Temerty Centre for AI Research and Education in Medicine
UNIVERSITY OF TORONTO

Faculty supervisors list

2022 T-CAIREM Summer Research Studentship Program

This list is intended for students who are applying for the T-CAIREM Summer Research Studentship Program in 2022. The listed University of Toronto faculty members have indicated that they have one or more positions available for summer students.

Applicants may also directly contact other U of T faculty members not on this list to see if they are hiring summer students.

It is the responsibility of the student to arrange a studentship with a U of T faculty supervisor before the studentship starts. The application deadline is 5pm on February 18, 2022.

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For more information about the 2022 program:
https://tcairem.utoronto.ca/summer-research-studentships

We look forward to working with the successful applicants this summer. Good luck!

For more information contact:
Zoryana Salo
Centre Administrator
zoryana.salo@utoronto.ca • tcairem.utoronto.ca
Temerty Centre for AI Research and Education in Medicine (T-CAIREM)
Temerty Faculty of Medicine • University of Toronto

POTENTIAL SUPERVISOR'S INFORMATION

Name	Abigail Ortiz
Phone number	(416) 535-8501
Preferred email address	abigail.ortiz@utoronto.ca
Primary U of T department	Psychiatry
Appointment level	- Assistant Professor

Supervisor's primary research interests
Mood disorders, episode prediction in depressive and bipolar disorders; analyses of wearable data in mood disorders patients (posture, sleep, HRV)

Briefly describe the research that the student(s) will be involved in.
Analyses of wearable data currently being collected in bipolar disorder patients:
1. Wearable 1 ("shirt") data: data collection for 24 hours, wearable collects heart rate variability (HRV) and posture (among others). Question is whether we can infer mood changes based on posture.
2. Wearable 2 ("ring") data: data collection for up to a year; wearable collects detailed info on sleep parameters, HRV, activity, etc. Overarching question is related to predicting relapse in this population.

Specific skills you're looking for in summer student(s).
His/her main skills should include analyzing and modeling large biological datasets, including machine learning algorithms, particularly pattern recognition, large-scale numerical optimization, Bayesian statistics, approximate inference methods, prediction and classification, supervised and semi-supervised learning, as well as deep learning.

Primary location of research	Centre for Addiction and Mental Health
Where will the student's research be conducted?	Remotely

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Alistair Johnson
Phone number	(857) 829-9976
Preferred email address	alistair.johnson@sickkids.ca
Primary U of T department	Division of Biostatistics (DLSPH)
Appointment level	- Assistant Professor

Supervisor's primary research interests
Analysis of electronic health records

Website	https://alistairewj.github.io

Briefly describe the research that the student(s) will be involved in.
Children with severe neurologic impairment (SNI)—who have common functional limitations and comorbidities arising from different neurologic and genetic diagnoses—constitute a growing population, as advances in clinical care facilitate survival of children who likely would have died in earlier eras. SNI is associated with significant health care utilization: 0.2% of children account for more than 20% of bed-days in pediatric hospitals. The goal of this project is to algorithmically identify clinical phenotypes shared by individuals with SNI regardless of the underlying etiology. Approaches include topic modeling of clinical notes and network analysis of co-occurring diagnoses.

Specific skills you're looking for in summer student(s).
- Python expertise
- Interest in medical data
- (Preferred) Graph modeling experience or NLP experience (e.g. topic modeling)

Primary location of research	The Hospital for Sick Children
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Andrew Pinto
Phone number	(416) 864-6060
Preferred email address	andrew.pinto@utoronto.ca
Primary U of T department	Faculty of Medicine
Appointment level	- Associate Professor

Supervisor's primary research interests
Mitigating bias in AI applications, Using AI to address social determinants of health at system & community & clinical levels

Website	https://upstreamlab.org

Briefly describe the research that the student(s) will be involved in.
Building on ongoing research and guideline-development related to bias in machine learning (ML) applications in population health, and on application of AI-derived data on social determinants of health in clinical settings, student(s) may be involved in: 1) conducting a systematic review of ML models applied in population health (e.g. of ML models to predict COVID-19 outbreaks at a neighbourhood level); 2) development of an easy to use appraisal tool to assess whether ML model developers have identified and mitigated bias; and/or 3) qualitative research to co-design strategies for using AI-derived social determinants of health data in primary care.

Specific skills you're looking for in summer student(s).
1. Knowledge of machine-learning applications in health-care
2. Qualitative research (interviews, focus groups)
3. Systematic review experience
4. Familiarity with key issues in health equity
5. Knowledge of research in social determinants of health

Primary location of research	The Upstream Lab at the MAP Centre for Urban Health Solutions, St. Michael’s Hospital, Unity Health Toronto
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	April Khademi
Phone number	(416) 979-5000
Preferred email address	akhademi@ryerson.ca
Primary U of T department	SMH / Keenan Research Center
Appointment level	- Assistant Professor - TAHSN-affiliated Scientist

Supervisor's primary research interests
image analysis, machine learning and AI for medical imaging (radiology and pathology)

Website	https://www.ryerson.ca/akhademi

Briefly describe the research that the student(s) will be involved in.
Designing, developing and validation machine learning algorithms for medical imaging. I focus on neurological MRI and breast cancer pathology images.

