

Vinith M. Suriyakumar

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*Website: [VMS-6511.github.io](https://github.com/VMS-6511)*

RESEARCH	<b>Areas:</b> Machine Learning, Theoretical Computer Science
INTERESTS	<b>Topics:</b> Differential Privacy, Algorithmic Fairness, Strongly Rayleigh Measures
	<b>Applications:</b> Healthcare & Social Welfare

**EDUCATION**      **University of Toronto**, Toronto, Ontario Canada  
 Department of Computer Science  
 M.S., Computer Science (Machine Learning), Sept 2019 - Present  
 GPA: 3.90/4.00  
 Focus: Differential Privacy and Algorithmic Fairness in Machine Learning for Healthcare  
 Advisors: Dr. Marzyeh Ghassemi, Dr. Nicolas Papernot, Dr. Anna Goldenberg  
 Affiliations: Vector Institute, The Hospital for Sick Children

**Queen's University**, Kingston, Ontario Canada  
 School of Computing  
 B.Computing., Biomedical Computing, May, 2019  
 GPA: 4.14/4.30 (Overall), 4.30/4.30 (Major)  
 Thesis: Deep Classification and Generative Models for Prostate Cancer MRIs  
 Advisors: Dr. Gabor Fichtinger & Dr. Parvin Mousavi  
 Affiliations: Kingston Health Sciences Centre

HONORS AND AWARDS	Ethics of AI Graduate Research Fellowship, University of Toronto, August 2020
	Mitacs Accelerate Research Fellowship, December 2019
	University of Toronto Arts and Science Fellowship, September 2019
	Queen's University: Graduated Dean's Honor List with Distinction, June 2019
	NSERC Industrial Undergraduate Research Award, August 2017
	1st Degree Black Belt in Karate, October 2010

**ACADEMIC EXPERIENCE**      **University of Toronto**, Toronto, Ontario Canada  
*Graduate Student*      **September, 2019 - Present**  
 Includes current Masters level coursework and research projects. Courses: Machine Learning, Neural Networks and Deep Learning, Probabilistic Learning and Reasoning

*Teaching Assistant* **September, 2019 - present**  
 Duties at various times have included office hours, assignment and exam marking, assignment development, and holding tutorials. Courses: Introduction to Databases, Introduction to Artificial Intelligence, and Capstone Design Project.

**Queen's University**, Kingston, Ontario Canada  
*Research Assistant* **September, 2017 - May, 2019**  
 Worked in biomedical engineering lab developing generative models to improve MRI image quality

from 1.5T to 3.0T for improving image quality in developing / rural regions. Developed classification models using neural networks to detect cancer lesions in prostate MRIs. Worked on combination of graphics and HCI research developing open source treatment planning visualization system with over 10 000 downloads worldwide.

*Peer Tutor*

**September 2016 - May 2017**

Individualized tutoring for students in introductory computer science courses such as discrete mathematics and introduction to programming.

**PUBLICATIONS**

Suriyakumar, V.M., N. Papernot, A. Goldenberg, and M. Ghassemi. 2020. Effects of Long Tails on Differentially Private Prediction in Healthcare Settings, FAccT 2021 (in submission).

Suriyakumar, V.M., N. Papernot, A. Goldenberg, and M. Ghassemi. 2020. The Pitfalls of Differentially Private Prediction in Healthcare, ACM CCS: Theory and Practice of Differential Privacy 2020 Workshop.

Chang. A\*, V.M. Suriyakumar\*, A. Moturu\*, N. Tewattananarat, A. Doria, and A. Goldenberg. 2020. Using Generative Models for Pediatric wbMRI. Medical Imaging in Deep Learning 2020. \* denotes equal contribution.

Suriyakumar, V.M., R. Xu, C. Pinter, G. Fichtinger. Collision detection for external beam radiation therapy applications in SlicerRT. 2017. Imaging Network Ontario Conference.

Suriyakumar, V.M., R. Xu, C. Pinter, G. Fichtinger. Open-source software for collision detection in external beam radiation therapy. 2017. SPIE: Journal of Medical Imaging 2017, 10135-51.

