APPLICATION DEVELOPMENT, SENSEMAKING, USER RESEARCH

Categories: Application Development, Sensemaking, User Research
Title: Fuse — Helping Users Make Sense of the Web
Contact: Nathan Hahn (nhahn@cs.cmu.edu)
Faculty: Niki Kittur (nkittur@cs.cmu.edu)

We are working to reimagine how individuals use browsers to find and manage complex information online. The web has become an information paradise — we can discover where to eat, what new laptop we should buy, and even where we should go on our next vacation. Not only are we doing this more and more, but there are a growing number of opinions and resources with answers to our questions. Should we be using tabs to organize all of this information? How can we save and organize what we find? What if we want to share our findings with someone else? We’ve been developing an application for the past couple of years that crystalizes some of our research into an end-user product: Fuse (https://getfuse.io).

We are looking for students who are interested in working with Fuse by expanding or improving on what it current does. Possible independent study or for pay RA position projects would include:

• Redesigning and improving the current user interface to provide an easier to navigate and more cohesive user experience
• Building out additional views and capabilities for users to capture, structure, reorganize and synthesize their collected data.
• Developing an iOS companion application to the current Chrome extension React application
• Adding collaborative features to allow for a better browsing experience among friends / colleagues
• Work our current prototypes to perform user testing, including: think alouds, diary studies, questionnaires, and A/B tests

We are looking for a wide range of individuals, including those with experience and a desire to expand their: Design, UI or UX skills, Font-end development (React, Firebase, iOS) abilities, and programming capabilities (Objective-C, Node.js). Anyone interested can send an email to Nathan Hahn (nhahn@cs.cmu.edu), and include a brief description of why they are interested in the project, along with their resume and GPA if available.

COMPUTATIONAL FABRICATION

Research Category: Computational Fabrication
One paragraph project description: We're exploring how the combination of light and printed structures (2D and 3D) can create interactive experiences and hidden content on physical and digital displays. In this project, you'll take a hands-on approach to fabricating some of these experiences via Moiré Patterns, and you'll help work towards building a tool for others to do it too!

Student requirements: Curiosity with a willingness to experiment. Familiarity with Adobe Illustrator or 3D modeling tools (e.g., Fusion 360). Familiarity with Processing or other programming experience (e.g., Java, Python, Javascript).

Contact person: Michael Rivera (mirivera@andrew.cmu.edu)

COMPUTATIONAL FABRICATION

Activity Structures: digital fabrication of interactive room scale structures with embedded fiber optic bragg-grating sensors, and displays.

We are seeking 1-2 Undergraduate and / or graduate students for assistance in the development of interactive molded structures. The project scope includes development of a custom CNC mechanism to inject into material fiber optic displays molds, layout design of fiber optic sensors embedded in the materials, and
application of signal processing and machine learning to classify various human activities / interactions with the structures. The study will assist with construction of the material prototypes, implementation of experimental scenarios, and development of the data analysis algorithm for activity classification. The student (s) will work in collaboration with PhD students in the Department of Civil and Environmental Engineering and the Human-Computer Interaction Institute (HCI) as part of Professor HaeYoung Noh Professor Scott Hudson's research groups.

Ideally students will have experience with digital fabrication, signal processing, and / or machine learning, but consideration will also be given to students with strong interest and motivation in similar areas. For more information contact Sai Swaminathan (saiganes@cs.cmu.edu) or Jonathon Fagert (jfagert@cmu.edu).

Video link of the working prototype: https://tinyurl.com/moldedoptics

DATA VISUALIZATION

Title: Visualizing Conversational Interactions

Description: Our project is conducting field studies of conversation experts to identify visualization opportunities and explore preliminary designs to support conversation data exploration and analysis. The aim is to better understand the data analysis practices and needs of conversation researchers to inform the design and development of visualization tools to assist their exploratory process and sensemaking. This fall, we are looking for students to help with collecting, coding and analyzing interview data (and relevant artifacts) to collaboratively extract and synthesize actionable design insights and opportunities.

Requirements: We are looking for students with experience (and/or interest) in the following:

- Qualitative interview design & analysis (e.g. thematic analysis)
- User research
- Conversation and discourse studies
- Contextual inquiry & design
- Participatory design

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

If you are interested, please send the following to Sung-A Jang <sunga@cmu.edu>

- resume
- a short description of your relevant work and/or educational experience

DESIGN

Design and HCI students wanted

Project: How to Design for Engagement

The goal of this project is to derive a set of design guidelines and recommendations for how to design for engagement. The goal is to review the literature, current products and systems, and to create a set of findings and recommendations about what works well and why.

