US borders

We are looking for students to fill one or more of the following roles:

1) Interaction designer. Students should have experience creating clickable, high fidelity software prototypes for both desktop and mobile devices at a minimum. Preferable to have some experience creating functional code-based prototypes with either web platforms or Android. Interest and ability to manage complex interactions with systems other than simple form applications. Experience (or at least interest) in robotics and creating interfaces for human-robot interaction.

2) UX Researcher to support usability studies. Basic experience running interface usability studies. Experience running complex studies with multiple devices or human-robot interaction studies is preferred. Ability to manage research study logistics, data collection, and data analysis.

HCII Research/Independent Study: Spring 2021

Students can participate in an independent study or as a paid hourly position.

Please contact Nikolas Martelaro nikmart@cmu.edu for more information.

UI / UX DESIGN

Visual UI/UX Design
This person will be passionate about interaction design. Responsibilities may include storyboards, wireframes, user flows, UI design, and animation. Experience with design software such as Sketch, Figma, or Adobe XD is highly recommended but not required.
Learn more about the tool at app.skeema.com.
Contact: Brad Breneisen bbreneis@andrew.cmu.edu

UX RESEARCH

This person will be passionate about UX research. Responsibilities may include conducting user tests and interviews, storyboards, personas, market research, and conceptual mockups. This person will focus on the early growth strategy for a young product focused on creating a community/social network around online product comparisons and reviews.
Learn more about the tool at app.skeema.com.
Contact: Brad Breneisen bbreneis@andrew.cmu.edu