Ben Agro

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Bringing research to real world robots

Work Experience

Waabi - Intern → Researcher I → Researcher II *May 2022 - Present*

- Developing novel perception and forecasting systems that enable self-driving trucks across perception, forecasting, behavior simulation, and sensor simulation.
- Rapid developement from research ideas to improvements on real autonomous trucks.
- Published work through various papers; see MAD, DIO, UnO, ImplicitO, DeTra, QUaD in the “papers" section below.

Robotics Vision and Learning Lab - Undergraduate Researcher *May 2021 - Sept 2021*

- Enabled robots to operate in complex scenarios with learning-based task and motion-planning systems
- Built a simulation environment for development, extended PDDLStream with learned stream-scoring and a queue-based algorithm, and deployed the system to a Franka Panda robot
- Published our work in the paper “Learning to Search in Task and Motion Planning with Streams"

Autonomous Space Robotics Lab - Undergraduate Researcher *May 2020 - Aug 2020*

- Developed a self-supervised semantic LiDAR segmentation pipeline for autonomous navigation
- Published the paper “Self-Supervised Learning of LiDAR Segmentation for Autonomous Indoor Navigation"

Papers

MAD: Memory-Augmented Detection of 3D Objects
Ben Agro, Sergio Casas, Patrick Wang, Thomas Gilles, Raquel Urtasun
Pending CVPR 2025 Submission
Top online non-ensemble method on the Waymo Open Detection Challenge

DIO: Decomposable Implicit 4D Occupancy-Flow World Model
Christopher Diehl, Quinlan Sykora, Ben Agro, Thomas Gilles, Sergio Casas, Raquel Urtasun
Pending CVPR 2025 Submission

DeTra: A Unified Model for Object Detection and Trajectory Forecasting
Sergio Casas, Ben Agro*, Jiageng Mao*, Thomas Gilles, Alexander Cui, Thomas Li, Raquel Urtasun*
ECCV 2024

UnO: Unsupervised Occupancy Fields for Perception and Forecasting
Ben Agro, Quin Sykora, Sergio Casas, Thomas Gilles, Raquel Urtasun
CVPR 2024, **Oral (top 0.7% of submitted papers)**

QuAD: Query-based Interpretable Neural Motion Planning for Autonomous Driving
Sourav Biswas, Sergio Casas, Quin Sykora, Ben Agro, Abbas Sadat, Raquel Urtasun
ICRA 2024

Implicit Occupancy Flow Fields for Perception and Prediction in Self-Driving
Ben Agro, Quin Sykora, Sergio Casas, Raquel Urtasun
CVPR 2023, **Highlight**

Toward globally optimal state estimation using automatically tightened semidefinite relaxations
Frederike Dümbgen, Connor Holmes, Ben Agro, Tim Barfoot
Arxiv Preprint 2023

Learning to Search in Task and Motion Planning with Streams
Mohamed Khodeir, Ben Agro*, Florian Shkurti*
IEEE Robotics and Automation Letters 2023

Self-supervised learning of lidar segmentation for autonomous indoor navigation
Hugues Thomas, ***Ben Agro****, Mona Gridseth, Jian Zhang, Tim Barfoot*
ICRA 2021

Education

PhD in Computer Science, University of Toronto — *Sept 2023 - Present*
Supervised by Raquel Urtasun

BASc in Engineering Science, University Of Toronto — *Sept 2019 - May 2023*
Majored in robotics, Cumulative Average = 97%, CGPA = 4.0

Awards

John Black Aird Scholarship, W.S. Wilson Medal, Ontario Professional Engineers Foundation Gold Medal, Governer's General Silver Medal
May 2024
Awarded to the student with the highest academic standing of any UofT undergraduate

Centennial Senior Project Award — *May 2024*
Awarded for the best undergraduate thesis project

University of Toronto Excellence Award — *May 2020*
To fund the research of exceptional UofT undergraduate students

University of Toronto Scholar Award — *Sept 2019*
Recognition of UofT's outstanding students at admission

Governor General's Bronze Medal — *May 2019*
Awarded for the highest academic standing in highschool

AP National Scholar — *May 2019*
Graduated highschool with six AP (university equivalent) credits

Personal Projects

BARFT: Bundle Adjusting Neural Radiance Fields with Temporal Regularization
A framework for training NeRFs with unknown (learned) camera poses.

Explainer of "Transformers As Statisticians"
Distilling the key ideas behind "Transformers as Statisticians: Provable In-Context Learning with In-Context Algorithm Selection"

Zero-Shot Video Retrieval With Vision Language Models
A zero-shot video retrieval system that leverages open-source vision-language models

Towards Globally Optimal Stereo Localization (Undergrad Thesis)
An investigation into how to make the problem stereo localization globally optimal, supervised by Tim Barfoot

"Captor" the autonomous drone
A custom-built autonomous drone with reliable onboard SLAM and vision-only obstacle avoidance

Geometry Boy
A version of the popular game Geomety Dash programmed for the original Gameboy hardware

News

Top U of T undergraduate Ben Agro is taking his passion for research into a direct-entry PhD — *June 12, 2023*