This is a Fall, 2019 independent study. Students can register for 6 or 9 credits. We will meet once a week.
We are looking for 2-3 undergrads or master’s students with experience in doing research and UI/UX design. Programming or electronics skills are not essential. The team will work a faculty member to review literature and examples of products, systems, and apps that require long-term engagement to achieve results. Deliverables will take the form of slides that convey findings and recommendations about what works well and why.

If you are interested please send email to Jodi Forlizzi, forlizzi@cs.cmu.edu.

DIGITAL FABRICATION/ACCESSIBILITY

Talking Tactile Surface Indicator: Digital fabrication of Interactive Tactile Surface Indicators for Navigation and Spatial Awareness of Visually Impaired Users
Patrick Carrington
Contact: Patrick Carrington (pcarrington@cmu.edu)

We are seeking 1-2 undergraduate and/or graduate students for assistance in the development of interactive tactile pavement structures. Tactile pavement structures, also known as ground surface indicators, are useful for assisting blind and other visually impaired users with navigating a city. We are developing interactive tactile pavement structures with new manufacturing techniques, such as 3D printing, thermoforming, etc, to enable visually impaired users to query information while interacting with them.

The project scope includes the development of prototypes with a desktop vacuum forming machine (Mayku FormBox -- https://www.mayku.me/), layout design of tactile molds, embedding pressure sensors in different materials, and programming sensors and interactions with the structures. There will also be a human-subject study with blind users focusing on the construction of the material prototypes and the implementation of experimental scenarios. The student(s) will work in collaboration with Ph.D. students in the Human-Computer Interaction Institute (HCI) and Professor Patrick Carrington’s research group.

Ideally, students will have experience with digital fabrication, Arduino programming, and working with sensors but consideration will also be given to students with strong interest and motivation to learn in similar areas. For more information, contact Sai Swaminathan (saiganes@cs.cmu.edu) or Patrick Carrington (pcarrington@cmu.edu).

EDUCATIONAL TECHNOLOGY

Authoring Tools for Easy Creation of Adaptive Tutoring Software
Contact: Vincent Aleven, aleven@cs.cmu.edu
Student Requirements: programming in JavaScript, HTML, CSS; Java familiarity helpful

What if homework problems could help you as you worked, as if they came with a tutor who could give step-by-step hints and immediate feedback whenever you did something wrong? Then you might not spend hours in confusion, only to hand in your paper and wait a day or more for help. Our lab’s goal is make it easy for teachers
to create online learning-by-doing exercises with this kind of tutoring built in. These self-guiding, self-grading homework problems are useful especially where human help is impractical, as in MOOCs. Studies show that this kind of adaptive tutoring software can dramatically aid learning, but adoption has been limited, in part because it has traditionally required advanced AI programming skills. In response, our lab invented the Cognitive Tutor Authoring Tools (CTAT: https://github.com/CMUCTAT/CTAT/wiki), by which non-programmers can create these software tutors. CTAT, which incorporates programming-by-demonstration and other end-user programming techniques, has been used to build dozens of tutors in math, science, foreign languages and other fields. But so far it has remained a tool for researchers: we want it to serve teachers and the instructional designers who write textbooks.

We seek a student willing to make CTAT attractive to these users. We want to make the current desktop Java application web-based and to improve authors' interactions. We have many specific ideas for improvements, and we could provide access to users so that the student could discover new requirements. Mentoring is available both from the professor and from the CTAT project’s professional staff.

GAME RESEARCH

Phipps Game Design Challenge (Organizer / Designer)
Jessica Hammer / OH!Lab
Contact: Emily Johns (ejohns@phipps.conservatory.org)

Game designer needed for collaboration with Phipps Conservatory. Phipps is organizing a game design challenge for middle- and high-school students as part of the Phipps Fairchild Challenge program. They are looking for help running game design workshops for students, pulling together relevant resources, and providing feedback on challenge entries.

You must be able to spend a minimum of four hours per week on-site at Phipps Conservatory working with their science education team. Prior experience with game design (e.g. taking a class, participating in GCS, working on a game-related research project) is recommended.

This position is available as an independent study.

Please email Emily Johns if you are interested in this position.

GAME RESEARCH

Games for Health Projects (Research Assistant / Programmer)
Jessica Hammer / OH!Lab
Contact: Rina R. Wehbe (rina.wehbe@uwaterloo.ca)
One or more research assistants needed to help with the development and data collection of a large public display game for health. The study is multipurpose and will explore the social factors affecting the use of public large displays and also seek to reduce stigma around mental health via gaming in a public platform.

