

Breakout Session 2: Track A

Ethical Development of Colorectal Cancer Imaging Biomarkers

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Ethical Development of Colorectal Imaging Biomarkers

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Director, Centre for Health Innovation

Senior Investigator, Canadian Cancer Trials Group

Affiliate Member, Vector Institute for AI

Rohan Faiyaz Khan (she/they), PhD Student, School of Computing

Colon Cancer



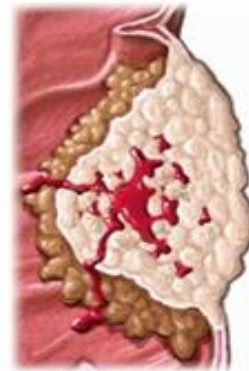
1 in 4 will get colon cancer.
Treatment depends on stage



Stage I



Stage II



Stage III

Colon resection

Colon resection + Adj. chemo



Stage IV

**Liver/lung surgery
+ chemo**

These are the patients
that die

Colorectal cancer is the
2nd deadliest cancer in
the US

Black patients are
20% more likely to
get colorectal cancer
than other groups

Black patients are
40% more likely to
die of colorectal cancer
than other groups



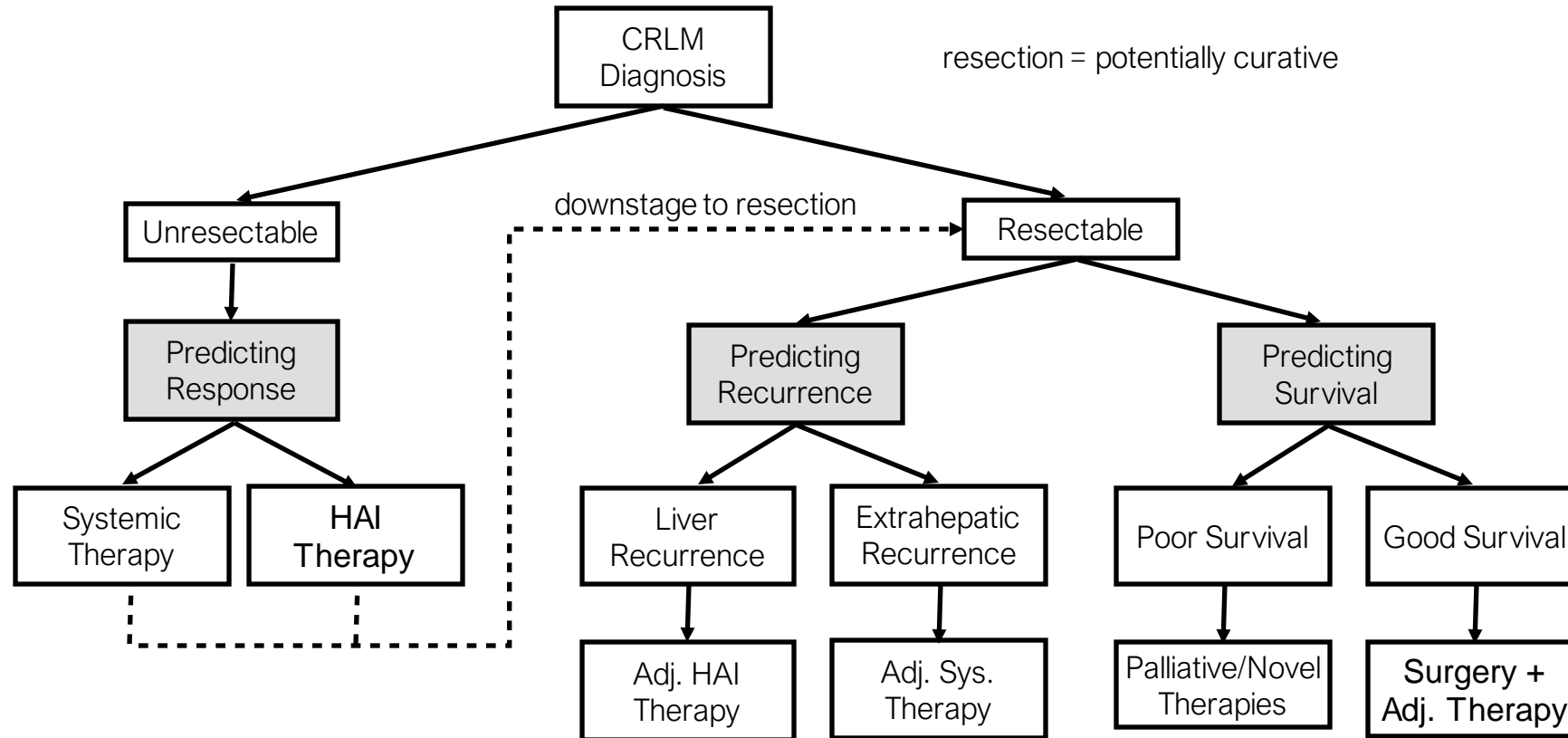
Memorial Sloan Kettering
Cancer Center

THE UNIVERSITY OF TEXAS
MDAnderson
Cancer Center

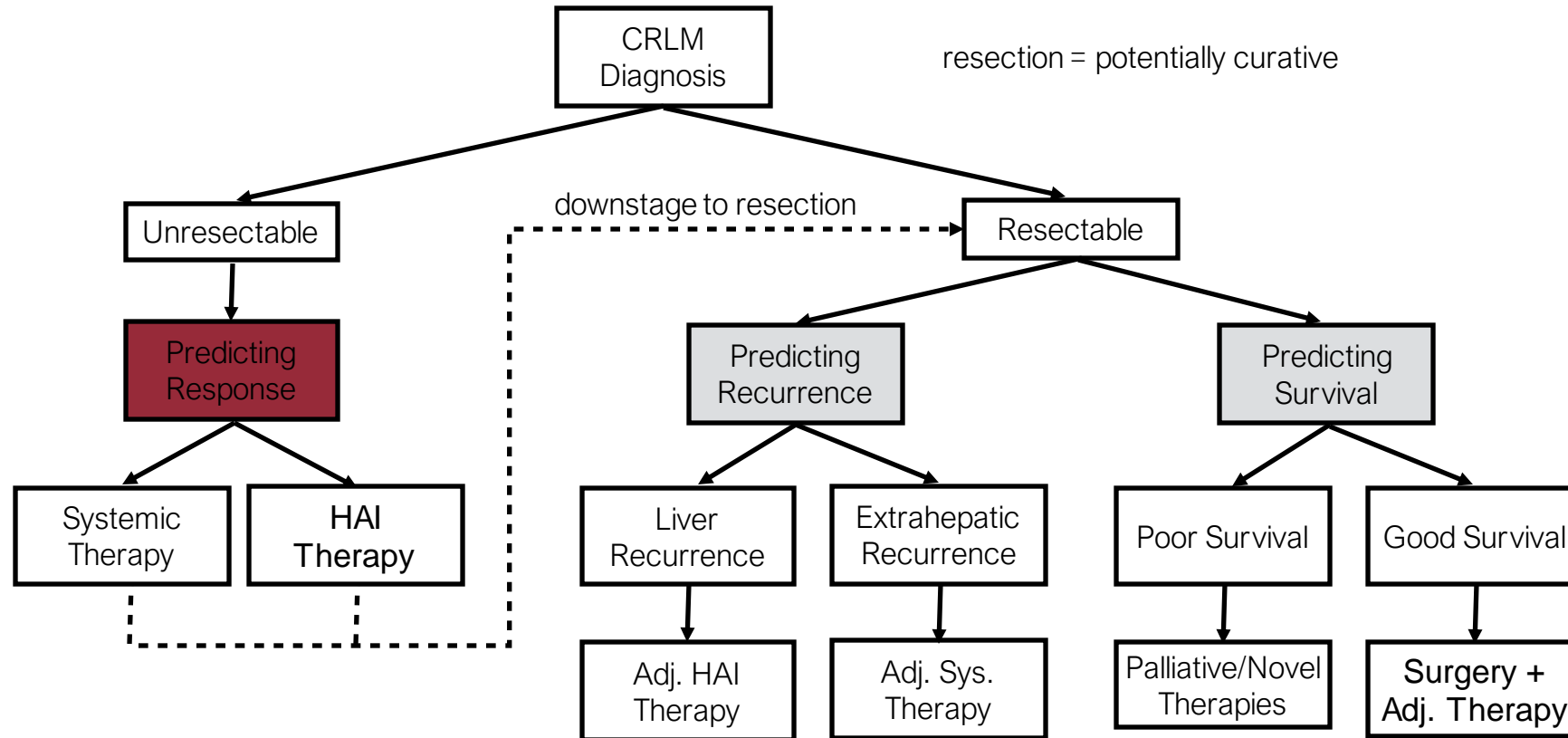


Queen's
UNIVERSITY

Treatment of Colorectal Liver Metastases



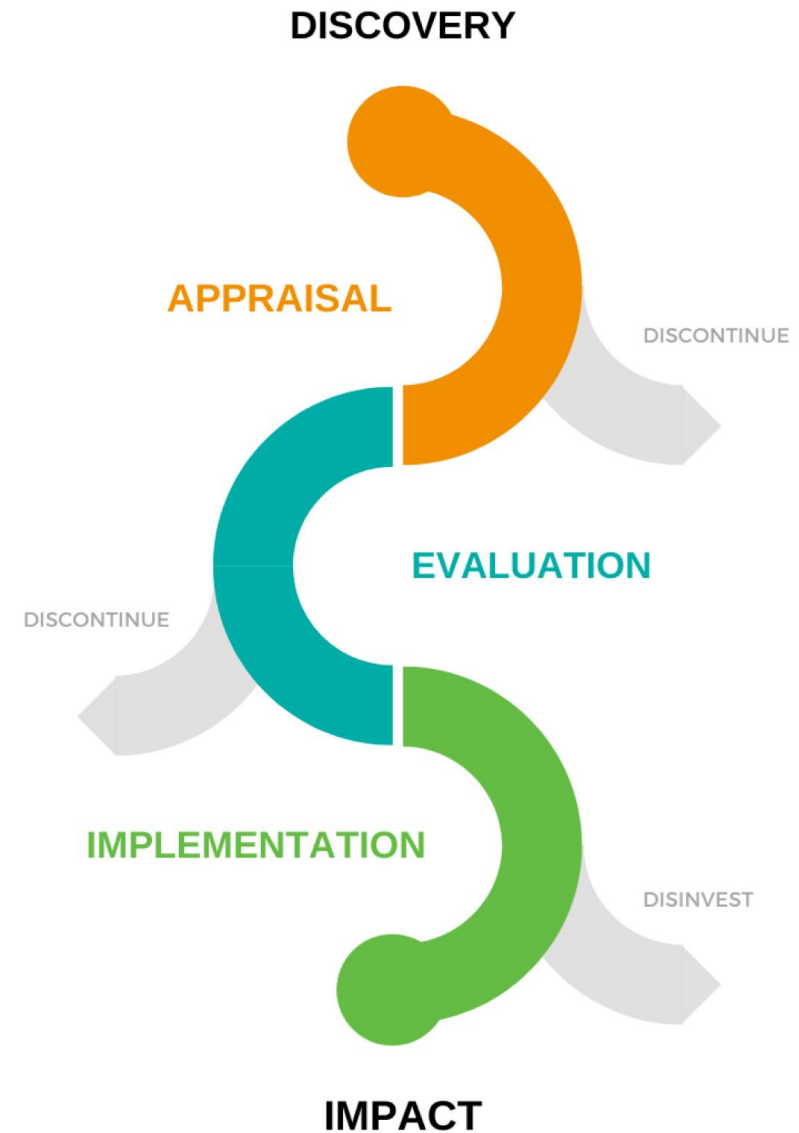
Treatment of Colorectal Liver Metastases



No known method to predict response in CRLM

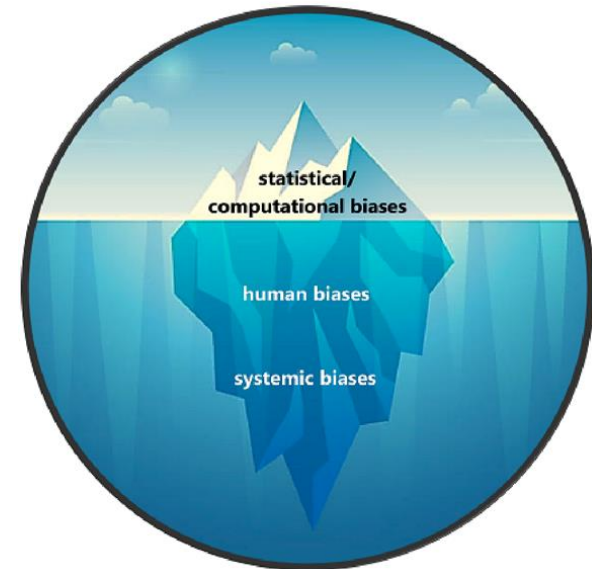
Standardization of Imaging Biomarker

- NIH R01 awarded in 2019 to develop accurate and robust imaging biomarkers for personalized treatment of colorectal liver metastases (CRLM) (PIs: Simpson - Queen's, Chun - MD Anderson, Do - Memorial Sloan Kettering)
- External validation needed (collaboration with MD Anderson)
- Scan protocol acquisition and reconstruction variation (prospective protocol)



The need for ethical development of imaging biomarkers

- AI models can learn biases through direct and indirect ways
- Black patients are more likely to be harmed by bias
- Our parent grant (R01) deals with statistical biases, but more complex human and systemic biases remain undiscovered.



The challenge of AI bias (from NIST).

Schwartz et al. Towards a Standard for Identifying and Managing Bias in Artificial Intelligence. NIST Special Publication. Gaithersburg, MD. 2022.

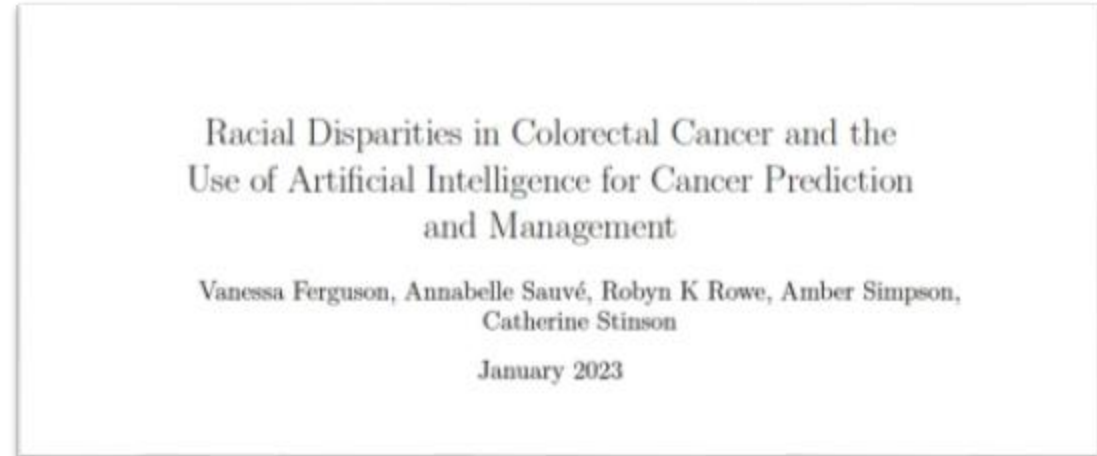
Research Aims

- **Aim 1:** Perform a comprehensive review of risk and race correction factors in colorectal cancer from the lens of race-based medicine.
- **Aim 2:** Train a neural network to recognize race and race surrogates from abdominal CT scans
- **Aim 3:** Develop an accessible podcast series as a primer for computational scientists and clinicians on bias in AI

Aim 1: Perform a comprehensive review of risk and race correction factors in colorectal cancer from the lens of race-based medicine.

Strategy & Methodology:

- Review the clinical literature on colorectal cancer and its related risk factors to understand the separation of biological and socioeconomic factors and how these influence each other.
- Review potential race correction/race variable factors that are at play for Black patients



Status of paper: In revisions with BMC Cancer

The Patient/Industry Trade-off in Medical Artificial Intelligence

Objective of Paper:

To analyze the conflict in medical AI research between providing benefits to patients against benefits to the industry. We inspect factors hampering integration of research into clinical care and propose approaches for addressing this gap.

