AI, CROWDSOURCING

Organizing Crowd Audits to Detect Bias in Machine Learning
Research category: AI, crowdsourcing, bias
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 how to best recruit people with best fit for specific tasks. 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, CROWDSOURCING

Facilitating Public Deliberations of Fairness Metrics in Machine Learning
Research category: AI, crowdsourcing, bias
Contact: Hong Shen (hongs@andrew.cmu.edu)
Ideal Qualifications: basics of AI and ML, UX/UI design, statistics, visualization, visual design, cognitive psych

This project aims at (1) developing more intuitive and generally understandable representations and interfaces to help the general public (i.e., lay people) better understand fairness metrics developed by machine learning experts; and (2) building tools and processes to help the general public discuss, deliberate and AI and fairness.

HCII Research/Independent Study: Fall 2020

We are looking for students to help design and test different variants
of the confusion matrices using the existing system as well as to
develop tools and processes for facilitating public deliberation.
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.

CAD SYSTEM IMPLEMENTATION

Title: "Using optimization for generative design of machine knit textiles objects"
Research Category: CAD system implementation, Machine Knitting, Program Synthesis

One paragraph project description:
The student will be contributing to the implementation of a Generative Design tool for knitting.
This will include work on extending a knitting compiler pipeline and implementation of a GUI for
machine knit designers. If the student is on campus they may get to work with an industrial
knitting machine to produce samples, assuming COVID safety conditions are met.

Student requirements
- 1+ year Experience in Python

Contact person
Megan Hofmann: meganh@cs.cmu.edu or
Scott Hudson: scott.hudson@cs.cmu.edu

DATA VISUALIZATION

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 he richness of qualitative analysis? We ware 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
- 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)

DATA VISUALIZATION

Explaining AI with Games

- Area: Games With a Purpose / Data Visualization
- We are exploring the design of human computational games to collect explanations of how artificial intelligence makes decisions on complex data. We have built a prototype game that allows players to guess what the AI is "seeing" in an image that it classified.

This semester, we plan to deploy our initial game, evaluate its results, and design new games in this space.
- Skills:
    - We are looking for students interested in game design or playtesting, and analyzing game log data.
    - We are also looking for technical students with experience building and testing web applications.
- Contact person: Adam Perer (adamperer@cmu.edu)

DATA VISUALIZATION

COVIDcast

- **Area:** Data Visualization
- We are working towards combating the COVID-19 pandemic by supporting informed decision-making at federal, state, and local levels of government and in the healthcare sector. We are designing interactive visualizations to make this information available to the wider public (http://covidcast.cmu.edu)
- Skills:
    - We are looking for students interested in designing data visualizations to communicate the data effectively.
    - We are looking for students interested in conduct semi-structured interviews with domain experts (e.g. public health officials) to understand user needs.
- Contact person: Adam Perer (adamperer@cmu.edu)

DATA VISUALIZATION

Project 1: Lightning fast interactive data visualizations
The research category: Data Visualization
Student requirements:
* enthusiasm for helping people understand data
* a proven track record of independently working on a project
* experience with web development
The contact person is me (Dominik Moritz, domoritz@cmu.edu)
Description:
To support effective exploration, interactive visualization systems must provide rapid response times for latency-sensitive operations. We have developed a prototype system that enables instant interactions with billion-record datasets. The prototype is available at https://github.com/uwdata/falcon. The system leverages smart prefetching and indexing techniques grounded in constraints from human perception. We want to work with you to bring

these techniques to another visualization toolkit (Vega), which is already used by thousands of developers in academia, research, and industry.

I am interested in hosting Masters and last-year undergraduate students in the Data Interaction Group (https://dig.cmu.edu/).

Project 2: Replacing Interactions with multidimensional visualizations
The research category: Data Visualization
Student requirements:
* enthusiasm for helping people understand data
* a proven track record of independently working on a project
* experience with web development
The contact person is me (Dominik Moritz, domoritz@cmu.edu)
Description:
To support effective exploration, interactive visualization systems must provide rapid response times for latency-sensitive operations. We have developed a prototype system that enables instant interactions with billion-record datasets. The prototype is available at https://github.com/uwdata/falcon. However, instead of using one-dimensional histograms and requiring interactions to gain insights into multidimensional datasets, we could show multidimensional visualizations when the user hovers over the chart for one dimension. With you, we want to explore this interaction technique and learn how it compares to interactive cross-filtering interactions.