Students applying for the position must be strong coders with some Java/C# experience. Experience with Unity engine or Processing Platform is an asset. Networking, Multi-touch Display, Touch Screen application work is an asset.

This project is a collaboration between the University of Waterloo and CMU. Advisor will meet weekly through Skype and later in person. Students must be independent workers who are motivated and committed to the project.

This opportunity can be filled either as a paid position or as an independent study.

Please email Rina if you are interested in this position.

GAME RESEARCH

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

One or more game 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.

Please email Erik if you are interested in this position.

GAME RESEARCH

**Interactive Learning Principles (Research Assistant / 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 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.

Please email Erik if you are interested in this position.

GAME RESEARCH

Sleepy Games (Research Assistants)
Jessica Hammer / OHILab
Contact: Adela Kapuścińska (akapusci@alumni.cmu.edu)

The Sleepy Games’ Project focuses on designing, playtesting and researching games that transform player behavior and habits around sleep. This semester we will be sense-making from existing data, writing a research paper based on playtesting data accumulated over the summer, and supporting a team of new designers.

We are looking for research assistants who can flexibly work on this project. Your responsibilities may include: data collection and analysis, sense-making and discussion of themes, audio transcription and assistance in compiling a final report.

There are no specific requirements for this position. What’s important is enthusiasm to develop new skills and demonstrated ability to self-manage along deadlines.

This opportunity can be either a paid position or an independent study; please indicate which you are interested in when you contact Adela.

GAME RESEARCH

Conference Experience Design (Designers / Programmers)
Jessica Hammer / OHILab
Contact: Mara Leff (Leff@jhf.org)

We are collaborating with Liftoff PGH, a healthcare innovation conference running in September 2020, to help design the attendee experience. We will create a conference tool that a) showcases the playful design skills of CMU students, b) helps attendees think creatively about the exhibits and talks they attend, c) share feedback on what they see, and optionally d) connect with one another.
In fall 2019, we are looking for a design-and-prototype team to help define what should be built, in preparation for production in the spring semester. You will ideate, innovate, and develop a pre-production package for the spring.

We are looking to fill two paid positions. Please apply as a pair; at least one member of the team must be an ETC student. Between you, you should have visual design, technical prototyping, and game/experience design skills. An interest in location-based experiences is a plus.

**GAMES WITH A PURPOSE / DATA VISION**

Title: Explaining AI with Games
Research Category: Games With a Purpose / Data Visualization

Description:
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 first set of games, evaluate its results, and design new games in this space.

Requirements:
We are looking for technical students with experience building and testing web applications. We are also looking for students interested in game design or playtesting.

We are looking for students who can commit 9 to 12 hours per week to this project over the spring semester. Work can be done either for independent study credit (9 or 12 units). To apply, please send:
• resume
• a short description of your relevant work and educational experience

Contact person:
Adam Perer <adamperer@cmu.edu>

**HEALTHCARE / DATA VISION**

Title: Interactive Care Pathways
Research Category: Healthcare / Data Visualization

Description:
Our project is developing interactive care pathways that guide doctors in diagnosing and treating patients and that automate the generation of physicians’ clinical notes. Care pathways are flow-charts that document what clinicians should do in routine situations where there is a clearly established standard of care, such as when an infant arrives at the emergency department suffering from a persistent fever. This work is being done in collaboration with physicians at UPMC Children’s Hospital. Over the fall semester, we want a small team of student research assistants to develop a web app that allows clinicians in the Emergency Department to view and interact with a care pathway while they treat their patient. The web app will collect a log of the clinicians actions and automatically produce a draft of the clinical notes. We have previously prototyped and
assessed a design with clinicians, and this semester, we want to develop a system we can deploy and test.

Requirements:
We are looking for students with experience building and testing web applications. We are looking for students who can commit 9 to 12 hours per week to this project over the spring semester. Work can be done either for pay or for independent study credit (9 or 12 units). To apply, please send:
• resume
• a short description of your relevant work and educational experience
• names of two CMU instructors who can vouch for your ability to work independently

Contact person:
Adam Perer <adamperer@cmu.edu>

HEALTHCARE / DATA VISION

Title: Making Medical Predictions Interpretable
Research Category: Healthcare / Data Visualization

Description:
We are working with doctors at Allegheny General Hospital who are experts in making predictions about patients with complex diseases. We have designed machine learning models that are also successful as predicting risk of patients. We are interested in designing visual interfaces to help explain how the machine learning algorithm is making its decision. We have an initial prototype, and we are looking to improve its features and visual design as well as evaluate its effectiveness with clinicians.

