# Aaron Hao Tan, MASc, PhD

Robotics Institute, Mechanical Engineering
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## BIO

I'm an incoming postdoctoral fellow at Stanford Robotics. I'm interested in robotic theory of mind to help robots predict their environment, understand collaborators' intentions, and make teamwork more efficient.

## PUBLICATIONS

### Forthcoming Contributions

*Notable Work

2024* **A. H. Tan**, S. Narasimhan, G. Nejat, "4CNet: A Diffusion Approach to Map Prediction for Decentralized Multi-Robot Exploration", IEEE Transaction on Robotics (*Under Review*)

2024* A. Fung, **A. H. Tan**, H. Wang, B. Benhabib, G. Nejat, "MLLM-Search A Zero-Shot Approach to Find Any Person in Any Environment using Multimodal Large Language Models", IEEE Robotics and Automation Letters (*Under Review*)

2024* S. Narasimhan, **A. H. Tan**, D. Choi, G. Nejat, "OLiVia-Nav: An Online Lifelong Vision Language Approach for Mobile Robot Social Navigation", IEEE International Conference on Robotics and Automation (*Under Review*), CoRL 2024 (*Workshop*)

2024* D. Choi, A. Fung, H. Wang, **A. H. Tan**, "Find Everything: A General Vision Language Model Approach to Multi-Object Search", IEEE International Conference on Robotics and Automation, (*Under Review*), CoRL 2024 (*Workshop*)

### Contributions in Progress

2024* **A. H. Tan**, A. Fung, H. Wang, G. Nejat, "Mobile Robot Navigation with Hand-drawn Maps: A Vision Language Model Approach", IEEE Robotics and Automation Letters
(*In Preparation*)

2024* H. Wang, **A. H. Tan**, A. Fung, G. Nejat, "X-Nav: Learning Cross-Embodiment Navigation for Wheeled and Quadrupedal Robots", IEEE Robotics and Automation Letters
(*In Preparation*)

2024* Y. Zhu, **A. H. Tan**, A. Fung, G. Nejat, "Voxel-based Neural Implicit Mapping of Human Centric Environments via Contrastive Learning", IEEE Robotics and Automation Letters
(*In Preparation*)

### Peer Reviewed Contributions

2024* H. Wang, **A. H. Tan**, G. Nejat, "NavFormer: Transformer Architecture for Robot Target-Driven Navigation in Unknown and Dynamic Environments", IEEE Robotics and Automation Letters, 2024

2024 Y. Zhang, M. Effati, **A. H. Tan**, G. Nejat, "Robust Face Mask Detection by a Socially Assistive Robot Using Deep Learning," Computers, 2024

2023* **A. H. Tan**, F. P. Bejarano, Y. Zhu, R. Ren, G. Nejat, "Deep Reinforcement Learning for Decentralized Multi-Robot Exploration with Macro Actions," IEEE Robotics and Automation Letters + ICRA, 2023

2023 C.H, Cheung, **A. H. Tan**, A. Goldenberg, "Development of a Pillow Placement Process for Robotic Bed-Making", IEEE/ASME MESA, 2023

2022* **A. H. Tan**, G. Nejat, "Enhancing Robot Task Completion Through Environment and Task Inference: A Survey from the Mobile Robot Perspective," Journal of Intelligent & Robotic Systems, 2022

2022 **A. H. Tan**, L. Donaldson, L. Moolla, A. Pereira, E. Margolin, "A Deep Learning Model to Identify Homonymous Defects on Automated Perimetry," British Journal of Ophthalmology, 2022

2022 **A. H. Tan,** A. Al-Shanoon, H. Lang, Y. Wang, "Mobile Robot Docking with Obstacle Avoidance and Visual Servoing", International Journal of Robotics and Automation, 2022

2021* **A. H. Tan**, M. Peiris, M. El-Gindy, H. Lang, "Design and Development of a Novel Autonomous Scaled Multi-Wheeled Vehicle," Robotica, 2021

2021* H. Hu, K. Zhang, **A. H. Tan**, M. Ruan, C. Agia, G. Nejat, "A Sim-to-Real Pipeline for Deep Reinforcement Learning for Autonomous Robot Navigation in Cluttered Rough Terrain," IEEE Robotics and Automation Letters + IROS, 2021

2019 **A. H. Tan**, H. Lang, M. El-Gindy, "A Novel Autonomous Scaled Electric Combat Vehicle," in ASME International Design Engineering Technical Conferences, Anaheim, USA, 2019

2018 **A. H. Tan**, A. Al-Shanoon, H. Lang, M. El-Gindy, "Mobile Robot Regulation with Image Based Visual Servoing," in ASME International Design Engineering Technical Conferences, Quebec City, Canada, 2018

2018 A. Al-Shanoon, **A. H. Tan**, H. Lang, Y. Wang, "Mobile Robot Regulation with Position Based Visual Servoing," in IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications, Ottawa, Canada, 2018

