DATA VISUALIZATION

Designing data visualizations for Interpretable Machine Learning in Healthcare
Area: Data Visualization

Machine learning is being actively deployed in healthcare institutions. However, doctors and patients often have little understanding how these automated algorithms are making predictions. This summer, we'll be building novel visual interfaces to help explain what these algorithms are doing to the stakeholders. We'll be partnering with a local research hospital, working with real ML models on real patient data, and designing new interfaces to convey the inner workings of these models.

Skills:
Web programming skills
Data visualization interest
Healthcare interest
Machine learning interest

Contact Person: Adam Perer (adamperer@cmu.edu)

DATA VISUALIZATION

Interviews and User Studies with Domain Experts about Machine Learning Predictions
Area: Human-AI Interaction / Data Visualization

The study's objective is to better understand the practices and needs of domain experts when presented with a prediction from a machine learning model. The data collected will be used to gain deeper insight into their complex, dynamic process of analyzing predictions and their special needs in working with this data. We will conduct semi-structured interviews with domain experts.

Skills:
User study experience
Semi-Structured Interview experience
Machine learning interest

Contact Person: Adam Perer (adamperer@cmu.edu)

HCII Research/Independent Study
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DATA VISUALIZATION

Visualizing and exploring large networks of data
Area: Data Visualization

Visualizations of large networks often suffer from cluttered presentations with illegible node labels and overlapping edges, making it difficult to derive even basic insights. In our prior research, we proposed an alternative interaction model, 'search, show context, expand-on-demand' where users pick a particular data point as a focus for analysis, specify their interest, and the system recommends relevant context (http://perer.org/papers/adamPerer-DOIGraphs-InfoVis2009.pdf). We plan to implement a similar system using modern web technologies.

Skills:
Web programming skills
Data visualization experience

Contact Person: Adam Perer (adamperer@cmu.edu)

DESIGN RESEARCH

The Design of Robots in Retail Environments
Jodi Forlizzi, forlizzi@cs.cmu.edu
Carnegie Mellon University

Statement of work
Our goal is to research and develop appropriate interactions between humans and robots in retail environments. We will be working with a local robotics company and a major retailer to conduct field observation, semi-structured field study, and prototyping of relevant human-robot interactions.

Proposed work
We will undertake the following phases: 1) observations of the robot at work in a retail environment, and 2) design and evaluation of potential interaction designs in the lab and in a retail environment.

Example cases may include:
- Drawing attention to a distressed robot in need of intervention.
- Developing interfaces for customers and employees in varying roles
- Safety and human factors issues
- Data acquisition and data processing

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Contact
Jodi Forlizzi, forlizzi@cs.cmu.edu

DESIGN RESEARCH

Wanted: Research Assistants to design conversational computing
Project: Conversational Computing

Our project explores a new kind of internet, one based on conversational access to information in contrast to today's visual browsing orientation. This type of computing would be very useful for people who have a visual impairment. It would also benefit other users who are in situations where using their hands and eyes can prove challenging (e.g., driving a car, cooking, walking).

As a first step towards understanding this new style of interaction we are looking for a small team of student research assistants that can help us design conversational interaction for the following application areas:

- Transactional: accessing transit data for opportunistic travel and mobile order of food for places that support mobile order (e.g. Starbucks, chipotle)
- Messaging: access to messaging data from services such as Discord or other group messaging service
- Social media: access to social media posts from services such as twitter, facebook, or snapchat

We are looking for students with experience (or at least interest) in any of the following:

- User of transactional apps including transit apps and mobile ordering app
- User of messaging services such as Discord or Slack
- User of social media. We are most interested in content consumption, not content creation
- User experience design
- Conversational interface design

We need students who can commit 9 to 12 hours per week to this project over the spring semester. Work can be done for independent study credit (9 or 12 units).

If you are interested, please send the following to Oscar J Romero Lopez <oromero@cmu.edu>:

- short description of your experience and interest

DESIGN RESEARCH

Category: Design Based Learning Research, IoT Smart Documentation, Maker Learning

Multiple positions are open for undergraduate research assistants on an NSF-funded project *Smart Spaces for Making: Networked Physical Tools to Support Process Documentation and Learning.* This NSF Research Experience for Undergraduates (REU) fellowship is for a part time position (up to 15 hours/week).
Candidates are sought for three roles:
· **Design Research (skills: observation + ethnography, co-design, interview, sketching, data collection and management, qualitative research analysis)**
· Technical Prototype Development (skills: hardware prototyping, fabrication, server-side programming)
· Physical Computing Lab Assistant (skills: hardware and electronics, inventory management, database management)

Project Details:
The Learning Media Design Center is looking for undergraduate research assistants to help design and develop smart documentation tools to support learning practices in creative, maker-based studio environments. They will work with an interdisciplinary team of design researchers, technology developers and learning scientists from CMU's HCII, School of Architecture and Integrated Innovation Institute (III), the University of Pittsburgh's Learning Research and Development Center (LRDC) and the Children's Museum. Students will participate in design research and technology development activities working with project site partners including Quaker Valley High School, CMU's IDeATe program, and AlphaLab Gear's *Startable* youth program at the Community College of Allegheny County.

