

CURRICULUM VITAE

NAME

Dr. Mariakakis, Alex Timothy

CONTACT INFORMATION

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Website

Personal <https://mariakakis.github.io>

LANGUAGE SKILLS

English Read, Write, Speak, Understand, Peer Review

EDUCATION

Degrees

Doctorate, Doctor of Philosophy, Computer Science and Engineering, Making Medical Assessments Available and Objective Using Smartphone Sensors (Completed) Sep. 2015 - Jun. 2019

University of Washington, Washington, United States, Academic

Supervisors: Jacob Wobbrock (2014/2 - 2019/6), Shwetak Patel (2013/9 - 2019/6)

Master's Equivalent, Masters of Science, Computer Science and Engineering (Completed) Sep. 2013 - Jun. 2015

University of Washington, Washington, United States, Academic

Supervisors: Jacob Wobbrock (2014/2 - 2019/6), Shwetak Patel (2013/9 - 2019/6)

Bachelor's, Bachelor of Science, Computer Science (Completed)

Aug. 2009 - May 2013

Duke University, North Carolina, United States, Academic

Bachelor's, Bachelor of Science in Engineering, Electrical and Computer Engineering (Completed) Aug. 2009 - May 2013

Duke University, North Carolina, United States, Academic

Credentials

Fellow

Jul. 2021

RECOGNITIONS

Prize / Award, Distinguished Paper Award **Oct. 2024 - Oct. 2024**

Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), Academic

This award was given by the journal's editorial board in recognition of a publication called "FeverPhone: Accessible Core-Body Temperature Sensing for Fever Monitoring Using Commodity Smartphones", for which I was a contributing author

Prize / Award, Best Workshop Paper Award **Oct. 2024 - Oct. 2024**

EarComp Workshop at the ACM International Conference on Pervasive and Ubiquitous Computing (UbiComp), Academic

This award was given by the workshop's program committee in recognition of a publication called "On the Production and Measurement of Cardiac Sounds in the Ear Canal", for which I was the last author

Prize / Award, Honorable Mention **Apr. 2024 - Apr. 2024**

ACM Conference on Human Factors in Computing Systems (CHI), Academic

This award was given by the conference's program committee in recognition of a publication called "Leveraging Idle Games to Incentivize Intermittent and Frequent Practice of Deep Breathing", for which I was a contributing author

Prize / Award, Honorable Mention **Apr. 2024 - Apr. 2024**

ACM Conference on Human Factors in Computing Systems (CHI)

This award was given by the conference's program committee in recognition of a publication called "Understanding the Role of Large Language Models in Personalizing and Scaffolding Strategies to Combat Academic Procrastination", for which I was a contributing author

Prize / Award, Best Paper **Apr. 2023 - Apr. 2023**

ACM Conference on Human Factors in Computing Systems (CHI), Academic

This award was given by the conference's program committee in recognition of a publication called "Investigating the Role of Context in the Delivery of Text Messages for Supporting Psychological Wellbeing", for which I was a contributing author

Prize / Award, Best Paper **Jul. 2021 - Jul. 2021**

ACM SIGCAS Conference on Computing and Sustainable Societies (COMPASS), Academic

This award was given by the conference's program committee in recognition of a publication called "NkhukuProbe: Using a Sensor-Based Technology Probe to Support Poultry Farming Activities in Malawi", for which I was a contributing author

Prize / Award, Best Paper Runner-Up **Sep. 2020 - Sep. 2020**

IEEE Pervasive Computing, Academic

This award was given by the journal editors for my first-author publication on "Challenges in Realizing Smartphone-based Health Sensing

Prize / Award, Best Paper Finalist **Apr. 2019 - Apr. 2019**

IEEE International Conference on Radio-Frequency Identification (RFID), Academic

This award was given by the conference's program committee for a publication on "IDCam: Precise Item Identification for AR-Enhanced Object Interactions", for which I was a contributing author

Distinction, Gaetano Borriello Outstanding Student Award

Oct. 2018 - Oct. 2019

ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp), Academic

This award recognizes graduate students who have made outstanding research contributions to the field of ubiquitous computing. The annual awardee is selected by the conference's Steering Committee based on their publication record and service to the community

Distinction, Top 10 Innovations from the University of Washington's Paul G. Allen School That's Making the World a Better Place

Mar. 2018

Vulcan, Private Sector

Vulcan, an investment company founded by Microsoft co-found Paul Allen, published a list of the top 10 innovations from the School of Computer Science that they saw as having the biggest potential to change the world for the better. One of my projects on scleral jaundice screening with a smartphone (BiliScreen) is #5 on that list

Citation, Geek of the Week

Sep. 2017

GeekWire, Private Sector

The Seattle-centric technology news site GeekWire "profiles the characters of Pacific Northwest tech, science, games, innovation, and more

Prize / Award, Honorable Mention

Sep. 2015 - Sep. 2015

ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp), Academic

This award was given by the conference's program committee for my publication on "HyperCam: Hyperspectral Imaging for Ubiquitous Computing Applications", for which I was a contributing author

Distinction, Graduation Cum Laude

Jun. 2013

Duke University, North Carolina, United States, Academic

Latin Honors are given to undergraduate students who maintain a high GPA throughout all four years of their studies. In the case of graduation cum laude, a student must have a GPA within the top-25% relative to the GPA distribution of the previous year's class

Distinction, Graduation with Departmental Distinction

Jun. 2013

Duke University, North Carolina, United States, Academic

Departmental Distinction is awarded to students who complete a faculty-supervised independent study project during their senior year and present that work in written and oral forms to the department's faculty. Furthermore, students who attain this distinction must also maintain a cumulative GPA of at least 3.5

Distinction, Tau Beta Pi

Apr. 2013

Duke University, North Carolina, United States, Academic

Tau Beta Pi is the oldest engineering honor society in the United States, honoring students who have shown significant academic achievement and commitment to personal and professional integrity

Prize / Award, Outstanding Teaching Assistant Award in Electrical and Computer Engineering

Jan. 2013

Duke University, North Carolina, United States, Academic

This award is given to undergraduate teaching assistants each semester who receive exceptional praise from their peers and supervising faculty

EMPLOYMENT

Academic Work Experience

Assistant Professor, Assistant Professor (Full-time)

Aug. 2020

Computer Science, St. George Campus, University of Toronto, Ontario, Canada, Academic

As a new tenure-track faculty member, I will be responsible for leading my own research program. This responsibility includes, but is not limited to, completing publications from my postdoc, establishing an independent research agenda, supervising students, applying for grants, and teaching courses

Postdoctoral Researcher (Full-time)

Sep. 2019 - Jul. 2020

Computer Science and Engineering, Seattle, University of Washington, Washington, United States, Academic

I conducted research involving the use of passive sensing (via smartphones, smartwatches, and Bluetooth beacons) to detect significant life events. I also led the writing of an NSF Smart & Connected Health grant proposal on the detection of heavy-drinking episodes using a similar approach to my work on significant life events. That grant was rejected, but we have plans of adapting that grant to other domains

Professional Master's Program Lecturer, Lecturer (Part-time)

Mar. 2018 - Jun. 2018

Electrical Engineering, Seattle, University of Washington, Washington, United States, Academic

I taught an introductory course on ubiquitous computing to ~35 students who were studying for their Master's degree while working in industry. The course was held 1 day a week for 3 hours. Beyond providing lectures, leading discussions, and grading assignments, I also redesigned the course so that the assignments had greater cohesion. In addition, I updated the curriculum to include more lectures on machine learning and discussions on newer topics in ubiquitous computing

Teaching Assistant (Full-time)

Sep. 2013 - Jun. 2014

Computer Science and Engineering, Seattle, University of Washington, Washington, United States, Academic

I provided supplemental lectures to ~100 undergraduate students on topics related to software design and implementation (e.g., event-driven programming, program structure, program correctness). I delivered the same 1-hour lecture 3 times a week to cover all of the students. In some cases, I was asked to reinforce what was taught in the main lectures; in other cases, I was asked to teach new content that was required for the homework assignments

Non-academic Work Experience

Visiting Researcher

Sep. 2019 - Jul. 2020

Sage Bionetworks, Research

Sage Bionetworks often runs open competitions called "challenges" where researchers attempt to achieve the best accuracy on a particular machine learning challenge. One such challenge with the Michael J. Fox Foundation aims to quantify the severity of Parkinsonian symptoms using motion sensor data. I helped verify that there was useful signal in the challenge's two datasets by producing a baseline machine learning model. In addition, I have been leading the creation of a study that would produce the largest dataset of continuous at-home gait in the world. With this dataset, we will create and validate various algorithms for estimating gait parameters (e.g., step cadence, speed) for an eventual

large-scale deployment through the National Institutes of Health. This dataset will eventually be open-sourced along with datasets from other gait researchers to form a standard in that research community