### Non-Refereed Contributions

2024 H. M. McDonald, **A. H. Tan**, L. Donaldson, E. Margolin, "Deep Learning Model for the Radiological Diagnosis of Typical and Antibody-Mediated Optic Neuritis", North American Neuro-Ophthalmology Society Annual Meeting, Waikiki, USA, 2024 (Poster)

2022 **A. H. Tan**, L. Donaldson, L. Moolla, E. Margolin, "A Deep Learning Model to Identify Homonymous Defects on Automated Perimetry", North American Neuro-Ophthalmology Society Annual Meeting, Austin, USA, 2022 (Poster)

2021 **A. H. Tan,** A. Fung, M. P. Hung, C. Getson, "Jeeves, the Ethically Designed Interface", Technical Report, Talk at RO-MAN: Roboethics Competition, McGill University (Online), 2021

2021 **A. H. Tan**, A. Fung, S. Sauderson, G. Nejat, "Socially Assistive Service Robots at the Autonomous Systems and Biomechatronics Lab," University of Toronto Engineering Research Days, Toronto, ON, Canada, June, 2021 (Poster)

2021 **A. H. Tan**, L. Moolla, A. Pereira, "A Deep Learning Model to Predict Postoperative Refraction in Cataract Surgery", University of Toronto Resident Research Day, Toronto, ON, Canada, June, 2021 (poster)

2019 **A. H. Tan**, "Design and development of an autonomous scaled electric combat vehicle", MASc Thesis, University of Ontario Institute of Technology, Oshawa, Canada, 2019)

## Recognition/Scholarships/Grants/Awards

Click Each Award for Reference

| | |
|---|---|
| 2024 | PRISM Corhort - Stanford University ($2k) |
| 2024 | Doctoral Completion Award - University of Toronto ($4k) |
| 2024 | Ontario Graduate Scholarship – University of Toronto ($15k) |
| 2024 | LocalHost Fellowship (Acceptance) |
| 2024 | Teaching Excellence Award (Nominated) |
| 2023 | Microsoft Startup Hub Program (up to $150k) |
| 2023 | Ontario Graduate Scholarship - University of Toronto ($15k) |
| 2022 | William Dunbar Memorial Scholarship - University of Toronto ($6k) |
| 2022 | Apple AI/ML Scholar Nominee - University of Toronto (1 of 3 selected across the university) |
| 2022 | Ontario Graduate Scholarship - University of Toronto ($15k) |
| 2022 | MIE Teaching Assistant Award - University of Toronto ($500) (Certificate) |
| 2022 | DiDi Graduate Awards - University of Toronto ($10k) |
| 2022 | COS: Awards of Excellence in Ophthalmic Research - 2nd Place Collaborator |
| 2022 | MIE Fellowship - University of Toronto ($12k) |
| 2021 | IEEE RO-MAN: The Roboethics Competition, McGill University - 1st Place ($1k) |
| 2021 | IROS: Outstanding Service as Chair of Technical Session |
| 2021 | Best Ophthalmology and Vision Sciences Research Day Paper - University of Toronto |
| 2021 | MIE Fellowship - University of Toronto ($12k) |
| 2020 | COVID-19 … |
| 2020 | MIE Fellowship - University of Toronto ($12k) |
| 2019 | Outstanding Thesis Award Nomination - Ontario Tech University (MASc) |
| 2019 | MIE Fellowship - University of Toronto ($12k) |
| 2018 | FEAS Graduate Scholarship - Ontario Tech University ($5k) |
| 2018 | Appeared in an international documentary commissioned by Korean Broadcasting System |
| 2017 | Capstone project video commissioned by Ontario Tech University for future students |
| 2017 | 1st Place Senior Engineering Design Competition - Ontario Tech University ($500) |
| 2017 | Team GM Recognition Award |
| 2016 | General Motors Assembly Plant Award ($2.5k) |
| 2016 | NSERC Undergraduate Student Research Awards ($8.6k) |
| 2012-2017 | President's List |

## TEACHING

Click Each Eval for Reference

| | |
|---|---|
| 2024 F | MIE1517: Introduction to Deep Learning Tutorial TA, University of Toronto |
| 2024 F | ROB301: Introduction to Robotics Tutorial TA, University of Toronto |
| 2024 S | MIE1070: Intelligent Robots for Society Head TA, University of Toronto |
| 2024 W | MIE 443: Mechatronics Systems: Design & Integration Head TA, University of Toronto |
| 2023 F | ROB301: Introduction to Robotics Tutorial TA, University of Toronto |
| 2023 S | MIE1070: Intelligent Robots for Society Head TA, University of Toronto |
| 2023 W | MIE443: Mechatronics Systems: Design & Integration Tutorial TA, University of Toronto |
| 2022 F | ROB301: Introduction to Robotics Head TA, University of Toronto |
| 2022 F | ECE1724: Bio-inspired Algorithms for Smart Mobility Tutorial TA, University of Toronto |
| 2022 S | MIE1070: Intelligent Robots for Society Head TA, University of Toronto |
| 2022 W | MIE443: Mechatronics Systems: Design & Integration Tutorial TA, University of Toronto |
| 2022 W | ENH610: Parasitology and Pest Control Lab TA, Toronto Metropolitan University |
| 2021 W | MIE443: Mechatronics Systems: Design & Integration Tutorial TA, University of Toronto |
| 2020 W | MIE443: Mechatronics Systems: Design & Integration Lab TA, University of Toronto |
| 2019 W | MECE3390U: Mechatronics Head TA, Ontario Tech University |
| 2018 F | MECE2230U: Statics Head TA, Ontario Tech University |
| 2018 W | MECE3390U: Mechatronics Head TA, Ontario Tech University |
| 2017 F | MECE3350U Control Systems Head TA, Ontario Tech University |