Specific skills you're looking for in summer student(s).
Signals and Systems
Programming w/ Python and Matlab
Algorithm Design
Validation
Medical Imaging

Primary location of research	Ryerson University
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Ben Fine
Phone number	(416) 305-4450
Preferred email address	benjamin.fine@thp.ca
Primary U of T department	Medical Imaging
Appointment level	- TAHSN-affiliated Scientist

Supervisor's primary research interests
Medical imaging, machine learning, health system improvement, EMR prediction tools, operations research

Website	https://www.instituteforbetterhealth.com/

Briefly describe the research that the student(s) will be involved in.
AI Deployment and Evaluation Projects related to medical imaging, EMR-embedded or operational prediction tools, depending on interests.

Specific skills you're looking for in summer student(s).
Clinical domain expertise (US, CT, Sepsis, Bedflow), classical and deep learning classifiers, evaluation of ML models, user experience research, publication/knowledge translation

Primary location of research	Mississauga
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Benjamin Haibe-Kains
Phone number	(416) 294-6281
Preferred email address	benjamin.haibe.kains@utoronto.ca
Primary U of T department	Medical Biophysics
Appointment level	- Associate Professor

Supervisor's primary research interests
Machine Learning
Deep Learning
Cancer
Pharmacogenomics
Radiomics

Website	http://bhklab.ca/

Briefly describe the research that the student(s) will be involved in.
Pharmacogenomics: BHK Lab researchers actively work in the fields of biomarker discovery and drug repurposing using both preclinical and clinical data. Our research projects are aimed at identifying optimal treatment options from high-throughput genomic and pharmacological data. We are looking for students to develop genomic-based predictors for drug response.

Radiomics: There is a growing demand for new predictive tools to support clinical decision-making. BHK Lab researchers develop advanced machine learning algorithms that extract new features from medical images. We are looking for students to develop a new data sharing platform for transfer learning in radiomics research (deep learning).

Specific skills you're looking for in summer student(s).
For radiomics and pharmacogenomics:
Scientific programming skills
Biostatistical and/or machine learning and/or deep learning
Previous experience in genomics and/or radiology

Primary location of research	MaRS Centre; Princess Margaret Cancer Centre
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Brian Courtney
Phone number	(416) 480-6100
Preferred email address	brian.courtney@sunnybrook.ca
Primary U of T department	Medicine
Appointment level	- Assistant Professor - TAHSN-affiliated Scientist

Supervisor's primary research interests
Image guidance technologies; medical devices;
coronary plaque characterization; tissue segmentation; intravascular imaging; intracardiac imaging; machine learning; ultrasound; OCT

Website	https://sunnybrook.ca/research/team/member.asp?t=10&m=592&page=527

Briefly describe the research that the student(s) will be involved in.
Our lab at Sunnybrook,together with our industry collaborator, has developed 2 technologies that may make minimally invasive cardiovascular procedures safer and more effective. Our intravascular imaging system uses ultrasound and light to image arteries that supply the heart with blood. Our intracardiac echocardiography system uses ultrasound to view the structures of the heart in 2D and 3D. The student will work towards integrating advanced data processing algorithms into these systems to provide automated measurements and image interpretations to support clinical decisions.

Specific skills you're looking for in summer student(s).
• Experience with machine learning (clustering, SVMs) and deep learning models (CNNs)
• Experience with designing algorithms for image processing, segmentation and pattern / object recognition
• Familiarity with computer vision libraries and machine learning development platforms
- Proficiency with C# (.Net Framework)

Primary location of research	Sunnybrook Health Sciences Centre
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Chris McIntosh
Phone number	(416) 634-7041
Preferred email address	chris.mcintosh@rmp.uhn.ca
Primary U of T department	Medical Biophysics
Appointment level	- Assistant Professor - TAHSN-affiliated Scientist

Supervisor's primary research interests
Machine learning, medical image analysis, computer vision, wearables, deep learning

Website	https://mcintoshml.github.io/

Briefly describe the research that the student(s) will be involved in.
The student will work as part of larger project team to assemble data, build ML models, and validate them in a healthcare setting. Ongoing project area descriptions are available on our lab website.

Specific skills you're looking for in summer student(s).
Skills are sought in two or more of the following areas: python (pytorch, pandas, and scikit-learn), machine learning, medical imaging, and wearable technologies.