I am interested in hosting Masters and last-year undergraduate students in the Data Interaction Group (https://dig.cmu.edu/).

Project 3: Interactive Visualization in Python
The research category: Data Visualization
Student requirements:
* enthusiasm for helping people understand data
* a proven track record of independently working on a project
* experience with Python or web development
The contact person is me (Dominik Moritz, domoritz@cmu.edu)
Description:
Python is the most popular programming language for data science but support for interactive data visualization is far behind what is supported in web-based environments. We have already implemented visualizations that can react to user inputs but we are looking for students to make the selections available in the Python context. This improvement will enable new use cases for interactively working with data in the Python ecosystem.

I am interested in hosting Masters and last-year undergraduate students in the Data Interaction Group (https://dig.cmu.edu/).

DESIGN / EDUCATION

Social Programmable Robots

- **Category:** design/education
- We are looking for enthusiastic design students to be part of our team! The project focuses on using social robots to empower Latinx and Native American middle school girls in computer science. Independent study students will work on elements of the culturally-responsive curriculum, interaction design for a remote social robot system, or discourse design for the social robot.
- Students should be HCI, design, CS, etc. students interested in the above topics
- Contact: angelaebstewart@gmail.com

DESIGN / EDUCATION

ClassInsight

- **Category**: design/education
- We are looking for enthusiastic design students to work on a system to support teacher discourse in the classroom. The aim of the system is to help teachers notice their classroom discourse behaviors, and determine their own goals to improve their classroom discourse. Interested students will work on transitioning the system from in person to remote classrooms and design of elements that support teacher goal setting.
- Students should be HCI, design, CS, etc. students interested in the above topics
- Contact: angelaebstewart@gmail.com

DESIGN RESEARCH

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

Description: Makers are creative and capable a 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

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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

Co-Designing Technologies to Support In-Home Health Workers and Nursing Home Caregivers
Research Category: Human-AI Collaboration, Participatory Design

Project description:
Home health aides 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 home health workers. We will work with in-home and nursing home caregivers to co-design novel technologies that center their needs, with particular attention to challenges that have been created or amplified by the pandemic. Early in the semester, the student will work with project faculty to review research literature, examples of existing policies (and policy proposals) focused on care labor, and existing technologies intended to support care workers. The student will then conduct interviews and design activities with care workers, to inform the design of novel systems. Deliverables will take the form of slides that convey findings and insights from the literature review and qualitative 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. Programming skills are a plus, but not essential.
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 (sarahf@andrew.cmu.edu) and Ken Holstein (kjholste@andrew.cmu.edu).

DESIGN RESEARCH

Designing Interactive Fiction Games about Implicit Bias and Microaggressions
Research Categories: Design; Social Computing

HCII Research/Independent Study: Fall 2020

In this project we are developing interactive narrative games that aim to provide players with a deeper understanding of implicit bias and microaggressions toward stereotype-targeted and marginalized groups (e.g., racial minority groups, LGBTQ+ youth). Specifically, we are designing narrative creation tools that utilize collaboration and crowdsourcing to co-create playable narrative games. The focus of this independent study will be on prototyping and testing novel design concepts in this space.

Contact: Geoff Kaufman (gfk@cs.cmu.edu)

DESIGN RESEARCH

Designing "Embedded" Interface Elements for Prosocial Outcomes
Research Categories: Design; Social Computing

In this project we are designing common interface elements (e.g., CAPTCHA verification tools, password/username generation tools, etc.) that embed persuasive content to shift emotions and behaviors in prosocial directions. Application areas include interface interventions to encourage more civil discourse in online communities, to reduce stereotypical perceptions and presumptions about outgroup members, and to reduce the spread of misinformation. The focus of this independent study will be on prototyping and testing novel design concepts in this space.