Students should have a genuine interest in inclusive education and the design of learning technologies.

The prospective candidate will work with project team members on:
· *Design Research:* synthesize generative design research, analyzing qualitative research, facilitate visioning activities to inform iterative prototyping. We are seeking strong skills in communication and interaction design, experience with qualitative research methods, and in developing excellent user experiences, and skills with synthesizing and modeling research findings and insights to understand the problem space and collaboratively refine solutions with the project team and users.
· *Technical Prototyping:* prepare working prototypes of smart IoT prototypes for deployment to three educational co-design partners. We are seeking strong skills in hardware and software (Arduino, Raspi) development towards an integrated platform for context-aware documentation tools. Ideal candidates should have also exposure to human-centered design methods and

experience in collaboratively developing, testing and refining solutions within an interdisciplinary team.

· *Physical Computing Lab Assistant:* work closely with a physical computing lab faculty to study, understand and deploy a tool that integrates NFC tags with inventory management and other tools to create in-situ, open, community documentation practices to improve student learning on campus. Ideal candidates should have also exposure to electronics and hardware laboratories and experience in collaboratively developing, testing and refining solutions within an interdisciplinary team.

The Human-Computer Interaction Institute (HCII) faculty mentor and Principal Investigator, Marti Louw, Director of the Learning Media Design Center, will serve as project lead and advisor with co-principal investigator, Daragh Byrne, School of Architecture.

To apply:
Upload your Resume and a link to your portfolio to the following Box Folder: **http://bit.ly/2zKGsZk** .
Note: Undergraduate students supported with NSF funds must be citizens or permanent residents of the United States or its possession.

EDUCATION RESEARCH

Implementation of Adaptive Learning Technologies
Lauren Herckis / Culture Lab
lrhercki@cmu.edu

Adaptive learning technologies promise to revolutionize the educational experiences of students through personalized learning experiences and timely, tailored feedback. The barriers to successful implementation of these technologies at scale are often technical and cultural in nature. During the spring semester, three studies will identify the barriers and affordances to successfully scaling the use of adaptive learning technologies at colleges and Universities.

We are seeking multiple student research assistants to help collect, organize, and analyze data. Responsibilities may include conducting face-to-face and telephone interviews, facilitating focus groups, conducting classroom observations, developing qualitative codebooks and applying them to audio recordings and written transcripts, assisting in thematic and content analyses of coded data, compiling data for reports, and collaborating to produce reports and publications. This work will entail qualitative research techniques and requires excellent organizational, analytical, problem-solving, and oral/written communication skills.

This opportunity can be filled as a half- (mini) or full-semester independent study or a paid position.

If you are interested in this position, please fill out this form.

EDUCATION RESEARCH

Deploying Educational Technology with Fidelity
Lauren Herckis / Culture Lab
lrhercki@cmu.edu

The *Decimal Point* educational game is based on an amusement park metaphor and is targeted at middle school math students. In prior studies, students who played the game performed demonstrably better on tests, and had significantly better feelings about, their experience as compared to students who used a more conventional technology to learn decimals. Ongoing research explores how we can help teachers use educational games effectively. We are looking for a strong researcher/writer to create a teachers' guide summarizing what we have learned during our research. You will also be listening to recorded interviews with participating teachers to understand what we have learned about implementation with fidelity, and making these insights actionable for teachers.

This opportunity can be filled as a half- (mini) or full-semester independent study.

If you are interested in this position, please fill out this <u>form</u>.

GAME RESEARCH

Frolic (Research Assistant, Designer, and/or Programmer)
Jessica Hammer / OH!Lab
Contact: Adela Kapuscinska (akapusci@alumni.cmu.edu)

Frolic is a game to motivate physical activity for girls aged 7-12, and to intervene with their parents to help them support their girls being physically active. We have created an early prototype of the game and are looking to expand it.

We have three roles available, as follows:
1) Research assistant. You should have great writing and communication skills. Help us write grants and run playtests!
2) Designer. You will be designing and writing short physically playful games, to be inserted into a mobile app. Video production skills are a bonus.
3) Programmer. We are looking for someone who can turn our front-end design (currently in Figma) into a working mobile application. In particular, you should feel comfortable designing and interacting with local databases in Unity. Web dev experience not needed.

This opportunity can definitely be filled as an independent study; we will know by January whether there is also the option of a paid position. Multiple positions are available for each of the three options.

Please email Adela if you are interested in this position.

GAME RESEARCH

Player-Programmed Partner Games (Research Assistant and/or Designer)
Erik Harpstead, Jessica Hammer / OH!Lab
Contact: Erik Harpstead (harpstead@cmu.edu)

One or more research assistants / designers needed to help with initial design and prototyping of a transformational game to teach coding and computational thinking skills based around a co-robotic (robots that work with humans to accomplish tasks that neither could do alone) game design concept for learners in low-resource environments. This is the initial phase of what will ultimately be a multi-year project.

Students interested in this position must have some prior experience in early stage concept design for interactive technologies. Prior experience designing games or with CS education would be desirable but is not a strict requirement.

This opportunity can only be filled as an independent study. Multiple positions are available. Please email Erik if you are interested in this position.

GAME RESEARCH

Interactive Learning Principles (Research Assistant and/or Designer)
Erik Harpstead / OH!Lab / LearnLab
Contact: Erik Harpstead (harpstead@cmu.edu)

One or more research assistants / designers needed to extend a project making learning science principles more interactive and usable by educational game designers. The project to date has created a portal presenting an existing list of 30 learning science principles as an ideation deck (www.edugames.design/principles). The goal of this semester will be to iterate on the content of the site and extend it with a series of small interactive experiences / games that illustrate each principle in action. We are

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We are looking for someone with some prior experience in interactive design and prototyping. Previous experience working with React would be preferable. Prior experience (taking classes, doing projects, etc.) with learning science principles is not required but may be helpful.

This opportunity can only be filled as an independent study. Multiple positions are available. Please email Erik if you are interested in this position.

GAME RESEARCH

Help-Seeking/Giving Game (Research Assistant and/or Developer)
Erica Cruz / OH!Lab
Contact: ecruz@cs.cmu.edu

One or more research assistants/game developers needed to help with creating a game-based intervention intended to encourage help-seeking behaviors in undergraduate women of color in STEM. The goal for this semester is to develop and iteratively test game prototypes, so that we can evaluate them in a formal study over the summer or in the fall.

Experience with developing in Unity3D and coding in C# or similar languages is ideal.

This opportunity can be filled as an independent study.

Please email Erica if you are interested in the position(s).

GAME RESEARCH

Information Bandwidth for Game-Aware Streaming (Research Assistant)
Erik Harpstead, Jessica Hammer / OH!Lab
Contact: Erik Harpstead (harpstead@cmu.edu)

One or more research assistants needed to continue a research project looking to understand the design needs of Game-Aware streaming interfaces. Game-Aware streaming interfaces are systems that augment the conventional video stream of services like Twitch or Mixer with additional meta-data from the game that could allow views to customize the stream or inspect information not currently shown on screen. While prior projects have looked at building technical prototypes of such systems, this semester will focus on trying to better understand the information bandwidth problem of game streaming.

The project will primarily focus on qualitative coding techniques on snippets of game stream videos. Prior experience with qualitative coding would be a plus but not a hard requirement. Having some experience designing or playing a diverse set of games may be helpful.

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This opportunity can only be filled as an independent study. Multiple positions are available (we are looking for a team of 2-3).

Please email Erik if you are interested in this position.

GAME RESEARCH

Aphasia Games for Health (Instructional Designer)
Jessica Hammer & Hakan Seyalioglu / OH!Lab, Pitt, Thorny Games & ARC
Contact: Hakan Seyalioglu (hakan@thornygames.com)

We are creating games to help people with [aphasia](#) practice the communication skills needed for rehab, and to retain their social connections with family and friends while living with communication impairment. As a first step, we are looking at how to make game rules accessible to this population. You will be taking existing games, creating new versions of the rules, testing them with the target audience (people with aphasia), and producing a guide to teaching this audience new games. Your work will be used over the summer in design workshops and in the fall in a game jam.

You should be an excellent communicator; instructional design skills and/or video production skills are a bonus.

This position is an independent study, but could lead to a paid position over the summer if we mutually agree.

Please email Hakan if you are interested in this position.

GAME RESEARCH

War Birds (Instructional Designer)
Jessica Hammer & Moyra Turkington / OH!Lab & Unruly Designs
Contact: Moyra Turkington (moyra.turkington@gmail.com)

Lumberjills is a historical live action roleplaying game where participants play British women who served in the Women's Timber Corps during WWII. The game aims to explore the personal impact of lumber service on women's lives - finding friendship and newfound capacity in their bodies through hard physical labour, and newfound desirability and life options through romance at the lumber camp dances on the weekends. Students will focus on the visual and instructional design of the text and other game components, as well as conduct playtests.

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For this position, you must be a strong and confident writer. Experience with instructional design or role-playing games is a plus.

This opportunity can only be filled as an independent study. You will need to be available for a one-hour remote meeting outside of typical 9-5 hours once per week; in February, you will have the opportunity for an expenses-paid weekend trip to a game convention to observe gameplay.

Please email Moyra if you are interested in this position.

LEARNING & SOCIAL RESEARCH

CARE (Coping After Racist Experiences) Project (Research Assistant)
Jessica Hammer / OH!Lab
Contact: Alexandra To (aato@cs.cmu.edu)

The CARE project examines how uncertainty impacts the emotional experience of racism. This semester we will be running a short online study about short stories about racist microaggressions as well as facilitating design workshops with small groups.

We are looking for research assistants who can flexibly work on this project. The primary need is for assistance in running an online study which will include writing copy, collecting and organizing data, and discussion of themes. RA's on the project may also have an opportunity to work with surveys and may be involved in an academic paper-writing process.

There are no specific requirements for this position - more important is enthusiasm to develop new skills.

This opportunity must be filled as an independent study with at least 6 units.

Please email Alexandra with a copy of your resume / CV as well as the number of units you would be interested in.

LEARNING & SOCIAL RESEARCH

CARE (Coping After Racist Experiences) Project (Workshop Facilitator)
Jessica Hammer / OH!Lab
Contact: Alexandra To (aato@cs.cmu.edu)

The CARE project examines how uncertainty impacts the emotional experience of racism. This semester we will be running a short online study about short stories about racist microaggressions as well as facilitating design workshops with small groups.

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We are looking for assistance in facilitating co-design workshops. Responsibilities will include recruitment and scheduling, producing and organizing materials for the sessions, and assisting with data collection including interacting with participants and facilitating conversation and design activities.

There are no specific requirements for this position - more important is enthusiasm to develop new skills. Specifically, facilitators should be prepared to discuss issues of race, identity, and racism both with the research team and with potential workshop attendees.

This opportunity may be paid or may be filled as an independent study.

Please email Alexandra with a copy of your resume / CV as well as your preference for pay or independent study (including preferred number of units if applicable) to express interest.

OTHER POSITIONS

Grant and Publicity Manager
Jessica Hammer / OH!Lab
Contact: Jessica Hammer (hammerj@andrew.cmu.edu)
The OH!Lab needs help producing reports and materials related to our successful projects; updating our website; creating presentations for funders; and preparing grants. You will be working directly with Jessica on a range of projects, including many of the ones listed above.

You should have excellent written and verbal communication skills. Visual design skills, a great web portfolio, or video production skills are a big plus.

This is a paid position, available to ETC students only.
Please email Jessica if you are interested.

Playtest Coordinator
Jessica Hammer / OH!Lab & the ETC
Contact: Mike Christel (christel@cmu.edu)

We are looking for someone to coordinate Playtest Night (weekly on main campus) and Playtest Day (once per semester, at the ETC). You will run our website, advertise events on social media, and attend playtesting events.

You should have excellent written and verbal communication skills.

This is a paid position, available to ETC students only.
Please email Mike if you are interested.

PRIVACY AND SECURITY

Inspecting Privacy Behaviors of Android Apps
Category: Privacy and Security, Smartphones
Contact: Jason Hong (jasonh@cs.cmu.edu)

The goal of the Brandeis project is to make it vastly easier
for developers and end-users to manage privacy in the context
of sensor-based smartphone apps. We are looking for students
to help analyze what permissions an app is requesting and
compare that against what data the app actually needs. For
example, weather apps only need what city you are in, but
many still request exact GPS data. Our goal here is to document
a large number of these mismatches, demonstrate that our new
programming model (PrivacyStreams) can address this problem,
and then share this data with folks at Google to help convince
them to adopt our ideas. Expecting students to do 5-10 hours a week
on this research, for pay or independent study. Send resume, GPA in
primary major(s), and links to any relevant projects.

Ideal Skills: Experience with privacy, security, Java, Android,
and any form of static or dynamic analysis is a plus.

PRIVACY AND SECURITY

Static Analysis of Privacy-Related Behaviors of Android Apps
Category: Privacy and Security, Smartphones
Contact: Jason Hong (jasonh@cs.cmu.edu)

The goal of the Brandeis project is to make it vastly easier
for developers and end-users to manage privacy in the context
of sensor-based smartphone apps. We are looking for students
to develop some software to statically analyze app behaviors
to better understand privacy issues with apps. Our starting
point is to examine what third-party libraries an app uses, as
one step in generating a privacy policy that describes what data
the app uses and why. Later steps will include decompiling apps
and examining the text strings. 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.

Ideal Skills: Experience with privacy and security, a lot
of experience with Android development and/or static analysis

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PRIVACY AND SECURITY

IoT Hub for Privacy and Security
Category: Privacy and Security, IoT
Contact: Jason Hong (jasonh@cs.cmu.edu)

The Internet of Things is coming. How can we protect everyday people
from all of the likely privacy and security risks? We're investigating
how centralized hubs can help offer new kinds of services that can
help with privacy, security, and management of lots of devices.
Examples include checking for software updates for devices, easy ways
of blocking unexpected network traffic, and simple kinds of end-user
programming to connect devices together. We're looking for UX designers
as well as software developers. Expecting students to average about 10
hours a week on this research (more is fine), for pay or independent
study. Send resume, GPA in primary major(s), and links to any relevant
projects.

Ideal Skills: Some subset of Android programming, Linux, web
programming, databases, UX design, networking

PRIVACY AND SECURITY

PrivacyIO: Discovering Privacy Concerns using the Crowd
Research category: Privacy, crowdsourcing, usability engineering
Contact: Haojian Jin (haojian@cs.cmu.edu)

Today, it is easy for companies to collect a great deal of data
about people, but hard to understand what are appropriate uses
of that data. The current state of the art is for experts to
review data practices. We are developing a technique to harness
the power of crowds to help assess the range and the magnitude
of privacy concerns people have about a given data practice.
We are looking for two research assistants to help us validate our
technique. Tasks will include a) generating storyboards using a system
we have developed; b) scheduling study participants and running user

studies. You will learn the state of arts privacy measuring technique from a UX perspective. 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. Send resume, GPA in primary major(s), and links to any relevant projects.

Ideal Qualifications: Genuine interest in HCI or privacy research, attention to detail, strong organizational skills, reliable, self-motivated, experience with conducting lab studies. Knowledge about usability techniques (e.g., storyboarding, heuristic evaluation) is a big plus.

PRIVACY AND SECURITY

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

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 an online platform to help the general public discuss, deliberate and debate issues around AI and fairness.

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 an online platform 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.

PRIVACY AND SECURITY

Bias Bounty for Identifying Bias in Machine Learning
Research category: AI, crowdsourcing, bias
Contact: Hong Shen (hongs@andrew.cmu.edu) and Alex Cabrera (cabrera@cmu.edu)
Ideal Qualifications: Databases, web programming, basics of AI and ML,

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visualization

In cybersecurity, bug bounties are used to reward hackers for finding vulnerabilities in software. We want to adapt this idea to build a novel online game-like system to enable and to incentivize crowd workers to uncover potential blind spots and biases in machine learning models. Developers might upload a ML model to our server, and we organize crowd workers to help identify potential problems. These crowd workers might include testers, who find instances of failures, as well as hypothesizers, who look at the overall results and come up with conjectures as to where the ML model is failing.

We are looking for students to help build out the initial infrastructure as well as initial test cases using face recognition. 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 algorithm 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.

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PRIVACY AND SECURITY

Analyzing Online Forums to Understand How Developers Protect Privacy
Categories: Privacy and Security, Qualitative/Quantitative Studies
Contact: Tianshi Li (tianshil@andrew.cmu.edu)

We are looking for one research assistant to help us gather and
analyze online discussion forums (e.g. Stack Overflow, subreddits
like r/AndroidDev) to understand app developer motivations, actual
practices, and gaps in knowledge and tool support with respect to privacy.

In this project, you may help with collecting online discussion data,
building machine learning models to identify privacy/security-related
discussion, and conducting qualitative/quantitative analysis on the data.

Ideal qualifications: Genuine interest in privacy and HCI research,
strong programming skills, prior experience in qualitative/quantitative
studies, prior experience in machine learning, independent and strong
problem-solving skills, reliable, self-motivated, quick learner

Contact: Send resume, major GPA, and a short summary of your interests and
qualifications to Tianshi Li (tianshil@andrew.cmu.edu)

PRIVACY AND SECURITY

Social Cybersecurity - help with online research study and in building an authentication
system
Contact: Cori Faklaris (cfaklari@andrew.cmu.edu) and Isadora Krsek
(ikrsek@andrew.cmu.edu).
Category(ies): Privacy and Security, Programming User Interfaces, User Studies

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. Helping to conduct an online research study: The independent study student on this
   project will assist in the online deployment of a web interface that helps people make

informed decisions about their privacy choices on Facebook. The student may also help with analysis of the collected data from this interface and with video interviews of its users, and help to draft a resulting research paper. Some familiarity with web programming (front-end or back-end) is a plus. Interested students should send their resume, major GPA, and links to any relevant projects to ikrsek@andrew.cmu.edu.