Primary location of research	Toronto General Hospital
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Christine Allen
Phone number	(647) 229-5970
Preferred email address	cj.allen@utoronto.ca
Primary U of T department	Pharmacy
Appointment level	- Full Professor

Supervisor's primary research interests
Developing advanced drug delivery strategies for cancer treatment

Briefly describe the research that the student(s) will be involved in.
Many cancer treatment regimens include administration of multiple drugs that differ in terms of their mechanisms of action and toxicity profiles. The Allen Lab is designing novel nanoparticle formulations that encapsulate synergistic drug combinations to improve treatment outcomes for cancer patients. When formulated appropriately, drug combinations arrive at the tumour site at the predetermined ratio to exert their synergistic effect. The formulation of drugs in nanoparticles may also reduce the systemic toxicity commonly observed with chemotherapeutic agents. The summer student will assist with the development of supervised regression-based machine learning models to expedite the discovery of synergistic drug combinations.

Specific skills you're looking for in summer student(s).
Synergistic ratios of drugs are determined through in vitro cytotoxicity assays and use of the Chou and Talalay combination index equation. Strong math, statistical, and programing skills (Python) are required. Cell culture experience is desirable. Candidates must be able to work as part of a collaborative and diverse team.

Primary location of research	Leslie Dan Faculty of Pharmacy
Where will the student's research be conducted?	In-lab

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Daniel Felsky
Phone number	(416) 939-0423
Preferred email address	dfelsky@gmail.com
Primary U of T department	Psychiatry
Appointment level	- Assistant Professor

Supervisor's primary research interests
Biostatistical modelling, mental health, psychosis, integration, machine learning

Website	https://www.felskylab.com

Briefly describe the research that the student(s) will be involved in.
The Whole Person and Population Modelling Lab is a diverse group using integrative biostatistical and machine learning approaches to develop diagnostic and prognostic models of mental illness across the lifespan. Data types most often used include genomic (genotype, methylation, RNAseq, proteomic), neuroimaging (fMRI, dMRI, sMRI), peripheral biomarker (cell counts, lipidomic, metabolomic), sociodemographic, behavioural, lifestyle, clinical, and other sources of environmental information (individual, neighbourhood, life experiential). The successful candidate will participate in a study identifying population-level factors and biological signatures associated with depressive and psychotic symptoms in youth. We will use multiple machine learning models, including gradient boosted trees and lasso.

Specific skills you're looking for in summer student(s).
Aptitude for literature search and independent learning. R and/or Python coding proficiency. Experience with biostatistics, data cleaning, and visualization. Knowledge of psychiatry, public health, human genetics, neuroimaging, or related field is a benefit.

Primary location of research	The Krembil Centre for Neuroinformatics, CAMH, 250 College Street, 12th Floor.
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	David Rudoler
Phone number	(416) 994-0540
Preferred email address	david.rudoler@ontariotechu.ca
Primary U of T department	IHPME
Appointment level	- Assistant Professor

Supervisor's primary research interests
Mental health services, population mental health, community-based care, healthcare analytics, health economics.

Briefly describe the research that the student(s) will be involved in.
The student(s) will help to develop and apply unsupervised learning approaches to identify and characterize different classes of schizophrenia patients. These classes will be used to help formulate care pathways.

Specific skills you're looking for in summer student(s).
Some knowledge of data science, econometrics, biostatistics, and/or machine learning. Familiarity with R programing language. Knowledge or interest in mental health services research. Strong oral and written communication skills. Ability to work collaboratively and across disciplines.

Primary location of research	Ontario Shores Centre for Mental Health Sciences
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Efrem Mandelcorn
Phone number	(416) 603-5193
Preferred email address	efrem.mandelcorn@utoronto.ca
Primary U of T department	Ophthalmology and Vision Sciences
Appointment level	- Associate Professor

Supervisor's primary research interests
Ophthalmology, Eye Disease, Surgical Outcomes, Clinical Care, Vision Sciences

Briefly describe the research that the student(s) will be involved in.
Utilization of random forest machine learning algorithms in order to identify to classify ocular disease by type of inflammatory markers present in the eye.

Specific skills you're looking for in summer student(s).
The student must have some proficiency in Python and R. They must be self-directed in their working and learning and take initiative to learn otherwise unfamiliar skills.

Primary location of research	Toronto Western Hospital
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Etay Hay
Phone number	(416) 535-8501
Preferred email address	etay.hay@camh.ca
Primary U of T department	psychiatry
Appointment level	- Assistant Professor

Supervisor's primary research interests
Computational neuroscience, depression, schizophrenia, machine learning, aging

Website	https://www.haybrainlab.com/

Briefly describe the research that the student(s) will be involved in.
Detect depression biomarkers of neuronal circuit changes in EEG using machine learning methods (deep learning)

Specific skills you're looking for in summer student(s).
Experience in coding is required
Experience in Tensor flow or deep learning is preferable
Neuroscience knowledge is preferable

Primary location of research	CAMH
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Frederick Roth
Phone number	(416) 946-5130
Preferred email address	fritz.roth@utoronto.ca
Primary U of T department	Donnelly Centre
Appointment level	- Full Professor

Supervisor's primary research interests
precision medicine, genome interpretation, machine learning, protein networks, genetic networks

Website	http://llama.mshri.on.ca/

Briefly describe the research that the student(s) will be involved in.
Projects may include: 1) building on our VARITY machine learning framework for inferring missense variant effects; 2) developing new structure-based or sequence-alignment-based predictive features; 3) automating the extraction of intuition from systematic experimental tests of variant effect; 4) identifying 'blind spots' of current computational predictors to inform iterative cycles of experimental testing and modeling.

Specific skills you're looking for in summer student(s).
Experience with scientific programming, evidence of excellence in quantitative coursework, and basic knowledge of molecular genetics or protein biochemistry.

Primary location of research	Sinai Health
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Girish Kulkarni
Phone number	(416) 888-5214
Preferred email address	girish.kulkarni@uhn.ca
Primary U of T department	Division of Urology, Department of Surgery
Appointment level	- Associate Professor

Supervisor's primary research interests
population-level quality of care, quality-of-life, health economics, clinical evaluation and treatment, machine learning

Briefly describe the research that the student(s) will be involved in.
The proposed research project is to develop an early warning system to identify patients at risk of progression to locally advanced bladder cancer (ie: muscle-invasive bladder cancer). The research student will work closely with Dr. Kulkarni and his research team to update the existing bladder cancer database at Princess Margaret Hospital, UHN. The student will assist the research team in developing time-series machine learning algorithms to develop an early warning system for progression to muscle-invasive bladder cancer. The student will also gain an in-depth understanding of the current management of bladder cancer.

Specific skills you're looking for in summer student(s).
We are looking for motivated students interested in the intersection of machine learning and urologic oncology. Proficiency in Excel, REDCAP, and basic Python is preferred, but not required. While prior experience in machine learning projects and interest in Urology are encouraged, it is not required.

Primary location of research	Toronto General Hospital and Princess Margaret Hospital, University Health Network
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Houman Khosravani
Phone number	(647) 444-5201
Preferred email address	houman@stroke.dev
Primary U of T department	Neurology/Medicine
Appointment level	- Assistant Professor

Supervisor's primary research interests
Our lab studies human performance factors in stroke and neurovascular resuscitation with a focus on quality of care delivered.

Website	https://sunnybrook.ca/team/member.asp?t=19&page=24392&m=905

Briefly describe the research that the student(s) will be involved in.
Difficulty with swallowing caused by oral-pharyngeal weakness, is a common but serious consequence of stroke. Patients with stroke require urgent screening for their ability to safely swallow. We aim to use audio/voice processing and ML to develop a smart-phone based interface for dysphagia screening. This technology democratizes the ability to provide timely, at the point-of-care (bedside) screening for dysphagia of stroke patients at a vulnerable time during their early phase of admission. We already have a feasibility pilot study completed with preliminary algorithms and datasets. Funding and partnership with T-CAIREM will propel this project into its next phase.

Specific skills you're looking for in summer student(s).
-motivation & passion to advance bedside quality of care
-python
-time series analysis experience is bonus but not needed
-knowledge about PyTorch (or similar packages)
-interest in neuroscience and complexity is welcome

Primary location of research	Sunnybrook Health Sciences Centre
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Jessica Gronsbell
Phone number	(647) 234-1558
Preferred email address	j.gronsbell@utoronto.ca
Primary U of T department	Statistical Sciences
Appointment level	- Assistant Professor

Supervisor's primary research interests
Semi-supervised learning; Weakly-supervised learning; Electronic health records

Website	https://sites.google.com/view/jgronsbell/home?authuser=0

Briefly describe the research that the student(s) will be involved in.
This project will investigate the use of natural language processing and machine learning for electronic health records phenotyping, the process of inferring patient characteristics from information contained in their health record. Our focus is on the development of semi-supervised learning methods that make this process more efficient.

Specific skills you're looking for in summer student(s).
Python, R, GitHub

Familiarity of statistical learning or natural language processing would be useful but not required.

Primary location of research	University of Toronto, St. George
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Jonathan Rose
Phone number	(416) 978-6992
Preferred email address	Jonathan.Rose@ece.utoronto.ca
Primary U of T department	Electrical and Computer Engineering
Appointment level	- Full Professor

Supervisor's primary research interests
Software and Natural Language Processing to support the measurement, diagnosis and therapy of mental health.

Website	https://www.eecg.utoronto.ca/~jayar/

Briefly describe the research that the student(s) will be involved in.
Our goal is to evolve a chatbot whose purpose is to help a smoker move towards the decision to quit smoking. The bot will make use of state-of-the-art Natural Language Processing models (such as GPT-3 and beyond), and employ a widely used clinical method to help in Behaviour Change, known as Motivational Interviewing. The challenge and opportunity is to build a conversational system that can respond directly to what people say, rather than pre-written generic statements that are less on point.

Specific skills you're looking for in summer student(s).
Seeking people with software skills relating to cloud computing (Amazon Web Services, Google cloud for example) machine learning and natural language processing backgrounds, and an interest in psychology.

Primary location of research	University of Toronto, Toronto
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Jonathon Maguire
Phone number	(416) 919-3462
Preferred email address	jonathon.maguire@utoronto.ca
Primary U of T department	Department of Paediatrics
Appointment level	- Full Professor

Supervisor's primary research interests
Covid-19 vaccination, testing, and infection in children and parents; clinical trials; creation of tools to facilitate evidence informed practice.

Website	https://www.targetkids.ca

Briefly describe the research that the student(s) will be involved in.
In April 2020, we directed Canada's largest ongoing children's cohort study, TARGet Kids!, to understand the effects of COVID-19 on Canadian children and families. We conducted surveillance involving 1123 children to understand COVID-19 infection and symptoms, physical and mental health status and seroprevalence among children and their parents. We will build upon this work to understand COVID-19 vaccine effectiveness, uptake and safety among 2000 children and their parents using machine learning methods. This study will provide needed information to inform vaccination policies for children and youth and provide confidence about COVID-19 vaccine effectiveness and safety for children.

Specific skills you're looking for in summer student(s).
Experience using R; biostatistics course(s); previous experience analyzing data using regression methods; experience applying machine learning methods preferred.

Primary location of research	St. Michael's Hospital
Where will the student's research be conducted?	Remotely

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Jose Zariffa
Phone number	(416) 597-3422
Preferred email address	jose.zariffa@utoronto.ca
Primary U of T department	Institute of Biomedical Engineering
Appointment level	- Associate Professor

Supervisor's primary research interests
Rehabilitation engineering; neural engineering; bioelectric signal processing; computer vision; upper limb function.

Website	https://bme.utoronto.ca/faculty-research/core-faculty/jose-zariffa/

Briefly describe the research that the student(s) will be involved in.
Recording from the peripheral nervous system can be used to decode control signals exchanged throughout the body, with applications in creating assistive technologies and treating chronic diseases. Our laboratory has collected unique datasets from multi-channel nerve cuff electrodes, which record data from the surface of nerves. The student will be responsible for exploring deep learning models for multi-scale time series analysis of neural signals. The objective will be to accurately classify compound action potentials originating from different neural pathways, by building models that combine information from spike shape and spike firing patterns, across multiple channels of data.

Specific skills you're looking for in summer student(s).
Previous experience with deep learning, including experience designing or modifying neural network architectures for a new task. Experience with models that process non-video time series data would be ideal.

Primary location of research	KITE - Toronto Rehab - UHN
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Jüri Reimand
Phone number	(647) 260-7983
Preferred email address	Juri.Reimand@utoronto.ca
Primary U of T department	Molecular Genetics
Appointment level	- Associate Professor

Supervisor's primary research interests
Cancer genomics, driver mutations, biomarkers, multi-omics data integration, machine learning

Website	https://reimandlab.org

Briefly describe the research that the student(s) will be involved in.
The student will use statistical and machine learning methods to analyse large pan-cancer genomics and other omics datasets, with potential projects in the discovery of driver mutations, biomarkers and candidate targets for therapies.

Specific skills you're looking for in summer student(s).
Coding skills (R or python), machine learning, data visualization, knowledge of genomics

Primary location of research	MaRS centre, Toronto
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Kei Masani
Phone number	(416) 597-3422
Preferred email address	k.masani@utoronto.ca
Primary U of T department	BME
Appointment level	- Associate Professor

Supervisor's primary research interests
Rehabilitation engineering and clinical engineering, particularly focusing on assistive technologies for people with disability in lower limb motor functions

Website	https://bme.utoronto.ca/faculty-research/core-faculty/kei-masani/

Briefly describe the research that the student(s) will be involved in.
Posturography, i.e., measuring the body sway during quiet standing, has been used to identify balance impairments in individuals unstable upright balance due to ageing or physiological/neurological diseases. For example, certain postural sway measures have been associated with increased risks of falling in the elderly and/or individuals with pathologies. The characteristics of posturography are summarized in various statistical variables as postural sway measures, including mean velocity and root mean square distance, which requires experts diagnostic skills. The purpose of the proposed project is to develop an algorithm using AI that can diagnose postural impairments.

Specific skills you're looking for in summer student(s).
My team has a large data set of posturography from patients with various diseases leading deteriorated standing balance. The student will work on developing the diagnosing algorithm using the dataset. Programing skills and fundamental understanding on AI and ML are required.

Primary location of research	KITE Research Institute
Where will the student's research be conducted?	Remotely

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POTENTIAL SUPERVISOR'S INFORMATION

Name	LUEDER KAHRS
Phone number	(647) 854-3626
Preferred email address	lakahrs@cs.toronto.edu
Primary U of T department	UTM (MCS)
Appointment level	- Assistant Professor

Supervisor's primary research interests
Medical Computer Vision and Robotics;
AI-, Vision- and Image-Guided Procedures

Website	https://www.cs.toronto.edu/~lakahrs/

Briefly describe the research that the student(s) will be involved in.
The student will work in the MEDCVR lab on the UofT-funded XSeed project "Multi-Sensor Fusion and Control of Robotic Needle Insertion for Remote Stroke Surgery". Together with Dr. Yu Sun and his Advanced Micro and Nanosystems Laboratory (AMNL) as well as Dr. Vitor Mendes Pereira (Schroeder Chair in Advanced Neurovascular Interventions) at UofT/UHN we will work on computer vision and AI-based methods for automatic vessel detection. Camera and Ultrasound images will be analysed and fused in real-time to guide a needle in soft tissue including compensation of deformation. The goals are a working implementation and journal / conference publication.

Specific skills you're looking for in summer student(s).
Strong coding skills; knowledge in computer vision, machine learning, Ultrasound imaging, camera calibration, elastic registration, soft tissue motion compensation, and/or image-guided surgery

Primary location of research	University of Toronto (Downtown Toronto, St. George)
Where will the student's research be conducted?	In-lab

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Maged Goubran
Phone number	(647) 234-0242
Preferred email address	maged.goubran@utoronto.ca
Primary U of T department	Medical Biophysics
Appointment level	- Assistant Professor

Supervisor's primary research interests
Computational Neuroscience, Artificial Intelligence, Neuroimaging, Neuromodulation, Connectomics

Website	https://medbio.utoronto.ca/faculty/goubran

Briefly describe the research that the student(s) will be involved in.
CT perfusion (CTP), which produces maps of blood perfusion parameters across the brain, is the mainstay imaging modality for acute stroke treatment selection and decision making; however, it has several drawbacks. The student will be involved in the architectural design, training and validation of a GAN model for synthesis of CTP-like perfusion maps from multiphase CT angiography and non-contrast CT data. We will use a dataset of ~6000 patient collected from the Sunnybrook stroke clinic over the last 10 years. If successful, these models can substantially reduce time-to-treatment and improve patient outcome prediction in the clinical acute stroke setting.

Specific skills you're looking for in summer student(s).
• Completion of Neural Networks and Deep Learning (CSC413 or equivalent), or demonstrated proficiency in similar topics (Deep Learning, CNNs, GANs).
• Programming experience in Python.
• Experience with a deep learning framework such as Pytorch or TensorFlow
• Bash/linux experience not necessary but will come in handy.

Primary location of research	Sunnybrook Research Institute
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Mark Bayley
Phone number	(416) 597-3422
Preferred email address	mark.bayley@uhn.ca
Primary U of T department	Faculty of Medicine
Appointment level	- Full Professor

Supervisor's primary research interests
Health systems change, health care policy, traumatic brain injury, concussion, stroke, rehabilitation

Website	https://kite-uhn.com/scientist/mark-bayley

Briefly describe the research that the student(s) will be involved in.
The Ontario Concussion Cohort is comprised of all residents of Ontario diagnosed with a concussion between 2008 and 2016 (>1.3 million cases). The cohort will be tracked for 5 years after index date via linked administrative health databases held at ICES to determine risk of developing of comorbidities and new illnesses; identify the pathway(s) of health care treatment following a concussion; identify areas of unmet needs following a concussion.

Specific skills you're looking for in summer student(s).
Student should posses SAS programming experience, background with concussion, some epidemiological experience is beneficial, strong analytical, writing, presentation, and data visualization skills

Primary location of research	KITE Research Institute - Toronto Rehabilitation Institute, University Health Network
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Mohammad Ali Shafiee
Phone number	(416) 270-9670
Preferred email address	mohammad.shafiee@uhn.ca
Primary U of T department	Medicine, Division of Nephrology
Appointment level	- Associate Professor

Supervisor's primary research interests
Artificial Intelligence, Machine Learning, Simulation, Virtual Reality, Extended Reality

Website	https://scholar.google.com/citations?user=Eg0AKocAAAAJ&hl=en

Briefly describe the research that the student(s) will be involved in.
1. “Machine Learning to Improve Organ Donation Rates and Make Better Matches”
2. Extended Reality Simulation of COVID19 Transmission Prevention Methods at University Health Network/Mt. Sinai ICU for Rapid Training and Education of Health Care Providers
3. Agent-Based Simulation of COVID19 Transmission and Prevention Measures in Hemodialysis Units at University Health Network/Mt. Sinai for Management, Rapid Training, and Education
4. Extended Reality Application for Medical Education Training and Assessment, A supplement to the Entrustable Professional Activities

Specific skills you're looking for in summer student(s).
1. Enthusiastic about Simulation, Extended reality and or Artificial Intelligence, with some background
2. Interest in Science and Physiology
3. Be familiar with Research ethics and team work
4. In Undergraduate or postgraduate study
5. 2-3 months committed time to work in hospital or remotely to complete the projects

Primary location of research	Toronto General Hospital
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Mohammed Al-Omran
Phone number	(416) 864-6047
Preferred email address	mohammed.al-omran@unityhealth.to
Primary U of T department	Division of Vascular Surgery and Institute of Medical Science
Appointment level	- Full Professor

