Peter Phan

tammy.phan@utoronto.ca | peternguyenphan.com

Education

University of Toronto • Master of Engineering, Mechanical Engineering 09/24 - Present

University of Toronto • Honours Bachelor of Science, Mathematics 09/19 - 06/24

with High Distinction; 3.85 final 2-year GPA

Research

Research Student • University of Toronto Department of Civil Engineering; Dr. Hamed Ibrahim 06/24 - Present

- *Master's project in ocean-atmosphere dynamics*
- Studied and utilized coupled ocean-atmosphere models, geophysical fluid dynamics, and numerical simulations.

Research Student • University of Toronto Department of Physics; Dr. Morgan O'Neill 05/24 - Present

- Project 1: *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's physicality by including cumulus drag and developing a new storm forcing function included in the equations of motion; compiled Jupiter-like parameters from the literature and ran months-long simulations to study Jupiter-like polar vortex dynamics.
- Project 2: *Deep Learning for Simulation of Giant Planet Polar Vortices*; original project proposal. Constructed and trained new neural networks to accurately predict polar vortex dynamics of Saturn; vastly improved computation time for simulation of equations of motion; I was the first person in the lab to introduce machine learning methods.
- Studied and incorporated numerical simulation, geophysical fluid dynamics, planetary and atmospheric science, and machine learning. Tools included Python, MATLAB, Fortran, Machine Learning, parallel programming, high performance computing
- Funded by the University of Toronto Department of Physics Summer Research Award ($9,500)

Jackman Research Scholar • Institute for the Study of University Pedagogy; Dr. Margaret Karrass 05/24 - 06/24

- Project: *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.
- Funded by the Jackman Scholarship ($1000 and on-campus residence and food accommodations)

Research Student • University of Toronto Department of Mathematics; Dr. Emmy Murphy 01/24 - 04/24

- Project: *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.
- Topics include differential topology, cohomology and homology theory, characteristic classes, and Morse theory.
- Resulted in my senior thesis project: *On Exotic Spheres* (10,000+ words; awarded 100%)

Research Assistant • University of Toronto Dept. of Math. and Comp. Sciences; Dr. Margaret Karrass 12/22 - 04/24

- Project 1: Study on the effectiveness of articulation for non-mathematics students learning mathematics
- Project 2: Development of course materials for a new university course on numeracy
- Project 3: Research into mathematics history and culture and related pedagogical techniques
- Project 4: Compiled an environmental scan report on interdisciplinary studies programs in North American universities by request of the ISUP Director

Research Trainee • University of Toronto Department of Biomedical Engineering; Dr. Milad Lankarany 05/22 - 08/22

- Project: *Characterize Parameters of Synaptic Plasticity from Neural Recordings in Patients with Parkinson's Disease*
- Assisted with code review and translation (MATLAB, Python)
- Study and incorporate a variety of techniques in computational neuroscience and statistics including generalized linear models and LIF neuron models

Teaching

University of Toronto TA Teaching Excellence Award Finalist 04/23

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

Assistant Coordinator • University of Toronto Dept. of Mathematical and Computational Sciences 09/22 - Present

- Managed team of 7-8 Teaching Assistants, assigned grading schemes, handled regrade requests and student concerns, contributed to test and exam development.
- MAT102 Intro. to Mathematical Proofs (1 semester)
- MAT132 Differential Calculus for Life Science (2)
- MAT134 Integral Calculus for Life Science (2)

Teaching Assistant • University of Toronto Dept. of Mathematical and Computational Sciences 01/22 - Present

- 1700+ total contracted hours and 250+ tutorial sessions.
- 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.
- MAT102 Intro. to Mathematical Proofs (2 semesters)
- MAT132 Differential Calculus for Life Science (2)
- MAT133 Calculus & Linear Algebra for Commerce (1)
- MAT134 Integral Calculus for Life Science (4)
- MAT135 Differential Calculus (1)
- MAT236 Vector Calculus (2)
- ISP130 Numeracy for University and Beyond (1)
- Writing Development Initiative (1)

Relevant Skills & Courses

Skills: Python, MATLAB, LaTeX, High Performance Computing (Niagara cluster, shell scripting, parallel programming), netCDF, HTML, Machine Learning (PyTorch, TensorFlow, Keras, Scikit-learn, pandas)
Undergraduate Courses: Hamiltonian Mechanics, Computability Theory, Probability, Differential Geometry, PDEs
Graduate Courses: General Relativity, Fluid Mechanics, Turbulent Flows, Atmospheric Physics, Advanced Atmospheric Dynamics, Advanced Dynamics, Deep Learning, Computational Methods for Partial Differential Equations

Honours

- **University of Toronto Dept. of Physics Summer Research Award** (Value: $9,500)
- **Jackman Scholar Award** (Value: $1,000 + on-campus accommodations)
- **Top Undergraduate Thesis** Highest grade in department (100%)
- **Queen's University Mathematics Summer School** Selected to attend the annual QMSS
- **Queen's University Graduate Admissions Scholarship** (Value: $50,000)
- **University of Ottawa Graduate Admissions Scholarship** (Value: $28,000)
- **University of Ottawa Graduate Special Merit Scholarship** (Value: $7,500)
- **Qualified for (Discontinued) Mathematical and Computational Sciences Honour Roll x2** 22/23 and 23/24
- **2023 University of Toronto TA Teaching Excellence Award Finalist**
- **University of Toronto National Biology Scholar**

Involvement & Other Employment

Jackman Scholar Research Colloquium (Poster Presentation) 05/24
2024 Canadian Undergraduate Mathematics Conference (Attendee) 07/24
Exotic Spheres: a high-level introduction • University of Toronto Mississauga Math Club (Talk) 10/23
Introduction to Field Extensions • University of Toronto Mississauga Math Club (Talk) 10/22

Math & Science Tutor and Summer Research Project Contributor • Paper 11/21 - 03/23

- K-12 math & science tutor for a service freely provided to students through their school board; contributed to development and implementation of new tutor performance evaluation framework.

Assembly Line Worker • Fiat Chrysler Automobiles 06/20 - 05/21

- Full-time assembly line worker; assembled vehicles and vehicle parts; trained for and operated heavy machinery and industrial chemicals; trained new staff in various assembly line roles.

Newspaper Carrier • Metroland Media 01/20 - 03/20
Assembly Line Worker • Wonderland Food & Emporium 07/19 - 08/19

- Mass-produced confectionaries for wholesale; inventory control; operated heavy machinery; order fulfillment

Crew Member and Maintenance Worker • McDonald's 11/17 - 07/19

- Prepare food; inventory control; 1 of only 3 maintenance workers; maintained heavy equipment; trained new staff