2. Building a social authentication system: The independent study student on this project will build out a system for authenticating workgroup users based on chats or posts such as in a Slack channel. We are looking for students who have experience in (or a willingness to learn) programming interfaces that use natural language processing and/or fuzzy logic for evaluating inputs. Prior experience with building applications for the Slack API or similar is a plus, as is project or course experience with usability for cybersecurity. Interested students should send their resume, major GPA, and links to any relevant projects to cfaklari@andrew.cmu.edu.

RESEARCH

Title: Come join us on building the world's first analogy search engine for science

Have you tried searching for papers online, perhaps for writing a report or reviewing the relevant literature? For many scientists and engineers alike, keeping on with the most recent innovations is one of the fundamental tasks. Yet, it is challenging to find relevant
and inspirational examples because just a step outside the boundaries of disciplines, the concepts, terminologies, and the ways of presenting and communicating research contribution differ vastly. You may have had a similar experience while searching for concepts iin different domains, only to find out later that the same concept is called by a different name in them. We think there is a real challenge and opportunity to innovate how today's scientists and engineers search for inspiration in scientific domains online.
Our secret sauce is creatively combining lots of scientific text available on the Web, training a machine learning model for predicting useful analogical relations between papers, and building and deploying a real-time search engine to the Web. We are looking for undergraduate researchers who are interested in:

 [Technical] Developing and extending on our prototype analogy search engine (if you are technically inclined and if any of the following keywords sounds familiar to you, great! Interactive front-end interface: Node.js, Express.js / Data visualization: D3.js,
 DC.js, Crossfilter.js / back-end: Flask, Google Cloud, Apache Beam / Machine-learning and Natural Language Processing: Tensorflow, PyTorch, BiLSTM, Embedding, spaCy)

 [Design] Identifying and developing user interaction scenarios and designing features and interaction flows to support them. Creating visual assets and sketches. Storyboarding, visual storytelling, and producing mock-ups and new prototype ideas.

 [Research] Supporting research efforts using the prototype search engine. Helping run user studies, recruit participants, record observations, and synthesize findings to prepare paper submissions.

These are not mutually exclusive categories. We have data, a working prototype, and machine learning models that support it so you are not asked to start from scratch in this endeavor. If you are interested, please send an email to Hyeonsu Kang (hyeonsuk@andrew.cmu.edu). Thanks!

RESEARCH

Wanted: Research Assistant for Knowledge Acceleration for Programming Project
Brad A. Myers & Niki Kittur
Contact: Michael Xieyang Liu xieyangl@cs.cmu.edu

Programmers spend a significant proportion of their time searching for and making sense of complex information in order to accomplish their goals, whether choosing different APIs, adapting code snippets found on the Internet to meet their needs or trying to learn unfamiliar code to fix an error or add a new feature. When performing tasks like these, programmers continually are making hypotheses, proposing questions, and discovering answers. However, after each sensemaking episode in which a programmer gains knowledge for themselves, their work is essentially lost, with no one else benefiting. Although there are many tools to help programmers find the answers, there are very few tools to help programmers make use of the knowledge gained performing the task, or share that knowledge with others.

Professors Brad Myers and Niki Kittur, along with Ph.D. student Michael Xieyang Liu in the HCII have a research project on designing, building, and evaluating systems in the form of browser extensions or IDE/text editor plugins that make programmers more effective and efficient. We have done many pilot studies with programmers about their experiences and needs, and we would like to invite students who have strong UX research skills to join us in designing and evaluating new tools and systems that address their needs in the spring.

This project can be done for pay or for independent study credit. We envision this taking about 8 to 12 hours per week during the Spring semester and full-time during summer is also an option. Students are also particularly encouraged to talk with us if they have their own ideas around making programmers more effective and efficient.

Requirements: UX research design and research.

Preferred requirements: Having a technical background, Data analysis skills.

Please send to Michael Xieyang Liu xieyangl@cs.cmu.edu: 1) your grade or level and degree program (e.g., Masters of HCI or Junior CSD with BHCI second major), (2) if you are an undergraduate, then whether you are a US citizen, (3) your resume/CV, (4) a list of your grades in any CS and HCI classes, (5) a description of your related experience and why would you like to work on this project, (6) whether you want to work for money or credit, and (7) how many hours per week you want to work.

RESEARCH

Wanted: Research Assistants to make it easier to Design AI
Project: UX Design for AI

Our project is working to make it easier for UX designers to envision and prototype products and services that leverage the capabilities of AI. Part of this is helping design teams recognize

"low-hanging fruit," the obvious and low-risk uses of AI that professional design teams seem to miss. For example, the Starbucks app never learns who pays for their coffee with the mobile app and never automatically lands these users on the pay tab when they access the app while inside a Starbucks. Additionally, the Instagram app does not use predictive text so influencers must repeatedly type the same tags for every post they make.