Requirements:
We are looking for technical students with experience building and testing web applications. Experience with data visualization or machine learning is a plus.

We are looking for students who can commit 9 to 12 hours per week to this project over the spring semester. Work can be done either for independent study credit (9 or 12 units). To apply, please send:
• resume
• a short description of your relevant work and educational experience

Contact person:
Adam Perer <adamperer@cmu.edu>

PROTOTYPING, SENSING, APPLICATIONS OF MACHINE LEARNING

Project Name: Wearables and Activity Recognition
Mentor: Mayank Goel
Category Keywords: Prototyping, Sensing, Applications of Machine Learning
Project Description:
A user's activities and behavior have a strong relationship with their overall health, productivity, and the way they interact with technology. Something as simple as a rough estimate of a person's step count can tell us if they suffer from any depressive symptoms or have anxiety bouts.

We are exploring what new capabilities can be unlocked if we go beyond simple geographical locations and step counts. We are developing systems that can help us understand a user's diet better, how they exercise, their daily indoor activities, driving behaviors, etc.

We are looking for students to contribute to various aspects of these efforts. Depending on their interest, the students can help in building and prototyping the hardware device, or they can contribute to the signal processing and machine learning component. Interested students will also have the option of collecting the data, annotating the data, and also contributing to the manuscript of the project.

Tools/Skills involved (you can work with a subset of these):
1. Design
2. 3D printing
3. Embedded Computing
4. Sensing
5. Python
6. Scikit-learn

PROJECTING, SENSING, APPLICATIONS OF MACHINE LEARNING

Project Name: Interacting with a watch using Augmented Reality
Mentor: Mayank Goel

PROJECTING, SENSING, APPLICATIONS OF MACHINE LEARNING

Project Name: Interacting with a watch using Augmented Reality
Mentor: Mayank Goel
Category Keywords: Prototyping, Sensing, Applications of Machine Learning

Project Description:
Users use their computing devices in a myriad of contexts and environments. However, in most cases, the devices are not aware of the changing environments, and the use of technology stops being fun, convenient, and more importantly, safe. One example is a smartwatch. It is on the user the whole time, but has a tiny screen and requires the users to keep their hands propped for too long.

To solve some of the challenges associated with a watch, researchers have appropriated the human body and projected information to increase the output area. However, the area can be increased further by not limiting ourselves to the skin. Increasing prevalence of AR headsets is particularly exciting here. We are exploring the possibility to combine the smartwatch screen with the information projected on an AR headset. (see figure). The watch provides an explicit intent by the user to interact because they will lift their hand to see the watch when they want to interact. The sensors on the watch can continue to detect some of the gestures (e.g., motion, touch). The user can also interact with the information using speech, in-air gestures sensed by the AR headset, or gestures on the headset’s surface (e.g., Google Glass).

I am looking for an awesome set of students to:
1. Build an interactive system that combines the displays of a watch and an AR headset
2. Develop new, useful interactions
3. Evaluate the usability and utility of some of the ideas.

This is a new project for our group, and you can contribute to any part of the project that interests you.

RESEARCH

Wanted: Research Assistants to help with Teacher Dashboard
Project: ClassInSight - Vista Schools
Professor John Zimmerman

Our project is developing a dashboard that shows teachers a summary of their own teaching behaviors so they can reflect on and improve their teaching. This is sort of like a FitBit for teachers.
This fall we will be capturing data from high school science classrooms in San Diego. We are looking for research assistants that can help:

- **design data visualizations** around classroom activities and around the effective use of discussion in science teaching.
- **implement** these visualizations **in javascript (D3 or P5)**
- help **design and execute an assessment**, where we show teachers their own data and see how they make sense of it
- collaborate with our research partners in San Diego who will be collecting and coding the classroom data.

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

- Interface design
- Information design
- Information visualization
- User studies
- Web development
- Learning science

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

If you are interested, please send the following to Kiemute Oyibo <koyibo@andrew.cmu.edu>

- resume
- a short description of your relevant work and/or educational experience

In addition, please go to LINK (https://doodle.com/poll/pesx3grbac87ny5e) and indicate the times you are free each week for a team meeting.

---

**RESEARCH**

Wanted: Research Assistants to help with systematic review of HCI literature  
Project: Examining the Evolution of HCI terminology and practice  

The aim of this project is to examine how meanings of terms common in the HCI vernacular such as “user,” “affordance,” and “deployment” have shifted over time, and how those shifts might be reflective of changes in research practice within the field.