Status:

Revisions being completed before submission

Target journal – AI and Ethics

Target submission – April 2024

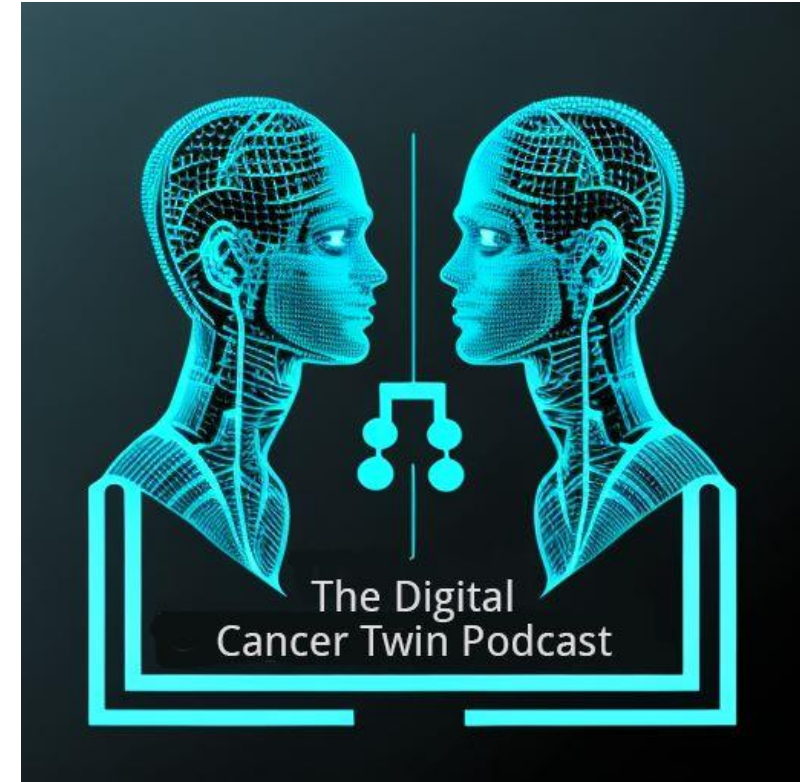
The Patient/Industry Trade-off in Medical Artificial Intelligence

Annabelle Suave¹, Rohan Khan¹, Amber L. Simpson^{1,2},
Catherine Stinson^{1,3*}

Aim 3: Develop an accessible podcast series as a primer for computational scientists and clinicians on bias in AI

Digital Cancer Twin

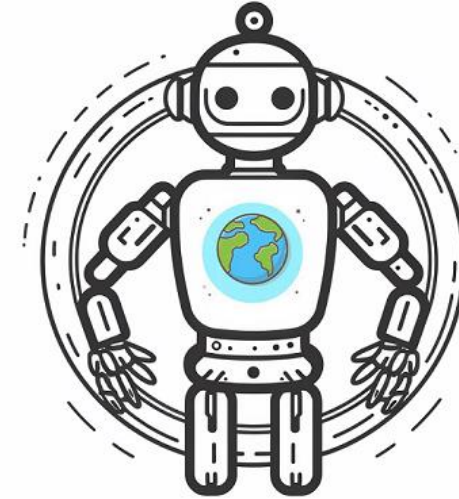
- Investigate the ethical, social, philosophical and technical implications of the cutting edge AI cancer diagnostic technology
- Available online on CFRC-FM, Apple Podcasts, Spotify, Pandora, Deezer:
 - [Introduction to the Digital Cancer Twin Project](#)
 - [AI, Military Funding, and the Digital Cancer Twin](#)
 - [Race Medicine, Data Justice, and an Ethics of Artificial Intelligence](#)
 - [The Role of the Humanities in AI and Medical Research](#)



Produced and edited by [Dr. Jordan Loewen-Colón](#) and Andrei Pora

The Responsible Use of AI Podcast

- Engages multidisciplinary scholars in discussions on the implications of AI technologies and tools, and necessary considerations prior to its deployment
- Available online on CFRC-FM, Apple Podcasts, Spotify, Deezer:
 - [Indigenous Data Sovereignty and Data Justice in the Age of AI](#)
 - [Implications for Data Curation in the Age of AI](#)
 - [Who is \(Ac\)counted for in AI?](#)



The Responsible Use of AI Podcast

Hosted by [Dr. Jordan Loewen-Colón](#), Vanessa Ferguson and Aakanksha Khandwaha

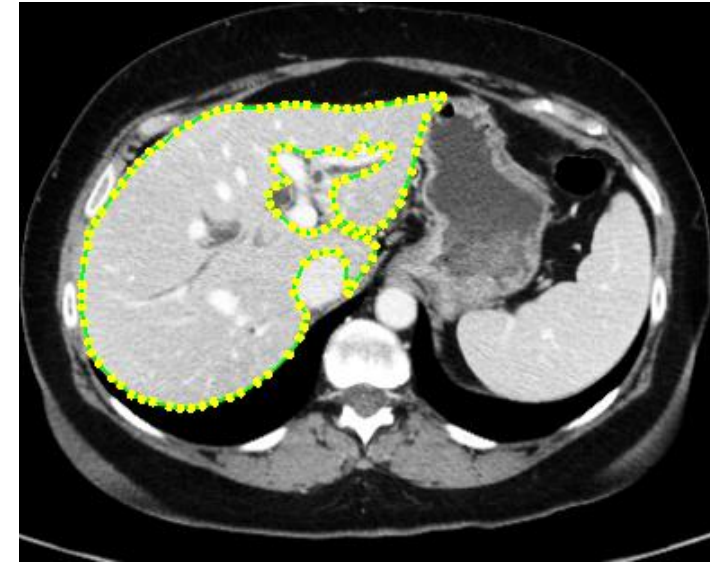
Aim 2: Train a neural network to recognize race and race surrogates from abdominal CT scans

Strategy and Methodology:

- Leverage our large consecutive series of CT scans for stage IV colorectal patients from two institutions (n=2450) assembled in the parent R01
- Taking inspiration from “Reading Race” (Banerjee et al., 2021) we will train a neural network to assess bias in the data.

Status:

Data from parent R01 is currently being prepared and annotated. Data is expected to be available in Summer 2024.



Segmentation of liver CT-scan

Our Lab



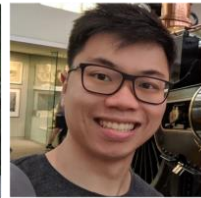
Danielle Cutler
Life Sci



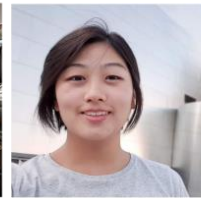
Alan Dimitriev
MSc - CS



Andrew Garven
MSc - DBMS



Ricky Hu
Med Student



Natalia Kim
MSc - CS



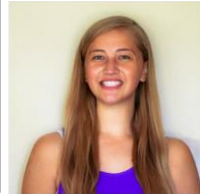
Kaitlyn Kobayashi
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Katie Lindale
MSc - TMED



Ramtin Mojtahedi Saffari
PhD - CS



Alex Robbins
MSc - PHS



Jean-Paul Salameh
Med Student



Katy Scott
MSc - CS



Shaina Smith
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Annabelle Suave
MSc - CS



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PhD - CS



Lola Assad
Undergrad - CS



Lydia Elbatary
Undergrad - CS



Ben Ravenscroft
Undergrad - CS



Mohammad Hamghalam
Post Doc



Jordan Loewen
Post Doc



Robyn Rowe
Post Doc

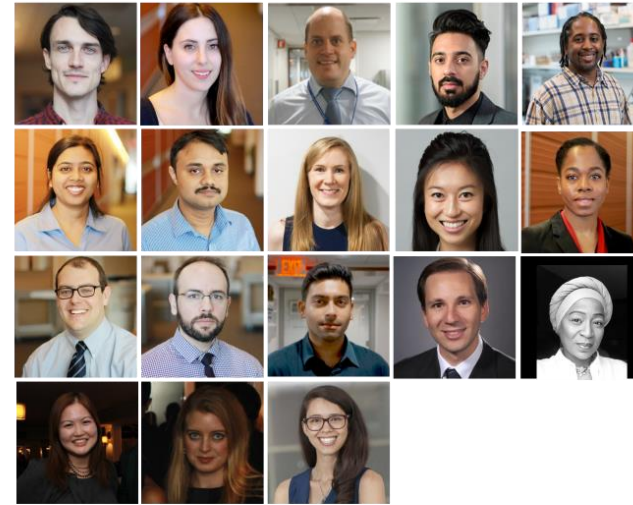


Jacob Peoples
AI Scientist



Vanessa Ferguson
MA - Phil

Alumni



CANADA
RESEARCH CHAIRS
CHAIRES DE RECHERCHE DU
CANADA

Thank you!



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