

DATA VISUALIZATION

Research Category: Data Visualization

Machine learning has essentially become ubiquitous for making sense of large and complex datasets. While these techniques may be automated and yield high accuracy precision, they are often black-boxes that limit interpretability. Interpretability is acknowledged as a critical need for many applications of machine learning, and yet there is limited research to determine how interpretable a model is to humans. In this project, we wish to build a novel platform to study, quantify, and measure human interpretability of machine learning models with the assistance of data visualizations.

Student Requirements:

Python and web-based programming skills (D3.js a plus). Basic knowledge of Machine Learning and Data Visualization.

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

DATA VISUALIZATION

Research Category: Data Visualization

Conversational data collection is pervasive, particularly with consumer devices like Alexa and Google Home, but there are few technologies to help effectively summarize conversations to aid with understanding what was said in the future. We plan to develop novel visual interfaces to help summarize and explain conversations. One of the initial use cases we plan to tackle are patient-doctor conversations, so both patients and doctors can benefit from having a useful record of the discussion afterwards.

Student Requirements:

Python and web-based programming skills (D3.js a plus). Basic knowledge of Natural Language Processing and Data Visualization.

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

EDUCATION RESEARCH

Can I Learn by Watching Others Play? (Research Assistants)

Jessica Hammer / OH!Lab

Contact: Amy Cook (amyshann@andrew.cmu.edu)

With the rise of streaming platforms such as Twitch, many people now choose to watch others play games instead of playing games themselves. Playing educational games can be an effective way to learn. We are investigating if someone can learn by watching someone else play an educational game (Portal 2). This work could lead to future opportunities like using Twitch to stream educational games for schools.

We are seeking multiple student research assistants to help coordinate and run our pilot study. You will gain experience collecting and analyzing qualitative and quantitative data in an educational games setting. Experience with Portal 2 and/or college-level introductory physics concepts is a plus, but neither is required.

This opportunity can be filled as an independent study.

Please email Amy if you are interested in this position.

EDUCATION RESEARCH

What Makes a Training Interaction Natural? (Research Assistants)

Erik Harpstead / OH!Lab, LearnLab

Contact: Erik Harpstead (harpstead@cmu.edu)

Several AI systems exist that support interactive task learning, however interacting with these systems often requires a user to adopt a stilted or unnatural pattern of interaction. In this project we are interested in coming at the problem from the other angle of trying to understand what kinds of training feel natural to people, particularly when they may be restricted by limitations in a learner. We aim to test several training interaction paradigms between remote human participants in a game-like environment.

We are seeking one or two student research assistants to help coordinate and run pilot studies, and potentially participant in interaction/game design. You will gain experience collecting and analyzing qualitative and quantitative data in an interactive lab setting. Experience with AI is not required but may be a plus. Experience with the Unity game engine and interactive web programming would be a plus for the task design.

This opportunity can be filled as an independent study.

Please contact Erik if you are interested in this position.

EDUCATION RESEARCH

Research Category: Education

Description

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*. Candidates are sought for two roles:

Design Research (skills: observation + ethnography, co-design, interview, qualitative research analysis)

Technical Prototype Development (skills: hardware prototyping, fabrication, server-side programming)

Research assistants will work with an interdisciplinary team of design researchers, technology developers and learning scientists from CMU's HCI, School of Architecture and Integrated Innovation Institute (III) and the University of Pittsburgh's Learning Research and Development Center (LRDC) to develop smart documentation tools to support learning practices in creative, maker-based studio environments. Students will participate in design research and 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.

Student Requirements:

Part-time position (up to 15 hours/week) for Spring 2019 (with the potential to continue over the summer) will be funded through a NSF Research Experience for Undergraduates (REU) fellowship. This program requires candidates to be a United States citizen or permanent resident .

Contact:

If interested, upload your resume and a link to your portfolio to the following box folder: <http://bit.ly/2zKGsZk>. Contact Marti Louw (mrlouw@andrew.cmu.edu) or Daragh Byrne (daragh@cmu.edu) with questions.