We are recruiting a team of undergraduate or graduate student research assistants for the Fall Semester to assist with a systematic review of HCI literature using a set of academic journals, conference publications, and relevant trade press. We are looking for research assistants that can help:

- Compile a comprehensive set of articles for analysis
- Extract relevant data from the set of papers
HCII Research/Independent Study
Fall 2019

- Conduct qualitative thematic analysis
- Synthesize their findings in writing

We are looking for students with experience (or strong interest) in:

- Examining the history of the field of HCI
- Conducting a systematic literature review
- Using inductive techniques of data analysis

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

If you are interested, please send the following to Dr. Sarah Fox <sarahfox@cmu.edu>

- resume
- a short description of your relevant work and educational experience

In addition, please complete the following poll with times you are free each week for a team meeting: https://doodle.com/poll/cqf2duxe5y2xhps5

---

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 finalizing and running an online vignette study, planning participatory design workshops, and writing a research paper.

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.

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.

---

SOCIAL RESEARCH

CARE (Coping After Racist Experiences) Project (Designer / Participatory Design)
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 finalizing and running an online vignette study, planning participatory design workshops, and writing a research paper.

We are looking for someone with a background in design who can assist in organizing and developing ideas for design probes and interventions, as well as help in the planning for participatory design workshops.
A background in design is recommended, but not required - more important is enthusiasm to develop new skills and demonstrated ability to self-manage along deadlines.

This opportunity must be filled as an independent study.

SOCIAL RESEARCH

Social Cybersecurity (Research assistant / programmer)
Laura Dabbish / CoEx Lab, Jessica Hammer / OH!Lab
Contact: Tianying Chen (tianyinc@andrew.cmu.edu)

The social cybersecurity project revolves around investigating people’s cybersecurity project through a lens of social psychology theory. This semester we are running a study to examine the effectiveness of the game prototype that we developed.

We are looking for someone with a background in programming (Unity and web programming specifically) who can assist in tweaking the prototype and make alternative versions of the game. Your responsibility also may involve making interactive prototypes in a web browser.

A background in programming, specifically Unity and web programming is required.

This opportunity can be filled as an independent study or paid position.

SOCIAL RESEARCH

Social Support from Strong and Weak Ties During Crisis (Research assistant)
Tianying Chen, Laura Dabbish, Robert Kraut, CoEx Lab / OH!Lab
Contact: Tianying Chen (tianyinc@andrew.cmu.edu)

This project investigates the difference between support received from strong and weak social connection during crisis. This semester we are running a study to examine what are the key reasons that would prompt people to disclose sensitive information and seek support during crisis to different social ties.

We are looking for someone with a passion for research who would be interested in learning about different aspects of research. The responsibilities of this position would involve a large amount of reading and literature review. Students working on this project will also have opportunities to participate in writing of the manuscript. Students will have weekly meetings to discuss any questions they might have for personal growth as a future researcher.

No specific background is required. However, students who are interested should make sure to have appropriate reading and summarizing skills, preferable with past research experience.

This position must be filled as independent study.
SOCIAL RESEARCH

Upcycled Home (Qualitative/Quantitative Data Analysis)

Kristin Williams / OH!Lab / DevLab
Contact: Kristin Williams (krismawil@cs.cmu.edu)

Upcycling domestic objects could offer households greater discretion and control over these IoT costs by supporting tailoring to the home. We will analyze data collected over a 7 day study to characterize upcycling needs/opportunities in the home.

You will help with data analysis and paper writing

You should have completed your first year of college. Experience with quantitative, qualitative, or both forms of data analysis is a plus.

This position is available as an independent study.

TECHNICAL RESEARCH

EUP COMPOSITION FRAMEWORK (Research Assistant)

Kristin Williams / OH!Lab / DevLab
Contact: krismawil@cs.cmu.edu

We will conduct a meta-review of research papers to develop a framework for end user programming that includes tangible user interfaces.

We will sample and characterize a dataset representing the state of the art research on end user programming. We will describe and analyze missing dimensions of EUP research that are important for tangible interfaces.

Your responsibilities will be data collection and analysis. You will identify and obtain relevant papers, then categorize/analyze them.

Strong organizational skills are required, specifically the ability to document work accomplished and to manage a large dataset. Strong analytical skills are a plus.

This opportunity can be filled as an independent study.

Please email Kristin if you are interested in the position.