**CONFERENCE PRESENTATIONS**

Chang. A\*, V.M. Suriyakumar\*, A. Moturu\*, N. Tewattananarat, A. Doria, and A. Goldenberg. 2020. Using Generative Models for Pediatric wbMRI. Medical Imaging in Deep Learning 2020. \* denotes equal contribution. (Oral)

Chang. A\*, V.M. Suriyakumar\*, A. Moturu\*, A. Doria, and A. Goldenberg. 2019. Early pediatric cancer detection in whole-body MRIs. Evolution of Deep Learning Symposium 2019. \* denotes equal contribution. (Poster)

Suriyakumar, V.M., R. Xu, C. Pinter, G. Fichtinger. Collision detection for external beam radiation therapy applications in SlicerRT. 2017. Imaging Network Ontario Conference. (Poster)

Suriyakumar, V.M., R. Xu, C. Pinter, G. Fichtinger. Open-source software for collision detection in external beam radiation therapy. 2017. SPIE: Journal of Medical Imaging 2017, 10135-51. (Oral)

Suriyakumar, V.M., R. Xu, C. Pinter, G. Fichtinger. Improving accessibility of radiation therapy software in developing countries. Canadian Undergraduate Conference on Healthcare 2017. (Oral)

**CHALLENGE PARTICIPATION**

NeurIPS 2020 Hide-and-Seek Challenge: Membership Inference on Clinical Time Series  
In collaboration with Christopher A. Choquette-Choo

**PAPERS IN PREPARATION**

Sharing Data Safely: Differentially Private Representation Learning  
In collaboration with Nicolas Papernot and Marzyeh Ghassemi.

Diverse Minibatches via Determinantal Point Processes for Improved DP-SGD  
In collaboration with Nicolas Papernot and Marzyeh Ghassemi.

On The Compatibility of Privacy and Fairness in Generative Models

In collaboration with Victoria Cheng, Shalmali Joshi, and Marzyeh Ghassemi.

Fair Use of Sensitive Attributes in Machine Learning for Healthcare  
In collaboration with Berk Ustun and Marzyeh Ghassemi.

Anomaly Detection for Pediatric Cancer Screening: A Multi-Site Study  
In collaboration with Alex Chang, Abhishek Moturu, Nipaporn Tewattananarat, Andrea Doria, and Anna Goldenberg.

#### MENTORING AND ADVISING

Victoria Cheng, Undergraduate Researcher, Summer 2020

Shrey Jain, Undergraduate Researcher, Summer 2020 - Present

#### SELECTED PROFESSIONAL EXPERIENCE

**The Hospital for Sick Children**, Toronto, Ontario Canada

*Research Assistant*

**May, 2019 - Present**

Building anomaly detection methods using generative models for early detection of pediatric cancer in whole body MRIs. This project is in collaboration with clinicians in the SickKids' Radiology department.

**Cape Privacy (formerly Dropout Labs)**, Remote

*Consultant*

**June, 2019 - August, 2019**

Contributed tutorials to the open-source library TF Encrypted for machine learning under secure multiparty computation protocols. Started investigations into using self-learning activation functions using polynomial approximations to speed up training time.

**Square**, San Francisco, California USA

*Data Science Intern*

**May, 2018 - August, 2018**

Developed a representation learning algorithm to cluster merchants into different business categories for improved pricing algorithms with 90% accuracy. Involved in ethics and governance of AI in products committee analyzing what Square's principles would be when implementing AI into its products.

**Helpful (acquired by Shopify)**, Toronto, Ontario Canada

*Machine Intelligence Intern*

**September, 2017 - April, 2018**

Improved transcriptions for speech recognition problems such as getting names and company specific jargon correct by 4-10x. Investigated computational linguistic techniques such as phoneme matching and pronunciation modelling to further improve transcriptions in the presence of different accents.

**IBM**, Toronto, Ontario Canada

*Deep Learning and Systems Research Intern*

**May, 2017 - August, 2017**

Led a research project exploring improvements to traditional query optimization in databases using machine learning. Implemented a few shot learning algorithm based on matching networks improving the database speed by 30% across standard SQL query speed benchmarks. Currently, I have 1 patent pending from this work.

#### SERVICE AND VOLUNTEERING

Director of Finance & Advisor, CUSEC

January 2019 - Present

NeurIPS 2019 Student Volunteer

December 2019

Co-Chair, Toronto Health Data Hackathon

September 2019 - October 2019

Chair, QHacks

April 2018 - February 2019

Co-Chair, CUSEC

January 2018 - January 2019

Director of Events, CUSEC

January 2017 - January 2018

Vice President Operations, Queen's Computing Students' Association

March 2017 - April 2018

## SKILLS

Data Processing Frameworks: Pandas, Numpy  
Machine Learning Frameworks: Tensorflow, PyTorch  
ML DevOps Frameworks: Weights and Biases, Tensorboard  
Languages: Python, Java  
Markup: LaTeX, Markdown