Research Intern**Jan. 2018 - Sep. 2018***Microsoft Research, Private Sector*

I helped an interdisciplinary team of chemists, computer scientists, and designers create chemical sensor patches that produce colorimetric readouts of ultraviolet radiation. Beyond informing the design of these sensors and catering this research to a computer science audience, I created a smartphone app that automatically interprets the sensor patches' colors regardless of the ambient lighting conditions. his work led to a conference publication

Research Intern**Jun. 2015 - Sep. 2015***FX Palo Alto Laboratory, Private Sector*

I helped create a web interface that surfaces coincidences and similarities in egocentric video collections. The interface merges segments of geo-tagged videos using location and visual similarity to automatically generated time-lapses of commonly viewed places during a person's daily commute

Research Intern**Jun. 2014 - Sep. 2014***Samsung Research America, Private Sector*

I led an investigation of how the sensors on a smartwatch can be used to determine whether a person is a driver or passenger inside a vehicle. In this investigation, I explore both motion sensing (accelerometer) and scene recognition (camera) could be used to achieve high classification accuracy. This work led to a conference workshop publication. I also helped with the development of other smartwatch sensing modules for activity recognition, such as a module for detecting eating and gait episodes

Research Intern**Jun. 2013 - Aug. 2013***HP Labs, Private Sector*

I helped create an indoor localization system that only requires a person's smartphone to be near a single wireless access point. While my mentor was responsible for implementing a way of estimating the distance between a person's smartphone and an access point using wireless signal processing, I implemented a holistic dead-reckoning system that leveraged the smartphone's inertial measurement unit to estimate a person's instantaneous speed and heading. This work led to multiple patents and a conference publication

Affiliations**Affiliate Scientist****Jul. 2021***Techna, Health***RESEARCH FUNDING HISTORY**

Principal Investigator, Grant, Development of Normal Physiological Behaviour Classification Using Multi-Modal Biomarker Dataset Towards Machine Learning-Driven Medical Devices (Awarded) Jun. 2024 - Oct. 2024

Project Description: Recent advances in data-driven machine learning (ML) classifiers have resulted in significant advances in many areas of healthcare. To build ML models that are capable of precisely detecting the onset of adverse health effects (e.g. seizures), large datasets of healthy canines demonstrating normal activity are required to be used as

a comparator. Thus, this project aims to develop a large, labelled dataset of normal canine behaviour for use in developing ML algorithms to detect abnormal animal physiological behaviour.

Other Investigators: Gerard O'Leary (Principal Investigator)

Funding Sources

- Mathematics of Information Technology and Complex Systems (MITACS): Accelerate (2024/6 - 2024/10 Total: \$10,000.00 (Canadian dollar) Received: \$10,000.00 (Canadian dollar), (competitive)

Principal Investigator, Grant, Connected, at-Home, Accessible Remote Monitoring in COPD (CHARM-COPD): A Program of Care in COPD that Ensures Digital Health Equity, Improves Continuity of Care, Improves Access to Care, That is Scalable and Enables Data for Discovery (Awarded) Apr. 2024 - Mar. 2026

Project Description: Our innovation design refines and evaluates a comprehensive Program of Care for people with COPD through a collaboration between UHN and Toronto Grace Health Centre. This research has the potential to create a scalable program of care for most patients with COPD, including those who have been marginalized. We are building on a platform running at TGHC that is following over 2, 000 patients with frailty, with plans to expand across Ontario over the next 12 months. We are adding to this platform and targeting a group that has high care needs often due to frailty: older adults with COPD. Patients will gain access to novel technologies as they emerge and be able to integrate the use of off-the-shelf wellness devices they may already be using

Other Investigators: Wu, Robert (Principal Investigator), Gershon, Andrea (Principal Investigator), Tran, Jake (Co-investigator), Gosse, Carolyn (Co-investigator), Kilby-Lechman, Danielle (Co-investigator), Zaheen, Ahmad (Co-investigator), Blazer, Alina (Co-investigator), Locquiao, Jhiffie (Co-investigator), de Lara, Eyal (Co-investigator)

Funding Sources

- University Health Network: AHSC AFP Innovation Fund (2024/4 - 2026/3 Total: \$186,743.00 (Canadian dollar) Received: \$58,000.00 (Canadian dollar), (competitive)

Co-investigator, Oscillometry for Remote Clinical Monitoring of Patients with COPD (Awarded) Mar. 2024 - Mar. 2026

Project Description: We have partnered with Toronto Grace Health Centre (TGHC), who currently monitor 2000 patients experiencing frailty through a clinical platform and digital dashboard. Our study has added patients with COPD to their program. We are collecting continuous detection of novel data including speech and cough audio, in addition to more traditional parameters (blood pressure, SpO2). Our goal has been to use this data to predict and treat acute exacerbations of COPD early to prevent hospitalizations. However, to date, we have not been successful. Neither have others working in this field. With support from Sunnybrook AFP, in a pilot feasibility sub-study, we propose adding and evaluating home oscillometry to our prediction models

Other Investigators: Gershon, Andrea (Principal Investigator), Wu, Robert (Co-investigator), de Lara, Eyal (Co-investigator), Maksym, Geoff (Co-investigator), Tran, Jake (Co-investigator)

Funding Sources

- Sunnybrook Health Sciences Centre (Toronto, ON): Alternative Funding Program (2024/3 - 2026/3 Total: \$157,100.00 (Canadian dollar) Received: \$35,000.00 (Canadian dollar), (competitive)

Principal Investigator, Grant, Chatbots for Patient Intake (Awarded) Jan. 2024 - Jan. 2025

Project Description: This research project aims to improve the patient experience and enhance healthcare efficiency within primary care settings. In response to concerns about extended wait times, especially in emergency rooms and walk-in clinics, our initiative centres on developing a user-friendly Medical AI Assistant, powered by ChatGPT technology. This Medical AI assistant will engage patients in a conversation to gather relevant information. Subsequently, it will generate a concise and comprehensive summary for doctors to review before patient

consultations. Additionally, the application will provide essential insights about any medications mentioned, aiding doctors in making informed decisions

Funding Sources

- Mathematics of Information Technology and Complex Systems (MITACS): Accelerate International (2024/1 - 2025/1 Total: \$30,000.00 (Canadian dollar) Received: \$30,000.00 (Canadian dollar), (competitive)

Principal Investigator, Grant, Connected, at-Home, Accessible Remote Monitoring in COPD (CHARM-COPD): A Program of Care in COPD Involving Virtual Pulmonary Rehabilitation, Integrated Care and Remote Clinical Monitoring (Awarded) Jul. 2023 - Jul. 2024

Project Description: Our collaboration to create a scalable Program of Care (CHARM-COPD) for people with COPD combines new initiatives at Toronto Grace Health Centre, University Health Network, and the University of Toronto. We will create and evaluate a comprehensive program that is feasible and acceptable to COPD patients. CHARM-COPD consists of Virtual Pulmonary Rehabilitation with a respirologist, Remote Clinical Monitoring, Integrated Care with close monitoring by nurses and therapists, and novel remote monitoring including continuous monitoring of activity, coughing and sleep. Our project aims to meet the needs of most COPD patients, including those impacted by frailty, low digital health literacy, lack of English language proficiency, and other issues that impact equitable access to care

Other Investigators: Wu, Robert (Principal Investigator), Tran, Jake (Principal Investigator), Gosse, Carolyn (Principal Investigator), Gershon, Andrea (Principal Investigator), Kilby-Lechman, Danielle (Co-investigator), Locquiao, Jhiffie (Co-investigator), Zaheen, Ahmad (Co-investigator), Blazer, Alina (Co-investigator), de Lara, Eyal (Co-investigator)

Funding Sources

- AGE-WELL and Canadian Frailty Network: Catalyst Funding Program in Healthy Aging (2023/7 - 2024/7 Total: \$50,000.00 (Canadian dollar) Received: \$1,000.00 (Canadian dollar), (competitive)

Co-investigator, Grant, Machine-Learning-Assisted Seizure Annotation User Interface (Awarded) Jul. 2023 - Nov. 2023