Contact: Geoff Kaufman (gfk@cs.cmu.edu)

DESIGN RESEARCH

Designing Novel Implicit Bias Measurement Tools
Research Categories: Design; Social Computing

In this project we are creating new tools that measure a respondent's implicit biases (e.g., based on gender, race, sexual orientation) in language use, interpretation of social events, and assumptions made about members of social outgroups. These tools are designed to surface

biases in ways that are spontaneous and automatic, which necessitates design approaches that conceal or obfuscate their true intended purpose. At the same time, the tools must provide feedback to respondents in a way that provides self-insight without triggering reactance. The focus of this independent study will be on prototyping and testing novel design concepts in this space.

Contact: Geoff Kaufman (gfk@cs.cmu.edu)

EDUCATION RESEARCH

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.

Skills or requirements: Programming experience with HTML and JavaScript.

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

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EDUCATION RESEARCH

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 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, artefacts 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). 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 Fall 2020 (renewable in Spring 2021.) 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.

EDUCATION RESEARCH

Title: A tool for helping middle school teachers orchestrate online collaborative classrooms
Category: Educational Technology Research

Intelligent tutoring systems are very effective in helping students learn individually, but sometimes learning collaboratively is more effective. We have a tutoring system, APTA, that helps students learn with a peer, in addition to systems for single students. What we still need is a tool by which teachers can easily monitor paired work and let students switch back and forth between working individually and working collaboratively. We have some low-fidelity designs, and we are looking for students who can help us implement a high-fidelity interactive prototype.

Skills or requirements:

- 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

EDUCATION 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.

Skills or requirements:
- 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

EDUCATION 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.

Skills or requirements:
- 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

EDUCATION RESEARCH

Title: Mathtutor tutor conversion to HTML
Category: Educational Technology Research

Intelligent tutoring systems (ITSs) are online learn-by-doing activities with step-by-step guidance (feedback and hints); they are like a coach helping students with problem-solving practice. These systems have proven very effective in helping students learn. Our lab pioneered this technology; over 20 years ago we spun off a firm that since then has sold ITSs to teach math in thousands of schools. Along the way we developed a set of tutors that cover all of middle-school math. We used the software tools we had then, but to make sure the tutors can continue to work on the web, we need to translate them to HTML and JavaScript. We have made great progress, but we have more to do. We are looking for a student who can reimplement tutors using our CTAT authoring tools.

Skills or requirements:
- Programming experience with HTML and JavaScript is essential.

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

EDUCATION 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.

Skills or requirements:
- 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

EDUCATION 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.

Skills or requirements:

- 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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EDUCATION RESEARCH

Educational Mobile App / Citizen Science / Observational Expertise

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.

This semester we are looking for a mobile app developer and a designer to complete prototyping and test an innovative mobile-based visual field guide to support learning to recognize and ID insects through play, practice and guided classification. Mobile app developer candidates should have experience with game or mobile application development skills for Android, with iOS or cross-platform development experience a plus. Mobile app designer candidates should have solid graphic and interaction design skills and bring background experience in interface mockups, user testing, and refining mobile applications with complex content and navigation such as an interactive key, identification gaming elements and field guide functionality. 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 is

HCII Research/Independent Study: Fall 2020

a NSF Research Experience for Undergraduates (REU) fellowship is a part-time position (up to 18 hours/week) with the potential to continue into the Spring. Interested students should email a cover introduction and resume and/or description of experience and a portfolio link <martil@cmu.edu>.

GAME RESEARCH

Educational Games on Twitch (Research Assistants)

Jessica Hammer / OH!Lab
Contact: Noor Hammad (nhammad@andrew.cmu.edu)

Our team is developing systems to support new types of educational games on Twitch. As a first step, we will be studying existing educational experiences on Twitch, such as craft-alongs or code demo sessions. We will also be interviewing other stakeholders to understand their needs, such as teachers and game designers.

We are looking for people with the following skills:
- Research assistants. You should be highly organized with good communication skills. Familiarity with game streaming is a plus.
- This position is available as an independent study (9-12 hours per week).

GAME RESEARCH

All of Us (Research Assistants, Game Designers)

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. This fall, we will be working with our target communities to define our game design approach, and creating a pre-production package for development in the spring.

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 (either lived or research experience) is a bonus.

- One or more game designers. When you apply, please indicate what prototyping skills you can contribute in addition to design per se.

This position is available as an independent study (9-12 hours per week) or as a paid position (10 hours per week). Please indicate your preference when you apply.