GAME RESEARCH

Games for Cybersecurity Behavior Change (Research Assistants)

Jessica Hammer / OH!Lab & Laura Dabbish / Coex lab

Contact: Tianying Chen (tianyinc@andrew.cmu.edu)

Existing games for cybersecurity behavior change are promising, but the results are often very small-scale. They also tend to focus on the games *being fun* instead of

measuring learning goals or behavior change outcomes. We aim to design, implement, and evaluate a game aimed at sustained long-term behavior change to encourage people to take cybersecurity measures to protect themselves.

We are seeking one or two student research assistants to help in the game design process. You will participate in the design of the game under guidance, learn and apply game design principles, make and test game prototypes, and participate in research data

collection and analysis. Sufficient knowledge in programming and making games with Unity to work independently is required.

This opportunity can be filled as an independent study.

Please email Tianying if you are interested in this position.

GAME RESEARCH

Games for Audio Data Collection (Research Assistants, Designers)

Jessica Hammer / OH!Lab

Contact: Jessica Hammer (hammerj@andrew.cmu.edu)

How can games motivate players to collect audio clips of everyday activities in their home? How should issues of privacy, security, and consent be addressed in the game? We will be reading and collating research papers on this topic, developing a set of game and application exemplars, and generating design concepts for novel games in this area.

We are seeking up to six student researchers and designers to assist with this process. You must be available on Friday afternoons for a weekly meeting. Experience with game design and/or literature reviews is a plus.

This opportunity is intended as a paid position, but independent study options are available.

Please fill out this form if you are interested:

<https://goo.gl/forms/OGOtVuKxMXPkpaYv2>

GAME RESEARCH

Using Large Public Displays for Reducing Stigma (Research Assistants)

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. The study is multipurpose and will explore the social factors affecting the use of public large displays and also seek to reduce stigma 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 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 an independent study.

Please email Rina if you are interested in this position.

GAME RESEARCH

Remixing Game Replays (Research Assistants, Designers)

Erik Harpstead / OH!Lab

Contact: Erik Harpstead (harpstead@cmu.edu)

In-game replays provide an affordance for treating a player's experience like a material by reifying an experience into something concrete that can be examined and molded. In this project we are interested in exploring the implications of this perspective on experience through a metaphor of remixing. Our goal for the semester will be to create one more prototype games implement a record-replay library to demonstrate remixing these replays.

We are seeking one or two student designers to help with the design and implementation of game prototypes. You will participate in the design of games under guidance, learn and apply game design principles, make and test game prototypes, and explore novel game design space. Sufficient knowledge in programming and making games with Unity to work independently is required.

This opportunity can be filled as an independent study.

Please email Erik if you are interested in this position.

GAME RESEARCH

Sleepy Games (Research Assistants, Designers)

Jessica Hammer / OH!Lab

Contact: Jessica Hammer (hammerj@andrew.cmu.edu)

How can games help players achieve healthy sleep? We will be reading and collating research papers on this topic, iterating on games designed by teams in the Transformational Game Design Studio, and generating design concepts for novel games in this area. At the end of the semester, we will write a Sleepy Game Design Manifesto.

We are seeking at least six student researchers and designers to assist with this process. You must be available from 12:30-1:30pm Friday afternoons for a weekly meeting. Experience with game design and/or literature reviews is a plus.

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

Please fill out this form if you are interested:

<https://goo.gl/forms/99kmXP2RDifCWkbj2>

HARDWARE PROTOTYPING AND UBIQUITOUS COMPUTING

Research Category: Hardware prototyping and ubiquitous computing

Skills: 3d printing, embedded computing, python, machine learning (any subset of these is great)

Contact person: Mayank Goel (mayankgoel@cmu.edu)

Description: A key trend emerging from the popularity of smart, mobile devices is the quantified-self movement. The movement has manifested into prevalence of two kinds of personal wellness devices: (1) fitness devices (e.g., FitBit), and (2) portable and connected medical devices (e.g., Bluetooth-enabled blood pressure cuffs). The fitness devices are seamless, very portable, but offer low-fidelity information to the user. They do not generate any medically-relevant data. The devices that actually generate data that doctors can use for their diagnosis are still cumbersome to use. For example, a “smart” glucose monitor is same as the conventional one. The only difference is that now you can see the measurement on your smartphone. However, the user still needs a finger prick for the actual measurement.

HCI Research/Independent Study

Spring 2019

We are currently working on building personal medical devices that are as seamless to use as a FitBit, but generate medically-relevant data. As an example, one of the projects we are working on right now is looking at calculating a user's blood glucose levels using a wrist-worn device. The device will also monitor the user's eating behavior and aims to

find correlation between their eating activities and their effect on the user's glucose levels.

We are looking for students to contribute to various aspects of this project. 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.

HEALTHCARE

Study on Student Well-Being

Research category: Healthcare

We're looking for an undergrad research assistant to help us conduct a psychological research study on student well-being. Tasks will include

- (a) setting up time slots online and scheduling student participants,
- (b) running in-person lab studies with student participants,
- (c) administering surveys and short interviews, (d) entering handwritten data into an Excel spreadsheet, and (e) conducting basic statistical analyses. Expected time commitment: 10 hours/week

Ideal Qualifications: Genuine interest in psychology research, attention to detail, strong organizational skills, reliable, self-motivated, quick learner, experience with conducting lab studies with student participants, prior statistical analysis experience

Contact: Send resume and a short summary of your interests and qualifications to Siyan Zhao <siyanz@andrew.cmu.edu>

HEALTHCARE

Recognizing speakers and emotions in audio

Research category: Smartphones, healthcare

We're looking for an undergrad research assistant to help us build an

Android app that can recognize speakers in conversation and emotions in speech. Tasks will include: (a) reading relevant existing literature on speaker detection and emotion detection, (b) implementing necessary machine learning components, (c) implementing an Android app, (d) testing app performance and algorithm accuracy. Expected time commitment: 12 hours/week.

Ideal qualifications: Prior experience with Android programming, prior experience working with speech data, independent and strong problem-solving skills, reliable, self-motivated, quick learner, prior experience on machine learning

Contact: Send resume and a short summary of your interests and qualifications to Siyan Zhao <siyanz@andrew.cmu.edu>

INTELLIGENT AGENTS

MessageOnTap: An Intelligent Agent for Streamlining Messaging

Research category: Intelligent Agents

MessageOnTap is an intelligent agent we are building for offering smart actions based on messages you get on your smartphone. Think of it like an autocomplete at the task level rather than just for spelling. For example, if you get a message from a friend about getting dinner at Porch at 8pm, you can activate the agent and it might show you a shortcut to OpenTable and auto-fill in the text entry fields. Or, if you get a message like "Here's my new phone# 555-5555", the agent might highlight that and make it one click to update the contact. We're looking for software developers to help improve MessageOnTap, as well as to do data collection and analysis.

Ideal Skills: Android programming, Natural Language Processing, intelligent agents, machine learning, Python, data analysis skills

Contact: Send resume and a short summary of your interests and qualifications to Fanglin Chen (chenfanglintc@gmail.com)

INTERACTION TECHNIQUES

Research Category: Interaction Techniques

Skills: Sensing, machine learning, python, prototyping (any subset of these is great)

Contact person: Mayank Goel (mayankgoel@cmu.edu)

Description: Today's computers can be used as a wristwatch, or worn as eyeglasses, or hidden in plain sight as a speaker, or microphone. The barrier to interact with computers is significantly reduced, and brand-new information is only a flick of the wrist or three syllables away. Lowering these barriers means that the devices around us will need to adapt quickly. When the driver of a car gets a notification, it is already hard for them to not look at the smartwatch on their wrist. Now, apart from the smartwatch, the user might also have a big touchscreen computer on their dashboard, a heads-up display, and a speech-based personal assistant. All of these devices vie for the driver's attention and can lead to a dangerous situation. Is there room to rethink how devices understand the user's context and keep technology safe? Can doing so improve the way we interact with technology? We are building new sensing techniques to develop better context awareness and investigate better ways to accommodate difficult usage scenarios. The project involves prototyping new wearable devices, tinkering with existing sensors and devices, designing new interaction techniques, and developing machine learning algorithms to enable new capabilities.

PRIVACY AND SECURITY

ClearTerms: Simplifying Terms and Conditions

Research category: Privacy and Security

Nobody reads Terms & Conditions on web sites. What if we could predict what people would care the most about, and just highlight those? Our team has collected a great deal of crowd data and created preliminary language models and a web site to showcase our results. We're looking for people to help improve our language model for analyzing policies. Expecting students to average at least 10 hours a week on this research, for pay or independent study.

Ideal Skills: Basic NLP and/or machine learning

Contact: Send resume and a short summary of your interests and qualifications to Jason Hong (jasonh@cs.cmu.edu)

PRIVACY AND SECURITY

IoT Hub for Privacy and Security

Research category: IoT, Privacy and Security

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 software developers. Expecting students to average about 10 hours a week on this research (more is fine), for pay or independent study.

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

Contact: Send resume and a short summary of your interests and qualifications to Jason Hong (jasonh@cs.cmu.edu)

SOCIAL COMPUTING

Project 1: Career trajectories

Area: Social Computing

Contact: Maria Tomprou

As part of a larger research effort on career development, we are studying challenges in career coaching and counseling. The independent study on this project will involve interviewing career advisors and job seekers, analyzing qualitative and quantitative data to identify technical and non-technical challenges and suggest design ideas for improving the job search process.

Ideal students will have a background or interest in social science, design, and user research.

The project is for you if you want to improve people's decision making about their careers and job choices using technology.

Interested students should send their resume along with major GPA to mtomprou@cs.cmu.edu

SOCIAL RESEARCH

Mitigating Effects of Racism through Social Support (Research Assistants)

Jessica Hammer / OH!Lab

Contact: Alexandra To (aato@cs.cmu.edu)

We are studying ways to provide support targets of racism (e.g., microaggressions) through social support. We have conducted interviews with people who have been the targets of racism and are in need of research assistance in analyzing this data and designing and conducting critical follow-up research. This project utilizes both qualitative and quantitative research methods and we welcome all levels of experience.

In the spring we are planning several major initiatives and research activities may include any of the following: 1) designing and distributing a survey study, 2) running a lab study about microaggressions, 3) analyzing qualitative data from an interview study, 4) reading and reviewing scientific literature, and 5) contributing to writing a research publication.

This is an independent study opportunity. Students can sign up for 6-12 credits.

Please email Alexandra if you are interested in this position.

UBIQUITOUS CPMPUTING

Sensing Synchrony of Human Motion

Area: Ubiquitous computing

Contact: Maria Tomprou

Are you interested in sensing human motion and social interactions? This independent study seeks to understand how behavioral synchrony relates to virtual collaboration and factors associated with it. We have an exciting research pipeline that shows synchrony in facial expressions and vocal cues relate to improved collaboration. However, we know little about the synchrony of head and body posture. Recently, CMU's perceptual computing lab has developed the OpenPose that allows us to identify key points related to head and body posture and allow us to test our research propositions. Then using data-driven implications, students will design a computer-mediated interface to promote collaboration through human motion. Would you like to be part of this exciting initiative with implications for the future of work and group collaboration?

Students with strong programming ability and data analysis skills will be best suited for this project. Interest in machine learning and technology related to human motion such as OpenPose is a big plus.

HCI Research/Independent Study
Spring 2019

Interested students should send their resume along with major GPA to
mtomprou@cs.cmu.edu.

HCI Research/Independent Study
Spring 2019