Project Description: Epilepsy is the most common serious neurological disorder in the world, affecting about 0.6% of the world's population, with a disproportionate effect on marginalized communities. Neurostimulation has emerged as another promising treatment for epilepsy, but devices that do this require invasive surgeries and produce limited improvements due to their simplistic approach to detecting seizures. To build machine learning models that do a better job of detecting seizures, it is necessary to collect large multi-modal datasets of patients having seizures and then have neurologists correctly label the seizure start and end times. This labeling process can be very arduous for neurologists. This project aims to develop a user-friendly interface that simplifies the process of labeling large datasets by enabling easy navigation through time series data and utilizing machine learning algorithms to suggest potential regions of interest to neurologists

Other Investigators: O'Leary, Gerard (Principal Investigator)

Funding Sources

- Mathematics of Information Technology and Complex Systems (MITACS): Accelerate (2023/7 - 2023/11 Total: \$7,500.00 (Canadian dollar) Received: \$100.00, (competitive)

Co-investigator, Grant, Can I Trust an AI Chatbot with My Sensitive Health Information? An Exploratory Study on the Impact of Cultural Influence on the Perception and Sharing of Sensitive Health Information with AI Chatbots (Awarded) Mar. 2023 - Jul. 2025

Project Description: Not all health information is highly sensitive, but the more health information a patient shares with their doctor, the fuller picture the doctor has to provide quality care. However, the scope of sensitive health information is still under debate. Despite guidelines surrounding protected health information (PHI), perceived sensitivity is

broader in concept and subjective in nature. These questions have become even more pressing with the rising prevalence of AI chatbots designed to converse with people about their health concerns. This proposal describes one study that sets the foundation for future research. In this study, surveys and interviews will be applied to shed light on two research questions: (1) What health information is considered sensitive by individuals from different cultural backgrounds? (2) What is the impact of culture and global trust on individual perception of personal health information sensitivity?

Other Investigators: Dong, Linying (Principal Investigator), Mudry, Jessica (Co-investigator), Crampton, Noah (Co-investigator)

Funding Sources

- Ryerson University (Ontario): Ted Rogers School of Management Research Advancement Grant (2023/3 - 2025/7 Total: \$15,000.00 (Canadian dollar) Received: \$1,000.00, (competitive)

Principal Investigator, Grant, Accessible Blood Pressure Estimation with Earbuds (Awarded) Feb. 2023 - Apr. 2025

Project Description: The objective of this proposal is to investigate the feasibility of using active noise-canceling earbuds to estimate a person's blood pressure during telehealth consultations. Using a new dataset that we will collect from human subjects spanning different degrees of cardiac health and blood pressure, we will investigate three approaches to blood pressure estimation: (1) we will adapt prior work that has leveraged chest phonocardiography to measure pulse wave velocity as a blood pressure proxy; (2) we will compute the difference in pulse arrival time to between the two earbuds to measure blood pressure via pulse transit time; and (3) we will use deep learning to analyze the earbud phonocardiogram and estimate blood pressure directly.

Other Investigators: Cafazzo, Joseph (Principal Investigator), Saha, Shumit (Co-investigator), Wang, Yuntao (Co-investigator), Ross, Heather (Co-investigator)

Funding Sources

- TRANSFORM HF: Seed Grant (2023/2 - 2025/4 Total: \$70,000.00 (Canadian dollar) Received: \$70,000.00 (Canadian dollar), (competitive)

Principal Investigator, Grant, Cognitive Assessments in Virtual Reality (Awarded) Jan. 2023 - Dec. 2023

Project Description: For this proposal, we will explore the use of virtual reality (VR) for cognitive assessments. Having complete control over a virtual environment will allow us to isolate the subject from distractions and deliver engaging stimuli that yield responses with greater dynamic range. Modern VR headsets also include physiological sensors that capture measures correlated with cognitive load, which will bear greater insight into how the subject feels as they complete a task. During the scope of this project, we intend on translating an existing tablet-based assessment to VR, deploying it to both healthy and clinically relevant cohorts, and then analyzing the sensor data to uncover potential biomarkers of cognition

Funding Sources

- Mathematics of Information Technology and Complex Systems (MITACS): Globalink (2023/1 - 2023/12 Total: \$12,000.00 (Canadian dollar) Received: \$12,000.00, (competitive)

Principal Investigator, Contract, Accessible Women's Health (Awarded) Nov. 2022 - Nov. 2027

Project Description: The excitement surrounding technology-mediated health tracking has led to the creation of designs that help menstruators track important aspects of their cycle to promote health awareness and intervention. However, multiple studies have identified design gaps such as prediction inaccuracy, gendered design, and a lack of promoting menstrual literacy. Our overarching goal is to create accurate and inclusive designs for menstrual health-tracking technologies. Our objectives to achieve this goal are as follows: (1) to create a framework with which we can create

predictive models for key aspects of menstruation using physiological and self-reported data; and (2) to identify important design considerations for menstrual health trackers that leverage the aforementioned data

Other Investigators: Truong, Khai (Principal Investigator)

Funding Sources

- Google: Unrestricted Gift (2022/11 - 2027/11 Total: \$266,300.00 (Canadian dollar) Received: \$266,300.00

Principal Investigator, Fellowship, Automatic Seizure Detection, Prediction, and Mitigation Using Minimally Invasive Implantable Bioelectrical Sensors (Completed) May 2022 - Jan. 2023

Project Description: Recent advances in neural implants by companies like NerveX Neurotechnologies have enabled the effective treatment of epilepsy. Identification and prediction of seizures from biosignals such as electroencephalography (EEG) data in real-time has high relevance to epilepsy management. Learning general representations of EEG data using unsupervised methods and then feeding these representations into classifiers that are specific to the individual could boost the performance of seizure detection and prediction. Combined with sampling techniques to address data imbalance problems, applying this method to machine learning classifiers such as a gradient tree boosting machine (GTBM) could improve existing seizure detection pipelines. This has significant applications for algorithms governing mobile anti-seizure implants

Other Investigators: O'Leary, Gerard (Principal Investigator)

Funding Sources

- Mathematics of Information Technology and Complex Systems (MITACS): Accelerate (2022/5 - 2023/1 Total: \$1,000.00 (Canadian dollar) Received: \$500.00, (competitive)

Principal Investigator, Grant, Capillary Refill Time Measurement Utilizing Mobile Application (CapApp) in Children (Completed) Jan. 2022 - Apr. 2023

Project Description: Our primary aim is to develop technology that provides an objective measure of capillary refill time through a mobile smartphone application. This application would quickly and accurately calculate the capillary refill time from the finger of the patient by using the smartphone camera and computer to record video of a fingertip and calculate the capillary refill time. The software will measure increments of change more accurately, precisely, and consistently than the human eye can distinguish when healthcare providers perform this test subjectively

Other Investigators: Strutt, Jonathan (Principal Investigator), Thompson, Matthew (Co-investigator), Patel, Shwetak (Principal Investigator)

Funding Sources

- University of Minnesota: Pediatric Device Innovation Consortium (2022/1 - 2023/4 Total: \$34,621.00 (United States dollar) Received: \$2,000.00, (competitive)

Principal Investigator, Contract, Accessible Women's Health (Awarded) Dec. 2021 - Dec. 2026

Project Description: The excitement surrounding technology-mediated health tracking has led to the creation of designs that help menstruators track important aspects of their cycle to promote health awareness and intervention. However, multiple studies have identified design gaps such as prediction inaccuracy, gendered design, and a lack of promoting menstrual literacy. Our overarching goal is to create accurate and inclusive designs for menstrual health-tracking technologies. Our objectives to achieve this goal are as follows: (1) to create a framework with which we can create predictive models for key aspects of menstruation using physiological and self-reported data; and (2) to identify important design considerations for menstrual health trackers that leverage the aforementioned data

Other Investigators: Truong, Khai (Principal Investigator)

Funding Sources

- Google: Unrestricted Gift (2021/12 - 2026/12 Total: \$200,000.00 (Canadian dollar) Received: \$200,000.00 (Canadian dollar)

**Principal Investigator, Grant, Continuous Passive Sensing for Bayesian Diagnostics in Mobile Health (Awarded)
Sep. 2021 - Sep. 2023**

Project Description: The long-term goal of my research program is to demonstrate that the combination of continuous passive sensing and explicit clinical assessments can produce proactive mHealth systems that are more accurate and efficient than mHealth systems employing either component on its own. Over the two-year term of this award, my research team will pursue a series of investigations, user studies, and deployments to create novel techniques that continuously track a person's behavior, symptoms, and physiology. We will innovate new ways of using passively sensed information to both trigger and improve the accuracy of clinical tests across health domains, such as stress and Parkinson's disease. Furthermore, we will be able to develop models that combine estimates from such tools to generate a holistic representation of the user's health in support of long-term disease management and adaptive interventions

Funding Sources

- University of Toronto: Connaught New Researcher Award (2021/9 - 2023/9 Total: \$20,000.00 (Canadian dollar) Received: \$20,000.00 (Canadian dollar), (competitive)

**Principal Investigator, Grant, Earbuds as a Sensing Platform for Physical and Mental Wellbeing (Completed)
Jun. 2021 - Jun. 2023**

Project Description: In this proposal, we seek to utilize earbuds as a convenient endpoint through which we can support people's physical and mental wellbeing. Newer models of earbuds include sensors for enhancing the user experience: proximity sensors for in-ear detection, accelerometers for orientation sensing, and microphones for active noise cancellation. We will explore how these sensors can be leveraged for portable physiological sensing and activity recognition. Our primary focus will be on utilizing the earbuds' microphones to record body sounds like coughing and tidal breathing. Continuous cough detection will enable us to report key symptoms related to influenza-like diseases like cough rate and productivity. Beyond using body sounds as continuous vital sign measurements, we will also monitor tidal breathing to provide guidance during meditation sessions. Lastly, we will use the earbuds' accelerometers for continuous posture sensing and to provide guidance during neck exercises

Other Investigators: Wang, Yuntao (Principal Investigator)

Funding Sources

- University of Toronto: University of Toronto – Tsinghua University Joint Research Fund (2021/6 - 2023/6 Total: \$40,000.00 (Canadian dollar) Received: \$20,000.00 (Canadian dollar), (competitive)

**Principal Investigator, Grant, Continuous Passive Sensing for Bayesian Diagnostics in Mobile Health (Awarded)
Apr. 2021 - Apr. 2026**

Project Description: The long-term goal of my research program is to demonstrate that the combination of continuous passive sensing and explicit clinical tests can produce proactive mHealth systems that are more accurate and efficient than mHealth systems with either component on its own. Over the next five years, my research team will pursue a series of investigations, user studies, and deployments to create novel techniques that continuously track a person's behavior, symptoms, and physiology. We will innovate new ways of using passively sensed information to both trigger and improve the accuracy of clinical tests across health domains, including stress, Parkinson's disease, and infectious respiratory illnesses. Furthermore, we will be able to develop models that combine estimates from such tools to generate a holistic representation of the user's health for long-term disease management and adaptive interventions

Funding Sources

- Natural Sciences and Engineering Research Council of Canada (NSERC): Discovery Grant (Early Career Researcher) #RGPIN-2021-03457 (2021/4 - 2026/4 Total: \$132,500.00 (Canadian dollar) Received: \$132,500.00 (Canadian dollar), (competitive)

Principal Investigator, Grant, Extending the Use of Time-of-Flight Cameras for Mobile Health (Awarded)
Nov. 2020 - Nov. 2022

Project Description: Research in mobile health (mHealth) has primarily focused on the sensors that have been on standard smartphones over the past decade: IMUs, microphones, and cameras. The goal of this proposal is to leverage the time-of-flight (ToF) sensor embedded in some modern smartphones for mHealth. The ToF camera provides rich spatial information that can overcome many limitations of past computer vision-based apps. This proposal will produce two mHealth applications that highlight different strengths of the ToF camera. The first application will leverage the fact that the ToF camera can objectively measure length, area, and volume to detect instances of craniosynostosis—skull deformation that can happen during infant development. The second application will leverage the ability of ToF cameras to track 3D motion to quantify the severity of Parkinsonian tremor. These approaches will be generalizable to other problem settings, enabling new applications for the latest smart-phone technologies

Other Investigators: Brudno, Michael (Principal Investigator), Taati, Babak (Principal Investigator)

Funding Sources

- University of Toronto: Mobile AI Innovation Lab (2020/11 - 2022/11 Total: \$193,000.00 (Canadian dollar) Received: \$45,000.00, (competitive)

Principal Applicant, Contract, University of Toronto Startup Funds (Awarded) **Aug. 2020 - Aug. 2025**

Funding Sources

- University of Toronto: Startup Funds (2020/8 - 2025/8 Total: \$600,000.00 (Canadian dollar) Received: \$600,000.00

Principal Applicant, Fellowship, Qualcomm Innovation Fellowship (Completed) **Sep. 2016 - Sep. 2017**

Other Investigators: Li, Hanchuan (Principal Applicant)

Funding Sources

- QUALCOMM Incorporated (USA): Innovation Fellowship (2016/9 - 2017/9 Total: \$100,000.00 (United States dollar) Received: \$50,000.00, (competitive)

Principal Applicant, Fellowship, National Science Foundation Graduate Research Fellowship (Completed) **Sep. 2015 - Sep. 2018**

Funding Sources

- National Science Foundation (USA): Graduate Research Fellowship (2015/9 - 2018/9 Total: \$102,000.00 (United States dollar) Received: \$102,000.00, (competitive)

ACTIVITIES

TEACHING ACTIVITIES

Courses Taught

Instructor, Winter CSC 318: Design of Interactive Computational Media **Jan. 9, 2024 - Apr. 4, 2024**

Computer Science, University of Toronto, Ontario, Canada, Academic

Undergraduate, Number of Students: 118

Lecture Hours Per Week: 2, Lab Hours Per Week: 2

Instructor: Computing for Medicine **Nov. 1, 2023 - Mar. 27, 2024**

Medicine, University of Toronto, Ontario, Canada, Academic

College, Number of Students: 10

Lecture Hours Per Week: 3

Instructor, Fall CSC 2526: Topics in HCI and Ubiquitous Computing: Mobile Health Sep. 7, 2023 - Dec. 6, 2023

Computer Science, University of Toronto, Ontario, Canada, Academic

Graduate, Number of Students: 15

Lecture Hours Per Week: 2

Instructor, Winter CSC 2526: Topics in HCI and Ubiquitous Computing: Mobile Health Jan. 9, 2023 - Apr. 7, 2023

Computer Science, University of Toronto, Ontario, Canada, Academic

Graduate, Number of Students: 10

Lecture Hours Per Week: 2

Instructor, Winter CSC 318: The Design of Interactive Computational Media Jan. 9, 2023 - Apr. 7, 2023

Computer Science, University of Toronto, Ontario, Canada, Academic

Undergraduate, Number of Students: 120

Lecture Hours Per Week: 2, Lab Hours Per Week: 2

Instructor, C4M: Computing for Medicine Sep. 14, 2022 - Apr. 12, 2023

Medicine, University of Toronto, Ontario, Canada, Academic

College, Number of Students: 10

Lecture Hours Per Week: 3

Instructor, Winter CSC 2526: Topics in HCI and Ubiquitous Computing: Mobile Health Jan. 10, 2022 - Apr. 11, 2022

Computer Science, University of Toronto, Ontario, Canada, Academic

Graduate, Number of Students: 30

Lecture Hours Per Week: 2

Instructor, Winter CSC 318: The Design of Interactive Computational Media Jan. 10, 2022 - Apr. 8, 2022

Computer Science, University of Toronto, Ontario, Canada, Academic

Undergraduate, Number of Students: 110

Lecture Hours Per Week: 2, Lab Hours Per Week: 2

Instructor, C4M: Computing for Medicine Sep. 9, 2021 - Apr. 11, 2022

Medicine, University of Toronto, Ontario, Canada, Academic

College, Number of Students: 10

Lecture Hours Per Week: 3

Instructor, Spring EE 590A: Advanced Topics in Ubiquitous Computing Mar. 29, 2018 - Jun. 7, 2018

Electrical Engineering, University of Washington, Washington, United States, Academic

Ubiquitous computing, Graduate, Number of Students: 35

Lecture Hours Per Week: 2, Tutorial Hours Per Week: 1

Course Development

Course Developer, Advanced Topics in Ubiquitous Computing

Mar. 29, 2018

Electrical Engineering, University of Washington, Washington, United States, Academic

The aim of this class is to introduce students to ubiquitous computing (ubicomp). The content focuses on how traditional topics of computing have evolved to support the vision of a connected, portable, and human-centric computing environment. Because ubicomp is an applied field, the course covers contributions across various fields: human-computer interaction, embedded computing, computer vision, distributed systems, machine learning, and electrical engineering. Students gain practical experience in developing sensing systems for activity recognition and gestural interaction. The course is a combination of lectures, tutorials, class discussions, and demonstrations. Occasional tutorials on necessary skills are provided in the first half of the class-time (e.g., Android and Arduino programming). The rest of the class time is used for discussions on the required readings, Co-developers: Wang, Edward

Program Development

Program, Computing for Medicine

Oct. 2021

School of Medicine, University of Toronto, Ontario, Canada, Academic

C4M is a certificate program designed for medical students and professionals to learn about programming, data science, and machine learning

Unique / innovative characteristics: This content is unique in that all the materials are grounded in examples related to healthcare. The lectures are also highly interactive because they incorporate Jupyter notebooks hosted on Google Colab, allowing learners to work with code in real time with minimal setup requirements on their computers.

SUPERVISORY ACTIVITIES

Student/Postdoctoral Supervision

Principal Supervisor: Gerard O'Leary, Physiological Monitoring in Dogs Using Novel Collar-based Hardware, (Postdoctoral Student)

Aug. 2023 - Jun. 2024

Post-doctorate, In Progress (Feb. 2023 - Jan. 2025)

University of Toronto, University of Toronto

Student Country of Citizenship: Ireland

Principal Supervisor: Salaar Liaqat, Health Sensing using Smartwatches and Smartphones: Implications of Data Collection Design, (PhD Student)

Sep. 2022 - Jun. 2024

Doctorate, In Progress (Jan. 2020)

University of Toronto, University of Toronto

Student Country of Citizenship: Canada

Other Supervisors

- de Lara, Eyal (Co-Supervisor)

Principal Supervisor: Andrii Lenyshyn, Cognitive Assessments in Virtual Reality, (PhD Student) May 2022 - Apr. 2028

Doctorate, In Progress (Oct. 2023)

University of Toronto, University of Toronto

Student Country of Citizenship: Ukraine

Principal Supervisor: Filip Miscevic, Automatic Seizure Detection, Prediction, and Mitigation Using Minimally Invasive Implantable Bioelectrical Sensors, (PhD Student) Mar. 2022 - Jan. 2023

Master's Thesis, Completed (Jan. 2022 - Jan. 2023)

University of Toronto

Student Country of Citizenship: Canada

Other Supervisors

- O'Leary, Gerard (Co-Supervisor)

Principal Supervisor: Dhruv Verma, Accessible, Single-shot Multispectral Imaging, (PhD Student) Sep. 2021 - Apr. 2026

Doctorate, In Progress (Sep. 2021)

University of Toronto, University of Toronto

Student Country of Citizenship: India

Principal Supervisor: Sejal Bhalla, Continuous Monitoring of Chronic Obstructive Pulmonary Disease in the Wild, (PhD Student) Sep. 2021 - Apr. 2026

Doctorate, In Progress (Sep. 2021)

University of Toronto, University of Toronto

Student Country of Citizenship: India

Other Supervisors

- de Lara, Eyal (Co-Supervisor)

Principal Supervisor: Ken Christofferson, Accessible Multimodal Blood Pressure Estimation, (PhD Student) Sep. 2021 - Apr. 2025

Doctorate, In Progress (Sep. 2021)

University of Toronto, University of Toronto

Student Country of Citizenship: United States

Other Supervisors

- Cafazzo, Joe (Co-Supervisor)

Co-Supervisor: Georgianna Lin, Accurate, Inclusive, and Accessible Menstrual Tracking, (PhD Student) Sep. 2021 - Apr. 2025

Doctorate, In Progress (Sep. 2021)

University of Toronto, University of Toronto

Student Country of Citizenship: United States

Student Recognitions

- Prize / Award, PhD Fellowship (2023/9), Google, Private Sector, \$0.00

- Prize / Award, Wolfond Scholarship in Wireless Information Technology (2020 - 2023, University of Toronto, Ontario, Canada, Academic, \$0.00)

Other Supervisors

- Truong, Khai (Co-Supervisor)

Co-Supervisor: Ian Ruffolo, Augmented Reality Guidance for Smartphone-based Motor Assessments, (PhD Student) Jun. 2021 - Jan. 2023

Doctorate, In Progress (Jan. 2021)

University of Toronto, University of Toronto
Student Country of Citizenship: Canada
Other Supervisors
- Brudno, Michael (Co-Supervisor)

Co-Supervisor: Brenna Li, Design Considerations for Chatbots Facilitating Patient-Physician Conversations, (PhD Student) Aug. 2020 - Apr. 2024

Doctorate, In Progress (Feb. 2020)
University of Toronto, University of Toronto
Student Country of Citizenship: Canada
Student Recognitions
- Prize / Award, Canada Graduate Scholarship (2022 - 2025, Natural Sciences and Engineering Research Council of Canada (NSERC), Ontario, Canada, Federal Government, \$0.00
Other Supervisors
- Truong, Khai (Principal Supervisor)

ADMINISTRATIVE ACTIVITIES

Event Administration

Posters & Demos Co-Chair, Conference, ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp) (Oct. 2023 - Oct. 2023) Feb. 2023 - Oct. 2023

Co-Organizer, Workshop, Workshop on Integrating Individual and Social Contexts into Self-Reflection Technologies (Apr. 2023 - Apr. 2023) Nov. 2022 - Apr. 2023
Primary Event Organizer: ACM Conference on Human Factors in Computing Systems (CHI)

Co-Organizer, Workshop, Workshop on Emerging Devices for Digital Biomarkers (DigiBiom) (Jul. 2022 - Jul. 2022) Feb. 2022 - Jul. 2022
Primary Event Organizer: ACM International Conference on Mobile Systems, Applications, and Services (MobiSys)

Online Conference Co-Chair, Conference, ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp) (Sep. 2020 - Sep. 2020) Jun. 2020 - Sep. 2020

Video Preview Co-Chair, Conference, ACM Conference on Human Factors in Computing Systems (CHI) (Apr. 2019 - Apr. 2019) Jan. 2019 - Apr. 2019

Founder and Co-Organizer, Workshop, DUB (Design, Use, Build) Doctoral Colloquium (Apr. 2017 - Apr. 2017) Jan. 2017 - Apr. 2017

Organizer, Workshop, National Science Foundation Graduate Research Fellowship Information Session and Workshop (Sep. 2016 - Sep. 2018) Sep. 2016 - Sep. 2018

ADVISORY ACTIVITIES

Mentoring Activities

Mariakakis, Alex

January 17, 2025

Mentor

Aug. 2022 - Apr. 2023

University of Toronto, Ontario, Canada, Academic

Jose S, Kaur R, Kondoor A, Chan Z, Number of Mentorees: 4, Project advisor for Biomedical Incubator Capstone Project (JPM400Y)

Mentor

Aug. 2021 - Apr. 2022

University of Toronto, Ontario, Canada, Academic

Liu I; Maher A; Li B, Number of Mentorees: 3, Project advisor for Biomedical Incubator Capstone Project (JPM400Y)

ASSESSMENT AND REVIEW ACTIVITIES

Journal Review Activities

Reviewer (Double Blind)

Jan. 2024

ACM Journal on Computing and Sustainable Societies, Number of Works Reviewed / Refereed: 1

Reviewer (Blind)

Jul. 2021

Journal of Medical Internet Research (JMIR), Number of Works Reviewed / Refereed: 3

Reviewer (Double Blind)

Mar. 2019

ACM Transactions on Computer-Human Interaction (TOCHI), Number of Works Reviewed / Refereed: 1

Reviewer (Double Blind)

Feb. 2017

Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), Number of Works Reviewed / Refereed: 74

Reviewer (Blind)

Oct. 2015

IEEE Pervasive Computing, Number of Works Reviewed / Refereed: 4

Reviewer (Blind)

Dec. 2019 - Dec. 2019

IEEE Sensors, Number of Works Reviewed / Refereed: 1

Reviewer (Double Blind)

Nov. 2018 - Nov. 2018

Biomedical Optics Express, Number of Works Reviewed / Refereed: 1

Reviewer (Double Blind)

May 2018 - Jul. 2018

ACM Conference on Computer Supported Cooperative Work (CSCW), Number of Works Reviewed / Refereed: 1

Conference Review Activities

Reviewer, Blind

Jul. 2024

International Conference on Body Sensor Networks (BSN), Number of Works Reviewed / Refereed: 5

Reviewer, Double Blind

Jul. 2020

International Symposium on Wearable Computers (ISWC), Number of Works Reviewed / Refereed: 1

Reviewer, Double Blind

Nov. 2016

ACM Conference on Human Factors in Computing Systems (CHI), Number of Works Reviewed / Refereed: 64

Reviewer, Double Blind**Jun. 2019 - Jun. 2022**

ACM Human-Computer Interaction with Mobile Devices and Services (MobileHCI), Number of Works Reviewed / Refereed: 16

Reviewer, Double Blind**Jan. 2018 - Feb. 2020**

ACM Conference on Human Factors in Computing Systems, Late Breaking Work (CHI LBW), Number of Works Reviewed / Refereed: 13

Reviewer, Double Blind**Aug. 2017 - Sep. 2017**

IEEE Virtual Reality and 3D User Interfaces (VR), Number of Works Reviewed / Refereed: 1

Reviewer, Double Blind**Apr. 2016 - Apr. 2016**

ACM Symposium on Applied Perception (SAP), Number of Works Reviewed / Refereed: 1

Reviewer, Double Blind**Apr. 2015 - Jun. 2022**

ACM User Interface Software and Technology (UIST), Number of Works Reviewed / Refereed: 24

Reviewer, Double Blind**Apr. 2015 - May 2016**

ACM Ubiquitous Computing (UbiComp), Number of Works Reviewed / Refereed: 8

Graduate Examination Activities**PhD Oral Exam Member, Filip Miscevic****Oct. 2024**

Biomedical Engineering, University of Toronto, Ontario, Canada, Academic

PhD Oral Exam Member, Zain Hasan**Jul. 2024**

Biomedical Engineering, University of Toronto, Ontario, Canada, Academic

PhD Oral Exam Member, Samantha Unger**Jul. 2024**

Biomedical Engineering, University of Toronto, Ontario, Canada, Academic

PhD Oral Exam Member, You Zhi Hu**Oct. 2023**

Mechanical & Industrial Engineering, University of Toronto, Ontario, Canada, Academic

PhD Oral Exam Member, Deniz Jafari**Oct. 2023**

Biomedical Engineering, University of Toronto, Ontario, Canada, Academic

Master's Oral Exam Member, Rawad Alkallas**Jun. 2023**

Biomedical Engineering, University of Toronto, Ontario, Canada, Academic

PhD Oral Exam Member, Yan Li**Mar. 2023**

Mechanical & Industrial Engineering, University of Toronto, Ontario, Canada, Academic

PhD Oral Exam Member, Antonia Barbaric**Feb. 2023**

Mariakakis, Alex	January 17, 2025
<i>Institute of Health Policy, Management and Evaluation, University of Toronto, Ontario, Canada, Academic</i>	
PhD Oral Exam Member, Kian Kianpisheh	Dec. 2022
<i>Computer Science, University of Toronto, Ontario, Canada, Academic</i>	
PhD Oral Exam Chair, Yasaman Rohanifar	Oct. 2022
<i>Computer Science, University of Toronto, Ontario, Canada, Academic</i>	
PhD Oral Exam Member, Yi Zhu	Aug. 2022
<i>Computer Science, Institut national de la recherche scientifique, Quebec, Canada, Academic</i>	
PhD Oral Exam Chair, Ananya Bhattacharjee	Mar. 2022
<i>Computer Science, University of Toronto, Ontario, Canada, Academic</i>	
Master's Proposal Defense Member, Sepehr Hosseini Khorasgani	Oct. 2024 - Jan. 2025
<i>Computer Science, University of Toronto, Ontario, Canada, Academic</i>	
PhD External Examiner, Saba Kheirinejad	Sep. 2024 - Nov. 2024
<i>Center for Ubiquitous Computing, University of Oulu, Finland, Academic</i>	
Master's Oral Exam Member, Mandeep Malhotra	Aug. 2024 - Sep. 2024
<i>Mechanical & Industrial Engineering, University of Toronto, Ontario, Canada, Academic</i>	
Master's Oral Exam Member, Gurnish Sidora	Jul. 2024 - Sep. 2024
<i>Biomedical Engineering, University of Toronto, Ontario, Canada, Academic</i>	
Master's Oral Exam Member, Yixin Guan	Jul. 2024 - Sep. 2024
<i>Faculty of Information, University of Toronto, Ontario, Canada, Academic</i>	
Master's Proposal Defense Member, Jenny Yu	Mar. 2024 - Apr. 2024
<i>Computer Science, University of Toronto, Ontario, Canada, Academic</i>	
PhD External Examiner, Mo Zhang	Feb. 2024 - Nov. 2024
<i>Computer Science, University of Birmingham, United Kingdom, Academic</i>	
PhD Oral Exam Member, Atsuhiko Hibi	Feb. 2024 - Aug. 2024
<i>Medical Imaging, University of Toronto, Ontario, Canada, Academic</i>	
Master's Oral Exam Member, Alyssia Sanchez	Feb. 2023 - Sep. 2024
<i>Biomedical Engineering, University of Toronto, Ontario, Canada, Academic</i>	
PhD External Reader, Pedro Elkind Velmovitsky	Feb. 2023 - Jul. 2023
<i>Public Health and Health Systems, University of Waterloo, Ontario, Canada, Academic</i>	
Master's Oral Exam Chair, Caroline Malin-Mayor	Aug. 2022 - Aug. 2023
<i>Computer Science, University of Toronto, Ontario, Canada, Academic</i>	

Master's Oral Exam Chair, Sam Osia <i>Biomedical Engineering, University of Toronto, Ontario, Canada, Academic</i>	Oct. 2021 - Nov. 2022
PhD Oral Exam Member, Saeid Alavi Naeini <i>Biomedical Engineering, University of Toronto, Ontario, Canada, Academic</i>	Oct. 2021 - Sep. 2022
PhD Oral Exam Member, Sujay Nagaraj <i>Computer Science, University of Toronto, Ontario, Canada, Academic</i>	Aug. 2021 - Sep. 2024
Master's Proposal Defense Member, Eric Lu <i>Computer Science, University of Toronto, Ontario, Canada, Academic</i>	Jun. 2021 - Sep. 2021
Master's Proposal Defense Chair, Navid Korhani <i>Computer Science, University of Toronto, Ontario, Canada, Academic</i>	Jun. 2021 - Sep. 2021
PhD Oral Exam Member, Chunjong Park <i>Computer Science and Engineering, University of Washington, Washington, United States, Academic</i>	Mar. 2021 - Jun. 2021
Master's Oral Exam Chair, Minfan Zhang <i>Computer Science, University of Toronto, Ontario, Canada, Academic</i>	Nov. 2020 - Apr. 2022
Research Funding Application Assessment Activities	
External Reviewer, Funder, Academic Reviewer <i>Natural Sciences and Engineering Research Council of Canada (NSERC), Ontario, Canada, Federal Government</i> Discovery Grant, Number of Applications Assessed: 1	Dec. 2024
Committee Member, Funder, Academic Reviewer <i>Mitacs</i> Accelerate Program, Number of Applications Assessed: 2	Sep. 2022
Committee Member, Funder, Academic Reviewer <i>Schmidt Sciences</i> Schmidt AI in Science Postdoc Fellowship, Number of Applications Assessed: 10	Oct. 2024 - Nov. 2024
External Reviewer, Funder, Academic Reviewer <i>UofT - Singapore Management University Strategic Partnerships</i> Joint Call for Collaborative Projects, Number of Applications Assessed: 1	Oct. 2024 - Oct. 2024
External Reviewer, Funder, Academic Reviewer <i>Swiss National Science Foundation</i> Section Projects, Number of Applications Assessed: 1	May 2024 - May 2024
Committee Member, Funder, Academic Reviewer <i>TRANSFORM HF</i>	Jan. 2024 - Feb. 2024

Seed Grant Program, Number of Applications Assessed: 5

PARTICIPATION ACTIVITIES

Event Participation

Mentor, Workshop, Health AI Systems Thinking for Equity (HASTE) Workshop & Networking Event (Oct. 2024 - Oct. 2024)

Knowledge and Technology Translation

Presenter

Mar. 2022 - Mar. 2022

Community Engagement, Pursue STEM, General Public

Outcome / Deliverable: My graduate students and I led a three-hour session related to applications of computer vision in health. The high school students had the chance to try out various image processing and deep learning techniques through catered code that was provided to them ahead of time. We also delivered two presentations related to our group's research and the intersection of health + CS more broadly.

Activity Description: Pursue STEM is an outreach program that encourages and supports Black high school students interested in science, technology, engineering, and math (STEM). The program is delivered in partnership with the Lifelong Leadership Institute which offers the Leadership by Design (LBD) program. The LBD program provides innovative leadership development opportunities to promising Black youth in the Greater Toronto Area. Students enter the LBD program in their Grade 10 year and progress lockstep through subsequent grades as a distinct cohort. Hence, the LBD program is a multi-year and multi-layered program.

Course Consultant

Oct. 2017 - Dec. 2017

Consulting for Industry, Microsoft, Industry/Business (>500 employees), <https://www.edx.org/course/introduction-todevice-programming>

Outcome / Deliverable: I helped create Microsoft edX's course called "Introduction to Device Programming". I provided input on many of the course modules, but I specifically created Module 2 on the basics of the C programming language.

Activity Description: Microsoft offers introductory online courses for people who are interested in learning a new skill in computer science. I was recruited by Kasey Champion, a member of Microsoft's Learning Team, to provide input on a course related to device programming. This course includes overviews of Arduino, the C programming language, simple circuits, and integrating Arduino with Azure Cloud resources

Presenter / Mentor

Mar. 2017 - Mar. 2019

Community Engagement, National Center for Women & Information Technology, Academic Personnel, <https://www.aspirations.org/aspirations-community/washington-seattle-and-west>

Outcome / Deliverable: As a graduate student, I led our research group's involvement with the NCWIT. We had at least 5 female interns from middle or high school complete summer internships with our research group, and I specifically mentored three of those individuals. Additionally, I have provided demonstrations at the NCWIT award ceremonies, which taught students and their parents about applications of computer science.

Activity Description: The National Center for Women & Information Technology (NCWIT) is a nonprofit designed to increase the meaningful participation of girls and women in computing. Our research group has worked with middle and high school women who have later received awards from the NCWIT. We have also provided demonstrations at the NCWIT award ceremony, which has both taught attendees about applied topics in computer science and allowed us to recruit talented girls and women for summer internships.

Lecturer**Jul. 2016 - Jul. 2017**

Community Engagement, Seattle-Area High School Teachers, Academic Personnel,
<https://news.cs.washington.edu/2016/07/10/10th-anniversary-of-uw-cses-cs4hs/> <https://cs4teachers.cs.washington.edu>

Outcome / Deliverable: I taught a lecture in the program that introduced the teachers to the fields of human-computer interaction and ubiquitous computing. The lectures also included demonstrations of concepts and technologies that could be reproduced in their classrooms

Activity Description: The University of Washington's CS4HS program is designed to teach local high school teachers about the importance of computer science and help them identify ways that they could expose their students to the field before their students graduate

Presenter**Jun. 2016 - Jun. 2016**

Community Engagement, Government Personnel, <https://news.cs.washington.edu/2016/06/18/sen-maria-cantwell-uwcse>

Outcome / Deliverable: I provided demonstrations and presentations on applications of computer science for mobile health and interaction. The work included my own PhD research and that of my colleagues

Activity Description: Senator Maria Cantwell visited the Department of Computer Science and Engineering to learn about how the state government's funding of the University of Washington has led to new innovations that have broad impacts outside of academia

Researcher**Feb. 2016 - Jul. 2017**

Involvement in/Creation of Start-up, Senosis Health, Industry/Business-Small (<100 employees),
<https://www.geekwire.com/2017/exclusive-google-buys-seattle-health-monitoring-startup-senosis-bolstering-digital-health-push>

Outcome / Deliverable: Senosis Health was acquired by Google in July 2017. My project on scleral jaundice (BiliScreen) was part of the intellectual property included in the agreement

Activity Description: Senosis Health is a startup created by my PhD advisor for his research group's mobile health research. Senosis was acquired by Google in July 2017 to help with their endeavors in digital health

Presenter**Sep. 2015 - Sep. 2015**

Community Engagement, University of Washington Foundation, Academic Personnel,
<https://news.cs.washington.edu/2015/09/15/changing-the-world-faculty-and-students-demonstrate-cses-impact-to-theuw-foundation-board>

Outcome / Deliverable: I provided demonstrations and presentations on applications of computer science for mobile health and interaction. The work included my own PhD research and that of my colleagues

Activity Description: The University of Washington Foundation is a group of alumni and other major donors to the University. The Department of Computer Science and Engineering held an event where graduate students working on particularly impactful projects were asked to present their work to members of the Foundation

Presenter**Nov. 2014 - Dec. 2018**

Community Engagement, DawgBytes Program, General Public, <https://www.cs.washington.edu/outreach/k12>

Outcome / Deliverable: As a graduate student, I organized, led, and presented our research group's booth at the yearly DawgBytes Computing Open House event

Activity Description: The DawgBytes Program is the official K-12 outreach program for the School of Computer Science and Engineering at the University of Washington. One of the events that DawgBytes holds every year is the Computer Open House where children and their parents can come on campus to learn more about computer science

Presenter**Apr. 2014 - Apr. 2018**

Community Engagement, Engineering Discovery Days Program, General Public,
<https://www.engr.washington.edu/about/k12/discovery-days>

Outcome / Deliverable: As a graduate student, I organized, led, and presented our research group's booth at the yearly Engineering Discovery Days event

Activity Description: The Engineering Discovery Days Program is the official K-12 outreach program for the School of Engineering at the University of Washington. Every April, the program organizes a 2-day event where students visit the campus to learn about and experience real-world applications of different disciplines in engineering

International Collaboration Activities**Co-Founder and Mentor****Jul. 2020 - Sep. 2021***China*

I helped co-found and organize the Access Computing Summer Program, a program sponsored by the Global Innovation Exchange as part of a long-term collaboration between the University of Washington and Tsinghua University. The program is targeted towards senior undergraduate and junior graduate students in the United States and China who are interested in developing research skills in ubiquitous computing and human-computer interaction. The students in this program not only receive guidance on a summer project, but also regularly attend group meetings, guest lectures, and workshops to expand their knowledge base (virtually due to COVID-19)

Mentor**Sep. 2018 - Oct. 2018***Singapore*

The Broadening Participation Workshop at the ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp) aims to increase the involvement of women, all researchers from developing countries, as well as underrepresented minorities, including persons with disabilities, in the field of ubiquitous and wearable computing

MEMBERSHIPS**Committee Memberships****Committee Member, Workshop Program Committee****May 2024 - Oct. 2024***Workshop on Computing for Well-Being (WellComp), Academic***Committee Member, Technical Program Committee****May 2024 - Oct. 2024***IEEE-EMBS International Conference on Body Sensor Networks (IEEE BSN), Academic***Committee Member, Workshop Program Committee****May 2023 - Oct. 2023***Workshop on Computing for Well-Being (WellComp), Academic***Committee Member, Health Program Subcommittee****Sep. 2022 - Jan. 2025***ACM Conference on Human Factors in Computing Systems (CHI), Academic***Committee Member, Workshop Program Committee****Jul. 2022 - Nov. 2022***Workshop on Urban Sensor Networks (USN), Academic*

Mariakakis, Alex	January 17, 2025
Committee Member, Posters/Demo Program Committee <i>ACM Conference on Embedded Networked Sensor Systems (SenSys), Academic</i>	Jul. 2022 - Nov. 2022
Committee Member, Workshop Program Committee <i>Workshop on Computing for Well-Being (WellComp), Academic</i>	Jul. 2022 - Sep. 2022
Co-chair, Editorial Board <i>Digital Public Health Surveillance: Methods, Approaches and Challenges (Digital Frontiers Issue), Academic</i>	Apr. 2022 - Oct. 2023
Co-chair, Posters & Notes Committee <i>ACM SIGCAS Computing and Sustainable Societies (COMPASS), Academic</i>	Feb. 2022 - Jul. 2022
Committee Member, Workshop Program Committee <i>Workshop on Emerging Devices for Digital Biomarkers (DigiBiom), Academic</i>	May 2021 - Jun. 2021
Committee Member, Editorial Board <i>Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), Academic</i>	Feb. 2021 - Feb. 2027
Committee Member, Editorial Board <i>ACM International Conference on Mobile Human-Computer Interaction (MobileHCI), Academic</i>	Jan. 2021 - May 2022
Committee Member, Interaction Techniques Program Subcommittee <i>ACM Conference on Human Factors in Computing Systems (CHI), Academic</i>	Sep. 2020 - Dec. 2020
Committee Member, Late-Breaking Works Program Committee <i>ACM Conference on Human Factors in Computing Systems (CHI), Academic</i>	Jan. 2020 - Feb. 2020
Committee Member, Program Committee <i>ACM Symposium on User Interface Software and Technology (UIST), Academic</i>	Apr. 2019 - Jul. 2019
Committee Member, Workshop Program Committee <i>International Workshop on Ubiquitous Personal Assistance (UPA), Academic</i>	Jul. 2018 - Aug. 2019

Other Memberships

Member <i>Institute for Pandemics, Academic</i> University of Toronto's Institute for Pandemics is one of the world's first academic centers dedicated exclusively to preventing, preparing for, fighting, and recovering from pandemics. The Institute draws from the University's diverse expertise to incorporate complex skill sets, from epidemiology, mathematical modelling, medicine, evolutionary biology, social sciences, pharmacy, management, engineering, to health economics and many other disciplines to address the multidimensional challenges of pandemics	Mar. 2023
Member <i>TRANSFORM HF, Health</i>	Jan. 2023

TRANSFORM HF is an Institutional Strategic Initiative created in joint support and partnership with the University of Toronto and the Ted Rogers Centre for Heart Research. TRANSFORM HF aims to build, support, and seed fund a community of engineers, scientists and clinicians who will work in tandem with Indigenous health experts and patients to develop point-of-care diagnostics, wearables, and AI technologies to monitor and proactively treat people with heart failure in their homes – and empower them to be more active in their own care

Member**Oct. 2021**

Data Sciences Institute – University of Toronto, Academic

The Data Sciences Institute (DSI) is a multi-divisional, tri-campus, multidisciplinary hub for data science activity at the University of Toronto. The DSI facilitates research connections, fosters innovation, and enhances teaching and learning in data sciences, including in emerging data-driven disciplines with a highly collaborative, inclusive approach

Member**Dec. 2020**

Temerty Centre for Artificial Intelligence Research and Education in Medicine (T-CAIREM), Academic

University of Toronto's T-CAIREM seeks to establish world-class educational programs in AI in medicine, fund research opportunities that bring together experts from a range of disciplines, and create a secure data platform to house datasets for applied AI learning and research

MOST SIGNIFICANT CONTRIBUTIONS

1. Mariakakis, Alex. (2021, October). Speech Analysis for Respiratory Health.
Speech production is a complex motor task that involves the precise coordination of orofacial, laryngeal, pharyngeal, and respiratory muscles. As a person speaks, airflow from the lungs gets modulated by the vocal folds in the larynx and is further shaped by the articulators within the vocal tract to produce sound. Given the critical role of respiratory support in this process, respiratory impairment can lead to notable alterations in vocal characteristics. My group has leveraged the microphones embedded in smartphones and wearables in tandem with deep learning models to generate digital biomarkers from speech
2. Mariakakis, Alex. (2021, October). Improving Menstrual Tracking.
Menstrual tracker apps often reduce users to the same experience: a cisgender woman with a consistent 30-day cycle who solely seeks to know when she will next menstruate. These assumptions can lead trackers to provide inaccurate information that causes body-related anxiety or false complacency in one's health. Therefore, my group is pursuing a holistic menstrual health tracker that leverages wearable sensor data (e.g., glucose, skin temperature, activity) to provide menstruators with accurate and actionable health insights. We have generated design recommendations for future menstrual trackers that accommodate diverse menstrual literacy and information-seeking goals. We have also applied statistical analyses and machine learning to the multimodal sensor data to derive new health insights
3. Mariakakis, Alex. (2021, October). Earbuds as an Acoustic Health Sensing Platform.
The human body generates numerous audible and subaudible sounds that encode information about one's health. These sounds, ranging from teeth grinding and swallowing to even breathing and heartbeats, can be detected by the internal microphone of an active noise-canceling earbud. My group has developed machine learning models that detect and categorize health-related sounds recorded by an earbud to enable new monitoring opportunities
4. Mariakakis, Alex. (2021, October). Facilitating Patient-Physician Communication.
Many interactions in healthcare are predicated on effective communication between patients and physicians. When these communications fail, patients can feel neglected and unsatisfied with their

experience, and physicians are unable to convey empathy to foster trust from their patients. Therefore, my group has been exploring how digital conversational platforms can be used to support, not replace, communication between patients and physicians. We started this research by investigating how patients and physicians talk with one another over a synchronous chat platform. We are now actively developing a chatbot that facilitates patient intake in order to better prepare both patients and physicians for their impending in-person consultation

5. Mariakakis, Alex. (2021, October). Technology-Mediated Mental Health Support.

Text messaging services can play a key role in promoting psychological wellbeing at scale. However, the ways that people interact with text messages vastly differ from how they handle face-to-face conversations. Moreover, the benefits and drawbacks that are engendered by a text messaging service depend not only on the content of the messages but also on how those messages are delivered (e.g., timing, length, tone). I have been actively involved as a faculty collaborator in research using qualitative research methods like semi-structured interviews and thematic analysis to identify design implications for such digital tools

CONTRIBUTIONS

1. Mariakakis, Alex T.. (2024, October). *Panel on AI in Medicine and Medical Research*. Annual Board of Directors Meeting for Physicians' Services Incorporated, Toronto, Canada.
2. Mariakakis, Alex T.. (2024, May). *Accessible Blood Pressure Estimation with Earbuds*. TRANSFORM HF Spring Network Meeting, Toronto, Canada. Retrieved from <https://transformhf.ca/event/transform-hf-2024-spring-network-event>
3. Mariakakis, Alex T.. (2024, May). *Embracing Ubiquitous Technology to Complement, Scale, and Extend Traditional Healthcare*. Translational Biology and Engineering Program Conference, Toronto, Canada.
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INTELLECTUAL PROPERTY

Patents

1. Taylor J, Patel S, Mariakakis A. (2018, June 1). Bilirubin estimation using sclera color and accessories therefor Patent No. US20200121228A1.
Pancreatic cancer is one of the deadliest forms of cancer worldwide because it is often detected in later stages. One of the few characteristic symptoms of pancreatic cancer is jaundice — the yellowing of the skin and eyes due to the build-up of a compound called bilirubin. Although jaundice is obvious in severe cases, the ability to identify more subtle instances of jaundice could lead to earlier detection or continuous monitoring. This patent describes an algorithm that analyzes a photo of someone's eyes to estimate their bilirubin level. The algorithm uses computer vision to separate the sclera (the white part of the eye) from the rest of the image and summarize its color. A machine learning algorithm uses that color feature vector to report a bilirubin level. Ambient lighting can affect the appearance of colors in an image, so the patent describes two methods for color control: a 3D-printed box for color control or color references for calibration
2. McGrath L, Law A, Bly R, Patel S, Mariakakis A, Baudin J. (2018, May 31). Smartphone-based digital pupillometer Patent No. US20200129063A1.
There is no definitive way of diagnosing traumatic brain injuries (TBIs) — head injuries caused by an external force that leads to brain damage. Recent medical literature has posited that the pupillary light reflex — the involuntary change in a person's pupil size in response to a light stimulus — can be a useful biological signal for objective TBI assessment. Some hospitals have a clinical device called a

pupillometer, which is able to measure a person's pupillary light reflex using an infrared camera; however, this device typically costs thousands of dollars and is thus not often used by paramedics. This patent describes how the smartphone can be used to produce similar measurements. The system uses a 3D-printed box to control the lighting around the eyes as the smartphone's flash provides a light stimulus. The smartphone's camera records the response, and the pupillary light reflex is measured using a deep learning

3. Wen J, Mariakakis A, Wang E, Warren N. (2017, February 1). Applanation tonometer Patent No. US20170215728A1.

Measuring intraocular pressure is an important test that ophthalmologists conduct to monitor cases of glaucoma. Ophthalmologists normally measure intraocular pressure using specialized and expensive equipment in a clinic, so patients often have to travel great distances for regular monitoring. This patent describes a system that allows ophthalmologists to measure intraocular pressure using only their smartphone and an unpowered smartphone accessory. The smartphone accessory gently applies pressure to the patient's eye, and the deformation of the eye is recording by the smartphone's camera. A computer vision algorithm is applied to the video to produce an intraocular pressure readout

4. Sen S, Lee J, Mariakakis A. (2019). Localization using access point Patent No. US10349214B2.

GPS does not work indoors, so many researchers have explored other sensing modalities for localizing a person inside a building. Indoor localization could help people find their way through unfamiliar buildings or provide people with personalized directions to their destination. The most common indoor localization techniques use people's smartphones to measure the wireless signal strength from nearby access points for triangulation or trilateration; however, these techniques often require coordination between many devices, which induces a significant overhead on the access points. This patent describes a way of providing indoor localization using just a smartphone and a single access point. The smartphone's sensors record the user's steps and heading to infer their local trajectory, and the access point periodically estimates the user's distance from a known location. These measurements produce a geometrical problem that can be solved to infer the user's location

5. Sen S, Lee J, Mariakakis A. (2018). Localization using access point Patent No. US9883342B2.

GPS does not work indoors, so many researchers have explored other sensing modalities for localizing a person inside a building. Indoor localization could help people find their way through unfamiliar buildings or provide people with personalized directions to their destination. The most common indoor localization techniques use people's smartphones to measure the wireless signal strength from nearby access points for triangulation or trilateration; however, these techniques often require coordination between many devices, which induces a significant overhead on the access points. This patent describes a way of providing indoor localization using just a smartphone and a single access point. The smartphone's sensors record the user's steps and heading to infer their local trajectory, and the access point periodically estimates the user's distance from a known location. These measurements produce a geometrical problem that can be solved to infer the user's location