Polyphonic (Producer, Research Assistants)

Jessica Hammer / OH!Lab
Contact: Adela Kapuscinska (akapusci@andrew.cmu.edu)

Polyphonic is a project that uses game streaming to crowdsource audio samples from viewers' homes. We will be deploying our game to the public, collecting data from both streamers and viewers, and analyzing the data we receive.

We are looking for people with the following skills:
- Producer. You should be ready to step into a leadership role on a large and high-profile project.
- Research assistants. You should be highly organized with good communication skills. Familiarity with game streaming is a plus.

This position is available as an independent study (9-12 hours per week).

GAME RESEARCH

Frolic (Game Designers)

Jessica Hammer / OH!Lab
Contact: Adela Kapuscinska (akapusci@andrew.cmu.edu)

Frolic is a mobile game for girls aged 7-12 that helps them with physically active play. The app currently includes 100 physical mini-games at a range of exertion levels, space required, number of players, and more. We would like to add an additional 100 games to the app - or even more, if we have more than one person interested in this role.

We are looking for someone with the following skills:
- Game designer. You should have experience playing, and ideally designing, analog games. No programming skills required.

These positions are available as an independent study (9-12 hours per week).

GAME RESEARCH

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 help with running co-design focus groups and a mini game jam, data organization and analysis, and research on existing counterspaces and playful resistance methods related to play and games. Game Designers would help with 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).

LEARNING SCIENCES

Research opportunity with the ClassInSight team.
Category: Learning Sciences, HCI.

The project focuses on helping instructors at the university level improve their practices by sharing with them data on their performance and nonverbal behaviors in the classroom. As part of the project, we are looking for students who can help and support the following tasks:
1. Help analyze qualitatively video interviews with instructors
2. Run user studies with instructors
3. Work on designing prototypes of dashboards

4. Use statistics and ML to analyze previously collected nonverbal behavior data.
Students should be HCI, design, CS/ML, etc. students interested in the above topics
Contact person: francesx@cs.cmu.edu

LEARNING & SOCIAL RESEARCH

PeerPresents (UX Designer, Research Assistant)

Jessica Hammer / OH!Lab
Contact: Adela Kapuscinska (akapusci@andrew.cmu.edu)

PeerPresents is a web-based system for real-time student peer feedback during class, for example on a presentation or demo. We are creating an instructor interface to our system. We have already completed preliminary research and design work, and are looking for someone to improve the interface and conduct usability tests with stakeholders. We are also deploying several test runs of our system this semester and would like someone to work with us on collecting and analyzing data.

We are looking for people with the following skills:
- UX designer. You should be able to work within an existing visual language for our system; if you have either user testing or prototyping experience, it's a plus.
- Research assistant. You'll be looking at system logs, so the ability to manipulate large data sets is a big plus. You'll also be coding and analyzing qualitative data.

These positions are available as an independent study (9-12 hours per week)..

PRIVACY AND SECURITY

Harvesting Android Network Traces at Scale
Research category: Privacy, smartphones, network traces
Contact: haojian@cs.cmu.edu

Ideal Qualifications: Interests in hacking Android devices and strong programming skills. Experiences with rooting Android devices is a big plus.

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. We have already collected network traces from 15k apps using an array of smartphones, and are interested in getting even more data.

HCII Research/Independent Study: Fall 2020

Tasks will include (1) rooting Android devices; (2) deploying a MITM VPN for network interception with Xposed and JustTrustMe; (3) building an automatic script to interact with app user interfaces. Through the project, you will have hands-on experience building a scalable mobile platform and a real-world understanding of the network flows. 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 AND SECURITY

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 are looking to hire 2 people to implement those pages. 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 AND SECURITY

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 AND SECURITY

Designing and Deploying ClearTerms Web Site
Research category: web, privacy and security
Contact: Jason Hong (jasonh@cs.cmu.edu)

Ideal Qualifications: Databases, web programming, UX design

ClearTerms is a project that uses basic AI algorithms to highlight important statements in Terms and Conditions policies (those policies on web sites that no one reads). We have built out the algorithmic side of things, and now want a web site to showcase our results, letting people see summaries of the most popular ecommerce web sites.

We are looking for students to help design and build out the web site. This includes crawling Terms and Conditions policies, applying the algorithm, visualizing the results, and designing a web site that makes it easy for journalists and the public to learn more about the web sites they use. 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.

SOCIAL COMPUTING

Connected Experience Lab

Project 1: Career Trajectories in Online Freelance Platforms

Area: Social Computing
Contact: Allie Blaising, 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 associated with this research effort:

1. **Interviews on Career Resilience and Unemployment:** The independent study student on this project will help design, recruit and conduct interviews with workers who have recently turned to online freelance platforms in response to pandemic-induced unemployment. Students will help process and analyze interview data to investigate themes related to newcomers' career trajectories (including career exploration and resilience during unemployment), developmental networks, self-presentation and information-seeking needs.
2. **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.

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

Project 2: Self-directed Career Development and Exploration on Video-Sharing Social Platforms

Area: Social Computing

Contact: Allie Blaising, 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 ablaisin@andrew.cmu.edu.

Project 3: Designing for account sharing in romantic relationships

Area: Interaction design, security and privacy, social computing

Contact: Junchao Lin, Laura Dabbish

Sharing digital accounts is common among social groups. Romantic couples have special account sharing behaviors. In previous research we have found romantic couples function as a team, using shared accounts to divide tasks, share information and optimize benefits for the couple as a unit. They struggle, however, with the single-user design of most digital accounts. In this project, we will use research through design methods to expand our understanding of couples' needs for account sharing and develop tools that support their everyday sharing.
We are looking for an independent study student to help prototype and build novel digital tools we will deploy to romantic couples to learn more about their account sharing behavior. These tools will be web-based or app-based. Students in CS or with user interface prototyping, programming, web programming or iOS development experience will be best suited for this project.
Expected Background: Experience or ability programming user interfaces or programming web interfaces. Willingness to learn UX design.

Contact info: Interested students should send their **resume, major GPA, and links to any relevant projects** to Professor Laura Dabbish dabbish@andrew.cmu.edu, and Junchao Lin junchaol@andrew.cmu.edu

Project 4: 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-interventions**: The independent study student on this project will work on designing and developing interaction techniques that incorporate cybersecurity training and information into people's everyday workflows. The student may also have an opportunity to conduct evaluations of these interventions.

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 dabbish@cmu.edu

Project 5: 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

Project 6: Diversity and Inclusion in Open Source Software Development

Area: Social computing

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 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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TECHNICAL RESEARCH

Educational Games on Twitch (Research Programmer)

Jessica Hammer / OH!Lab
Contact: Noor Hammad (nhammad@andrew.cmu.edu)

Our team is developing systems to support new types of educational games on Twitch. We will be integrating and improving several existing systems. You will have the opportunity to help re-architect these systems; this is an excellent opportunity for someone looking to improve their software engineering skills. We will also begin the re-development process this semester, with the option to continue into the spring.

We are looking for someone with the following skills:
- Programmer. Web development experience required. Software engineering experience is a plus.

This position is available as an independent study (9-12 hours per week).

TECHNICAL RESEARCH
Polyphonic (Research Programmers)
Jessica Hammer / OH!Lab
Contact: Adela Kapuscinska (akapusci@andrew.cmu.edu)

Polyphonic is a project that uses game streaming to crowdsource audio samples from viewers' homes. We will be deploying our game to the public, collecting data from both streamers and viewers, and analyzing the data we receive. Your role will be to maintain the game and make any necessary changes to keep it available to the public.

We are looking for people with the following skills:
- Web developer. You should be comfortable with both frontend and backend.
- Unity programmer. Experience deploying to mobile a plus.

These positions are available as paid positions (10 hours per week).

TECHNICAL RESEARCH

Counterspace Games for BIWOC (Javascript Programmers)

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. The Javascript Programmer(s) would help enable iterative remote playtesting, specifically by writing code to both record WebGL canvas gameplay in a browser in real time and save the recordings to this project's custom site's server. Please feel free to email Erica for further details.

We are looking for people with the following skills:
- One or more programmers familiar with Javascript, HTML and CSS. Experience with WebGL and Unity is a bonus. Prior experience with marginalized communities is a bonus, especially lived experience as a BIWOC.

These positions are available as an independent study (9-12 hours per week).