This spring we are looking for student research assistants (RAs) that can help with two different activities:

- Design Tools: We have developed two different taxonomies that describe AI. One focuses on the capabilities of AI, what it can do. The other focuses on design patterns that are used when the output of AI systems gets presented to users. We need help from RAs to design new forms that make the AI capabilities and design patterns accessible to professional UX designers.
- Design Workshops: We are working with two different companies to help train their UX design teams in recognizing opportunities where adaptive interfaces can automate the work people do. These are situations where a worker repeatedly performs the same task in the same way. An adaptive interface will learn the pattern a user follows in order to complete a task. It then begins to automate the work they typically do, reducing the effort needed to navigate and select items. We will work with these companies through workshops where their employees practice recognizing opportunities and generating adaptive interaction designs.

We are looking for students that have training and experience with any or all of the following:

- Visual communication design
- Information design
- Design teaching
- Design facilitation
- Interaction design
- Wireframing transactional flows
- Adaptive interface design

We need students who can commit 9 to 12 hours per week to this project over the spring semester. Work can be done for **independent study credit (9 or 12 units).**

If you are interested, please send the following to Changhoon Oh <ochangho@andrew.cmu.edu>

- short description of your experience and interest with adaptive interfaces, design facilitation, and information design
- resume
- list of times you are available for a weekly team meeting during the spring semester

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RESEARCH

Wanted: Research Assistants to improve laser cutters
Project: Transforming Digital Fabrication Tools into Intelligent Shop Assistants

Our project wants to turn digital fabrication tools (e.g., laser cutters, CNC routers, 3D printers) into intelligent shop assistants. This includes giving them the ability to do things like sense the materials they are working on, develop an understanding of their ability to function at different quality levels, negotiate the tradeoffs between quality and time, and sensing when something may have gone wrong, such as when they have caught themselves on fire.

This spring we want to develop a computational understand of laser cutter quality as a first step towards making tools that can reason about quality and can self-calibrate as the laser loses power and as the lens becomes clouded. We are looking for students that have experience using laser cutters who can help build a computational understanding of quality:

- **Search the web f**or experts who share insights on how to improve the quality of a laser cutter's cutting or engraving, for how to make high quality snap fits and friction fits, and how to reduce or eliminate scorching.
- **Cut and Etch** a variety of different materials on a large number of laser cutters to explore which techniques produce high quality and to learn the tradeoffs between quality and time. This includes things like making many passes on a cut with lower power and with refocusing of the lens; spraying down material with water to reduce scorching, tweaking how air flows to reduce the streaking of smoke across a piece of material.
- **Design a test cut pattern/plan** that allows a laser cutter to run a test and self-calibrate based on how it performs on the test cut.
- **Coordinate with other RAs and members of the research team** to design how the human expertise can best be encoded in a way that is accessible to the laser cutter.

We are looking for students with experience (or at least interest) in any of the following:

- Laser cutting and etching
- Digital fabrication
- Industrial design and the design of things to be assembled
- Craft

We need students who can commit 9 to 12 hours per week to this project over the spring semester. Work can be done for **independent study credit (9 or 12 units).**

If you are interested, please send the following to Nur Yildirim <yildirim@cmu.edu>

- short description of your experience and interest with digital fabrication and with working on a laser cutter
- resume
- list of times you are available for a weekly team meeting during the spring semester

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RESEARCH

Research Category: Haptic Devices

My group uses a variety of devices to create haptic effects. These include tablet-type displays where the friction can be changed depending on the user's touch position and vibration-producing platforms and ticklers. Our research centers on what people perceive with such devices. Students in the group code the device (usually in Python or a higher-level language) and conduct experiments that measure perception. This work has led to several papers with the students as co-authors. My preference is for students to join the research for more than a single semester, as there is a learning period.

Contact: Prof. Roberta Klatzky
klatzky@cmu.edu

RESEARCH

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HCII Research/Independent Study
Spring 2020

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- resume
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SOCIAL COMPUTING

Research Category: Human-Centered AI, Social Computing

An outstanding issue with machine learning-based decision-making algorithms is the inherent trade-offs between different system criteria. There is an emerging body of literature demonstrating trade-offs between fairness and accuracy, and between different fairness notions. By improving fairness, overall accuracy might decrease. Furthermore, different fairness notions are not compatible with each other: well-established results show that common statistical fairness notions are often mutually exclusive. An accurate understanding of such trade-offs is critical for stakeholders and practitioners to appropriately use these machine learning methods. The focus of this project is to take an interdisciplinary approach to study, explain, and address the inherent trade-offs between different system criteria in machine learning-based decision-making. We want to develop methods to capture trade-offs between different system criteria in machine learning algorithms. We will also develop visualizations and interactive interfaces to explain the trade-offs between the models to the stakeholders. Finally, we want to explore social and technical innovations that let stakeholders navigate and negotiate the fundamental trade-offs between different system criteria.