**Course Evaluations**: University of Toronto (Eval/Certificate), Ontario Tech University (view 1/ view 2)

## MENTORING

Click View and **Name** for Reference

2024-Now **Sourabh Prasad**, Master of Engineering Student at University of Toronto
- Project: Cross Embodiment Navigation

2023-24 **Daniel Choi,** Undergraduate Student at University of Toronto
- Thesis: Trajectory Prediction and LLM Reward Tuning for Robot Social Navigation with Deep Reinforcement Learning (view)
- Currently: MASc Student at University of Toronto

2022-23 **Yuhan Zhu,** Master of Engineering Student at University of Toronto
- Paper: Voxel-based Neural Implicit Mapping of Human Centric Environments via Contrastive Learning (under review)
- Currently: PhD Student at University of California, Riverside

2022-23 **Haitong Wang,** Master of Engineering Student at University of Toronto
- Paper: NavFormer: Transformer Architecture for Robot Target-Driven Navigation in Unknown and Dynamic Environments
- Currently: PhD Student at University of Toronto

2022-23 **Yuntao Cai,** Undergraduate Student at University of Toronto
- Thesis: Decentralized Multi-Robot Exploration (view)
- Currently: MASc Student at University of Toronto

2022-23 **Siddarth Narasimhan,** Undergraduate Student at University of Toronto
- Thesis: Using Contrastive Learning for Map Prediction in 3D Environments via Trajectory Map Pretraining (view)
- Currently: MASc Student at University of Toronto

2021-22 **Yuhan Zhu,** Undergraduate Student at University of Toronto
- Thesis: A Realistic Simulator in Search and Rescue (view)
- Currently: PhD Student at University of California, Riverside

2021-23 **Fraser Robinson,** MASc Student at University of Toronto
- Thesis: An Intelligent Social Robot for Assisting with Multiple Daily Activities (view)
- Currently: Mechatronics Engineer at Revolve Surgical

2021-22 **Giro Ele,** Undergraduate Student at University of Toronto
- Thesis: Investigation of Multi-object Tracking Techniques for Robotic Application (view)

2021-22 **Richard Ren,** Undergraduate Student at University of Toronto
- Thesis: Benchmarking Deep Reinforcement Learning Methods for Decentralized Multi-robot Exploration (view)
- Currently: Software Engineer at Amazon

2020-21 **Federico Pizzaro Bejarano,** Undergraduate Student at University of Toronto
- Thesis: Research and Implementation of Decentralized Multi-Robot Coordination Methods Applied to Urban Search and Rescue (view)
- Currently: PhD Student at University of Toronto

2020-21 **Ge Lin,** Undergraduate Student at University of Toronto
- Thesis: Simulator for Search and Rescue (view)
- Currently: Robotics Engineer at Zebra Technologies

2018-19 **Undergraduate Capstone Project Supervision**, Ontario Tech University
- Supervised 4 cross functional teams (view)

2017-18 **Undergraduate Capstone Project Supervision**, Ontario Tech University
- Supervised 2 cross functional teams

## ACADEMIC SERVICE

2020-Now **Conference Reviewer**

- IEEE International Conference on Robotics and Automation (ICRA)
- Conference on Robot Learning (CoRL)
- IEEE International Conference on Intelligent Robots and Systems (IROS)
- Robotics: Science and Systems (RSS)

**Journal Reviewer**

- IEEE Robotics and Automation Letters (RA-L)
- International Journal of Intelligent and Robotic Systems
- Machine Learning (Springer Nature)
- Scientific Reports (Springer Nature)

## NEWS & ACTIVITIES

Click Each Item for Reference

| | |
|---|---|
| 2024 F | Spotlight Presentation @ CoRL 2024 (Invite, Talk) |
| 2024 S | Keynote Speaker at The Future of Construction (Picture/Talk) |
| 2023 S | Placed 3rd in the prestigious Shot on iPhone Photography Award hosted by IPPAWARDS (Picture) |
| 2023 W | Won 1st place in Toronto's competitive men's basketball league (Picture) |
| 2022 F | