

EDUCATION

University of Toronto	
MEng, Mechanical Engineering	June 2025
Master's Project: <i>Heat Flow and Thermal Structure of the Lower Atmosphere</i>	
Advisor: Hamed Ibrahim	
Honours BSc, Mathematics	June 2024
With High Distinction; 3.85 final 2-year GPA	
Senior Thesis: <i>Seven-dimensional Exotic Spheres</i>	
Advisor: Emmy Murphy	

HONORS AND AWARDS

University of Toronto Department of Physics Summer Research Award (\$9,500)	2024
Jackman Scholar Award (\$1,000)	2024
Queen's University Mathematics Summer School (Selected to Attend)	2024
Queen's University Graduate Admissions Scholarship (\$28,000, Declined)	2024
University of Ottawa Graduate Admissions Scholarship (\$50,000, Declined)	2024
University of Ottawa Graduate Special Merit Scholarship (\$7,500, Declined)	2024
University of Toronto TA Teaching Excellence Award Finalist	2023
University of Toronto National Biology Scholar	2018

RESEARCH EXPERIENCE

Graduate Student Researcher	August 2024 - Present
University of Toronto Faculty of Engineering	
- Machine Learning for Discovery of Heat Flow and Thermal Structure of the Lower Atmosphere	
- Applying various statistical and data-driven methods on ERA5 reanalysis data to elucidate the dependencies and mechanisms of the heat flow between the Earth surface and tropopause.	
Student Researcher	May 2024 - Present
University of Toronto Department of Physics	
- Modelling of Polar Vortex Crystals on Jupiter; translated original model to Python; programmed netCDF output into the model; parallelized code and ran on the Niagara supercomputer for greater efficiency; improved model includes cumulus drag, a new storm forcing function, compiled Jupiter-like parameters from the literature and ran months-long simulations to study Jupiter-like polar vortex dynamics.	
- Deep Learning for Simulation of Giant Planet Polar Vortices; original project proposal. Constructed and trained new neural networks to predict polar vortex dynamics of Saturn. I was the first person in the lab to introduce machine learning methods.	
- Studied and incorporated numerical simulations, geophysical fluid dynamics, planetary and atmospheric science, and machine learning. Tools included Python, MATLAB, Fortran, Machine Learning, parallel programming, high performance computing.	
Undergraduate Student Researcher	Jan 2024 - May 2024
University of Toronto Department of Mathematics	
- Study of Exotic Seven-Dimensional Spheres; manifolds that are homeomorphic to but not diffeomorphic to the standard seven-dimensional Euclidean sphere.	
- This project compiled and introduced all the tools needed to understand exotic spheres. I also included a new and different technique from Milnor's original work to prove the homeomorphism, by directly computing the homology of the exotic sphere, as well as a brief overview of current work.	
Research Trainee	May 2022 - Aug 2022
University of Toronto Institute of Biomedical Engineering	
- Characterize Parameters of Synaptic Plasticity from Neural Recordings in Patients with Parkinson's Disease.	
- Assisted with code review and translation (MATLAB, Python); studied and incorporated a variety of techniques in computational neuroscience and statistics including GLMs and LIFs.	

TA Teaching Excellence Award Finalist

2023

University of Toronto

- The only undergraduate finalist in award history.
- 14 finalists were selected from 324 faculty-sponsored and student-nominated Teaching Assistants across all campuses.

Assistant Coordinator

September 2022 - Present

University of Toronto Dept. of Mathematical and Computational Sciences

- Head Teaching Assistant for various mathematics courses on logic, proofs, differential and integral calculus, including MAT102 (1 term), MAT132 (2), MAT134 (2).
- Managed team of 7-8 Teaching Assistants, assigned grading schemes, handled regrade requests and student concerns, contributed to test and exam development.

Teaching Assistant

January 2022 - Present

University of Toronto Dept. of Mathematical and Computational Sciences

- Teaching Assistant for various mathematics courses on logic, proofs, differential and integral calculus, including MAT102 (3 terms), MAT132 (2), MAT134 (4), MAT135 (1), MAT236 (2).
- Hosted multiple weekly office hours and tutorials, assisted instructor during active learning lectures, prepared class material, graded assessments, invigilated tests and exams, assisted in curriculum development.
- Completed over 1700 total contracted hours and led over 20 weekly tutorial groups.

Teaching Assistant

September 2024 - Present

University of Toronto Dept. of Mechanical and Industrial Engineering

- Teaching Assistant for MAT238: Differential Equations and Discrete Math; required course for all industrial engineering students.
- Hosted multiple weekly office hours and tutorials, assisted instructor during active learning lectures, prepared class material, graded assessments, invigilated tests and exams, assisted in curriculum development.

Research Assistant

December 2022 - May 2024

University of Toronto Institute for the Study of University Pedagogy

- Developing an Evidence-Based Support Program for First-Year Math Students and Their TAs; investigated how TAs identify and remediate knowledge gaps that impede first-year math students' academic success, as part of a greater project aimed at developing a new support program for students in first-year math courses.
- Conducted literature review on psychological process and object conception in mathematics; developed and administered an evidence-based interview protocol to math TAs; analyzed collected data using qualitative research techniques; presented final research poster at the Jackman Research Colloquium.
- Project: Study on the effectiveness of articulation for non-mathematics students learning mathematics.
- Project: Development of course materials for a new university course on numeracy.
- Project: Research into mathematics history and culture and related pedagogical techniques.
- Project: Compiled an environmental scan report on interdisciplinary studies programs in North American universities by request of the ISUP Director.

Skills: Python, MATLAB, machine learning (TensorFlow, PyTorch, Scikit-learn, pandas, JAX), scientific computing (shell scripting, MPI parallel programming), L^AT_EX, netCDF

Courses: Hamiltonian Mechanics, General Relativity, Computability Theory, Probability, Differential Geometry, PDEs, Deep Learning, Computational Methods for PDEs, Computational Imaging, Data Analytics, Nonlinear Optimization, Reinforcement Learning

Talks/Presentations:

- Jackman Research Colloquium Poster Presentation
- Exotic Spheres: a high-level introduction (University of Toronto Mississauga Math Club)
- Introduction to Field Extensions (University of Toronto Mississauga Math Club)