Supervisor's primary research interests
Machine learning, artificial intelligence, vascular surgery, health outcomes, large databases

Website	http://stmichaelshospitalresearch.ca/researchers/mohammed-al-omran/

Briefly describe the research that the student(s) will be involved in.
Vascular surgery patients suffer from the highest rates of complications among all surgical patients given their significant comorbidities and high-risk operations. Current tools for predicting post-operative outcomes are limited by the need to manually input data, non-specificity to high-risk surgical populations, and inability to capture unstructured data such as clinical notes. Machine learning (ML) techniques including neural networks, decision trees, and ensemble approaches provide an opportunity to develop automated and more accurate surgical risk prediction algorithms. Our goal is to build and evaluate ML models that use pre-operative patient characteristics to predict outcomes following major vascular surgery.

Specific skills you're looking for in summer student(s).
We highly encourage all students with an interest in machine learning (ML) and artificial intelligence (AI) to apply. Previous experience in health research, computer science, and large database analysis are assets, but not required. We are primarily interested in strengthening your ML/AI skills and applying this to improve patient outcomes.

Primary location of research	St. Michael’s Hospital, Unity Health Toronto, University of Toronto
Where will the student's research be conducted?	Remotely

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Mojgan Hodaie
Phone number	(416) 603-6441
Preferred email address	mojgan.hodaie@uhn.ca
Primary U of T department	Surgery
Appointment level	- Full Professor

Supervisor's primary research interests
advanced brain imaging; brain image reconstruction; prediction models; multiple sclerosis; trigeminal neuralgia;

Website	https://hodaielab.com

Briefly describe the research that the student(s) will be involved in.
Multiple sclerosis (MS) is a progressive demyelinating disease affecting the central nervous system. Trigeminal Neuralgia (TN) secondary to MS (MS-TN) results in paroxysmal pain that is clinically indistinguishable from classical TN. Since treatment approaches and outcomes of these conditions may differ significantly, accurate diagnosis has important implications for the management of pain. Furthermore, the underlying contribution of MS to pain perception in MS-TN is to be investigated. This project aims to explore TN-specific MR imaging signatures in MS-TN. Using in vivo neuroimaging techniques, and machine learning (ML) algorithms, we will identify structural correlates of TN pain in MS-TN patients.

Specific skills you're looking for in summer student(s).
Experience in using MR data processing frameworks (freesurfer, FSL, MRTrix)
Coding experience (Python, R)
Knowledge in statistics and machine learning
Biomedical expertise – neuroanatomy, neuroscience.
Written & Oral Communication skills

Primary location of research	Toronto Western Hospital
Where will the student's research be conducted?	In-lab

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Paul Wong
Phone number	(416) 443-3308
Preferred email address	paul.wong@rogers.com
Primary U of T department	Surgery
Appointment level	- Assistant Professor

Supervisor's primary research interests
Augmented reality in surgery
Surgical robotics
Translational AI research in surgery

Website	https://www.drpaulwong.ca

Briefly describe the research that the student(s) will be involved in.
Opening for a summer research computer programmer to develop a novel computer surgical navigation system for total knee replacement. Deep learning and computer vision will be used for augmented reality applications to assist in total knee replacement. A computer-vision based tracking system will be built to identify anatomic structures and position during surgery. This system will allow surgeons to perform total knee replacement more precisely and to enhance patient safety. Student will be integrated into a team based environment working with surgeons, residents and engineers.

Specific skills you're looking for in summer student(s).
- Enthusiastic
- Ability to work independently
- Good communication skills
- Proficient in the following programming environment:
Unity
Tensorflow
C++
Python

Primary location of research	Michael Garron Hospital
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Radhakrishnan Mahadevan
Phone number	(416) 946-0996
Preferred email address	krishna.mahadevan@utoronto.ca
Primary U of T department	Chemical Engineering
Appointment level	- Full Professor

Supervisor's primary research interests
Systems Biology, Synthetic Biology, Machine Learning for Protein Engineering, Metabolic Engineering, Microbiome Engineering

Briefly describe the research that the student(s) will be involved in.
Student will develop machine learning models for predicting enzyme function from sequence. Student will collect appropriate data sets and develop modeling pipelines that can enable the testing of various methods for predicting function and generating new enzyme designs.

Specific skills you're looking for in summer student(s).
Python programming, Optimization, Familiarity with PyTorch, Biochemistry domain knowledge, chemistry or chemical engineering for representing chemical structures

Primary location of research	St. George campus
Where will the student's research be conducted?	Remotely

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Rahul` Krishnan
Phone number	(647) 482-7590
Preferred email address	rahulgk@cs.toronto.edu
Primary U of T department	CS and LMP
Appointment level	- Assistant Professor

Supervisor's primary research interests
machine learning, healthcare, deep generative models, probabilistic inference, causal inference

Website	http://www.cs.toronto.edu/~rahulgk/

Briefly describe the research that the student(s) will be involved in.
The student will be involved in a project to study the application of algorithms to detect (and potentially mitigate) dataset shift on predictive models built using real-world healthcare data.

Specific skills you're looking for in summer student(s).
(1) Strong foundational background in linear algebra, statistics and programming (preferably in python),
(2) Introductory class in machine learning (alternatively: practical, documented hands on experience building and training machine learning models)
(3) Interest in working within a interdisciplinary team,
(4) Good communication skills (both spoken and written)
(5) Curiosity!

Primary location of research	Toronto, ON
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Rajeev Muni
Phone number	(416) 867-7411
Preferred email address	rajeev.muni@utoronto.ca
Primary U of T department	Ophthalmology
Appointment level	- Assistant Professor

Supervisor's primary research interests
Retinal displacement, retinal detachment, artificial intelligence in ophthalmology, computer vision

Website	https://ophthalmology.utoronto.ca/vice-chair-clinical-research

Briefly describe the research that the student(s) will be involved in.
The student will be involved in our ongoing research using computer vision to map retinal displacement using retinal imaging technologies, such as OCT and ultra-widefield imaging. The goal is to be able to map and detect vascular features before and after retina surgeries to determine if the retina has been displaced post-surgery.

Specific skills you're looking for in summer student(s).
Computer vision, neural network, and machine learning experience. Experience with retinal or medical imaging would be an added benefit.

Primary location of research	St. Michael's Hospital, Toronto, ON
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Somi Afiuni
Phone number	(647) 405-2264
Preferred email address	safiuni@lunenfeld.ca
Primary U of T department	Department of Molecular Genetics
Appointment level	- TAHSN-affiliated Scientist

Supervisor's primary research interests
Spatial imaging, Digital pathology, Machine learning, Algorithms, Cancer research

Website	https://www.jacksonlabltri.com

Briefly describe the research that the student(s) will be involved in.
I'm a Scientific associate (Staff data scientist) at Jackson lab; a systems biology and precision medicine lab located in the Lunenfeld Tanenbaum Research Institute. We investigate the multi-cellular structure and mechanisms of tissues and tumours with imaging using machine learning methods to advance digital pathology applications. The research would be regarding applying different algorithms in the existing data analysis pipeline for spatial imaging using programming languages for cancer research applications.

Specific skills you're looking for in summer student(s).
Programming languages R, Programming frameworks,
Quantitative research, Data analysis, Biology/pathology expertise

Primary location of research	Mount Sinai Hospital
Where will the student's research be conducted?	Combination of both

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Srinivas Raman
Phone number	(416) 946-2320
Preferred email address	srinivas.raman@rmp.uhn.ca
Primary U of T department	Radiation oncology
Appointment level	- Assistant Professor

Supervisor's primary research interests
Artificial intelligence, radiation oncology, lung cancer, radiomics

Website	https://radonc.utoronto.ca/faculty/srinivas-raman

Briefly describe the research that the student(s) will be involved in.
In a multidisciplinary collaboration between the radiation oncology department, radiology department, and ALTIS Labs, a fully-automated imaging-based prognostication technique using deep learning has been developed to predict survival outcomes in patients with lung cancer. We propose to extend this methodology to predict oncological and toxicity outcomes in a cohort of radiation therapy patients treated at Princess Margaret Cancer Center. Depending on the student's background and interests, they will be involved in 1) study design, 2) data extraction and processing, and 3) development and validation of a convolutional neural network-based method for outcomes prediction.

Specific skills you're looking for in summer student(s).
Good communications skills, and interest in biomedical research
Knowledge of statistical methodology and experience with tools such as R
Programming skills in python (nice to have)
Basic knowledge of CNNs and RNNs (nice to have)

Primary location of research	Princess Margaret Cancer Center, Toronto
Where will the student's research be conducted?	Remotely

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POTENTIAL SUPERVISOR'S INFORMATION

Name	Victoria McCredie
Phone number	(416) 302-1959
Preferred email address	victoria.mccredie@uhn.ca
Primary U of T department	Dept of Medicine
Appointment level	- Assistant Professor

Supervisor's primary research interests
Biostatistical modelling,
Computational modeling of physiological data,
High-resolution patient subphenotypes,
Critically ill acutely brain-injured patients,

Website	http://criticalcaretoronto.com/twh-msicu/our-team/dr-victoria-mccredie/

Briefly describe the research that the student(s) will be involved in.
The student(s) will be involved in conducting a systematic review of machine learning models applied in neurocritical care, specifically evaluating models aiding the clinicians in monitoring and managing intracranial pressure, seizures, hemodynamics, and ventilation.

Specific skills you're looking for in summer student(s).
Evidence synthesis
Knowledge translation
Biostatistical and/or machine learning and/or deep learning
Knowledge of research in critical care is a benefit
Systematic review experience (preferred but not mandatory)

Primary location of research	University Health Network, Toronto
Where will the student's research be conducted?	Remotely

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