Mithun Vanniasinghe

647-782-0797 mithun.vanniasinghe@mail.utoronto.ca linkedin.com/in/mithun-vanniasinghe mithunvvv.github.io

Research Interests

Robotics | Control Theory | Safe Control | Reachability | Reinforcement Learning | Imitation Learning

Education

University of Toronto **Sep/21 – Apr/26**

Bachelor of Applied Science in Engineering Science, Major in Machine Intelligence, Minor in Robotics *Toronto, Canada*

cGPA: 3.83/4.0, Dean's Honour's List 2021-2025

- **Relevant Coursework:**

ECE356 – Introduction to Control Theory (A+) ECE421 – Machine Learning (A+)
ECE324 – Machine Intel., Software & Neural Nets (A+) ROB311 – Artificial Intelligence (A)
ECE367 – Matrix Algebra & Optimization (A) ECE368 – Probabilistic Reasoning (A)
ECE557 – Linear Control Theory (IPR) ECE411 – Adaptive Control & Reinforcement Learning (IPR)
ROB501 – Computer Vision for Robotics (IPR) ECE470 – Robot Modeling & Control (IPR)

Research Experience

Undergrad Thesis Student **Sep/25 – Present**

LEAF Lab (Advisors: Nick Rhinehart) *University of Toronto*

- Investigating Hamilton-Jacobi reachability analysis and bisimulation-based representation learning to enhance safety in robotic systems, with the goal of improving both sample efficiency and operational safety.

Imitation Learning & Robotics Researcher **May/25 – Sep/25**

Autonomous Space Robotics Lab (Advisors: Tim Barfoot, Nick Rhinehart) *University of Toronto*

- Developed and implemented an imitation learning model, Ratatouille, for human-robot social navigation. **Submitted as second author to ICRA 2026.**
- Designed and conducted real-world experiments, debugging hardware and managing distributed computation across devices using ROS communication.
- Debugged multimodal dynamics issues and identified key factors required for successful behavioral cloning, enabling robust model tuning and real-world deployment in human-robot social navigation.

Reinforcement Learning Researcher **Aug/24 – Sep/25**

DORL Lab (Advisors: Jiayu Chen, Chi-Guhn Lee) *University of Toronto, University of Hong Kong*

- Co-developed LOKI, a hierarchical imitation learning framework for offline skill discovery, introducing a novel extrinsic-intrinsic objective (this idea served as the basis for the paper.) **Submitted as co-first author to ICRA 2026.**
- Built the codebase for the initial phase of the alignment-enforced Vector Quantized VAE and implemented the weakly supervised macro-segmentation pipeline.
- Conducted all experiments and performed detailed time-series analysis of learned skills, including the collection, preprocessing, and cleaning of the offline trajectory dataset to ensure high-quality inputs for hierarchical imitation learning.

Machine Learning Researcher **May/23 – Present**

Super CDMS International Collaboration (Advisors: Scott Oser, Yan Liu) *University of British Columbia*

- Led the implementation of time series **GANs**, adapting model architectures for specific use cases to enhance blinding schemes. Utilized **Python** and **TensorFlow** to generate synthetic time series sensor data, reducing bias in experimental analyses.
- Applied ML techniques, including PCA and t-SNE, to validate the effects of dimensionality reduction in embedding spaces during time series GAN training.

Physics Researcher **May/22 – Aug/22**

Super CDMS International Collaboration (Advisors: Miriam Diamond) *University of Toronto*

- Designed **Python** testing protocols, utilizing the **unittest** framework, to decrease the risk of signal analysis software failure across a wide range of machines and hundreds of users. Leveraged **GitLab CI/CD** and **Singularity/Apptainer** containerization.
- Conducted benchmarking tests via **Bash** scripts in **High Performance Computing** environments and developed **Python** programs for runtime analysis informing software engineers about computing needs of the collaboration.

Publications

Ratatouille: Imitation Learning Ingredients for Real-world Social Robot Navigation
Submitted to ICRA 2026

- J. R. Han, M. Vanniasinghe, H. Sahak, N. Rhinehart, and T. D. Barfoot, "Ratatouille: Imitation Learning Ingredients for Real-world Social Robot Navigation," *arXiv preprint* arXiv:2509.17204, 2025. [Video Demo]

Offline Discovery of Interpretable Skills from Multi-Task Trajectories
Submitted to ICRA 2026

- C. Zhu, M. Vanniasinghe, J. Chen, and C.-G. Lee, "Offline Discovery of Interpretable Skills from Multi-Task Trajectories," *arXiv preprint* arXiv:2509.xxxxx, 2025.

Teaching Experience

Linear Algebra Teaching Assistant **Sep/23 – Present**
Linear Algebra for Engineers *University of Toronto*

Calculus Teaching Assistant **Sep/23 – Present**
Calculus for Engineers *University of Toronto*

Industry Experience

Applied Machine Learning Engineer **May 2024 – Present**
Tenstorrent Inc. *Toronto, Canada*

- **Model Bring-up + Inference Server:** Deployed Mistral 7B on internal inference server, integrated with ML model studio platform, and resolved complex batching and context leakage issues.
- **Model Benchmarking + Infrastructure:** Benchmarked 18+ CV, NLP, and diffusion models on custom hardware, modified 50+ demo scripts for multi-batch and dual-chip support, and added performance logging for internal metrics visibility.
- **LLM App Development + Evaluation:** Built real-time LLM agent app for internal demo day (search + multi-threaded chat), integrated Llama 3.1 70B for live inference, and implemented log-likelihood evaluation using vLLM for grounded model comparisons.

Technical Skills

Languages: Python, C, C++, Bash
Libraries: NumPy, TensorFlow, PyTorch, Keras, SciPy, Scikit-Learn, Matplotlib
Technologies/Frameworks: ROS2, MATLAB, Git, High Performance Computing, Docker

Awards and Honours

- Dean's Undergraduate Student Summer Research Pivot Fellowship $8000 **May/25**
- Gary L. Palmer Memorial Scholarship $1600 **Aug/23**
- Herbert Gladish Memorial Scholarship $1100 **Aug/23**
- NSERC USRA University of British Columbia $10,500 **May/23**
- Engineering Science Research Opportunity Program Award $7500 **May/22**

Leadership and Mentorship

VP Technical Writing, UofT Machine Intelligence Student Team (UTMIST) **July 2025 – Present**

- Coordinated monthly AI/ML newsletter article publications across a team of 15+ writers.
- Initiated and managed the conversion of written articles into engaging short-form video content for social media.

Engineering Mentor (NSight) **Sept 2024 – Present**

- Provide 1:1 mentorship to first-year engineering students, offering guidance on academic success, internship and research experience, study skills, and transitioning to university.

Engineering Orientation Leader **Sept 2022 – Present**

- Served as orientation group leader to welcome incoming first-year students; volunteered at welcoming ceremonies, Frosh Week, and the club fair.