Student requirements:
We will prefer students who have taken any Machine Learning class and HCI class (e.g., UCRE or DHCS)

Contact person:
Haiyi Zhu, haiyiz@cs.cmu.edu

SOCIAL COMPUTING

Social network experiment on the development of collective resilience in emergencies
Hirokazu Shirado, shirado@cmu.edu
Carnegie Mellon University

Statement of work
Our goal is to develop and explore effective network interventions to make social networks resilient to collective dangers over time. We will be performing experiments with thousands of people placed into a game simulating an unpredictable situation related to a natural disaster.

Proposed work
We will undertake the following phases: 1) design and implementation of an economic game online, 2) running virtual-lab experiments with Amazon Mechanical Turk workers, and 3) quantitative analysis of behavioral data.

Example cases may include:
- Programming a Web-based social experiment
- Running experiments with real human subjects (payment and mail handling)
- Analyzing human behaviors in networks (Python and R)

Contact
Hirokazu Shirado, shirado@cmu.edu. Students will be selected in early January.

SOCIAL COMPUTING

Diversity and Inclusion in Open Source Software Development

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.

HCII Research/Independent Study
Spring 2020

Any of the following skills helpful: experience conducting interviews, experience with data science pipelines (eg, using python, SQL or R)

Contact person: Laura Dabbish, dabbish@andrew.cmu.edu

SOCIAL COMPUTING

Category: Social Computing, User Research, Privacy and Security
Title: Cybersecurity in Romantic Relationships

Contact: Laura Dabbish (dabbish@andrew.cmu.edu) and Junchao Lin (junchaoli@andrew.cmu.edu)

Description:
People commonly share their password and login information with their romantic partners. In a survey study we began identifying why romantic partners share accounts (convenience, household maintenance, trust, and relationship maintenance). We also identified some design principles for account sharing in romantic relationships. Our current project will use qualitative and participatory design methods to understand the account sharing behaviors and distill insights to inform novel designs for account sharing in romantic relationships. There are two independent study opportunities associated with this research effort:

1) Helping to conduct a remote diary study: The independent study student on this project will assist in conducting a remote diary study of account sharing behaviors in romantic relationships. The student may also help conduct video interviews with study participants, analyze collected data, and help draft a resulting research paper. Interested students should send their resume, major GPA, and links to any relevant projects to dabbish@cmu.edu

Student requirements: Students on this project should have an understanding of and experience with basic user research methods and strong organizational skills.

2) Designing for account sharing in romantic relationships: The independent study student on this project will create prototypes to test novel designs for account sharing in romantic relationships. We are looking for students who have experience in (or a willingness to learn) UX design, participatory design or programming user interfaces. Prior experience with APP development is a plus. Interested students should send their resume, major GPA, and links to any relevant projects to dabbish@cmu.edu

Student requirements: Experience or willingness to learn UX design & participatory design. Experience or ability programming user interfaces or programming web interfaces.

TECHNICAL RESEARCH

Audio GWAP (Programmer and/or Research Assistant)
Jessica Hammer / OH!Lab
Contact: Jessica Hammer (hammerj@andrew.cmu.edu)

We have created a hybrid mobile-desktop experience for Twitch communities to provide crowdsourced audio data from their environments. This semester, we will be deploying our system live to Twitch and collecting real data from Twitch viewers. We need help on both the technical and the human end to make this happen.

We are looking for the following positions:
1) Research programmer. Help us stabilize our system and implement a few last features. An interest in UI/UX is a plus.
2) Research assistant. Work with streamers to run our game in their streams, and look at the data we get back.

Multiple positions are available for each of the options, available as either independent study or paid. Preference will be given to students who have already worked on the project, but we expect to have room for new students as well. All students will have the chance to contribute to writing a research paper if desired.

Please email Jessica if you are interested in the position and in what role.

TECHNICAL RESEARCH

XAI GWAP (Programmer, Data Analyst, and/or Research Assistant)
Jessica Hammer + Adam Perer / OH!Lab + DIG Lab
Contact: Adam Perer (adamperer@cmu.edu)

We have created a GWAP (Game With A Purpose) to collect data on how image recognition can be made more explainable. This semester, we will be deploying our game, collecting data at scale, and writing a research paper.

We are looking for the following positions:
1) Research programmer. Help us add new features to our game, as well as make our logging system more robust!
2) Data analyst. We are looking for someone with strong data analysis skills to help us make sense of large volumes of game logs.
3) Research assistant. You will be working on compiling relevant literature and helping with a qualitative evaluation of our game.

HCII Research/Independent Study
Spring 2020

This position is available as an independent study. All students will have the chance to contribute to writing a research paper if desired.

Please email Adam if you are interested in the position and in what role.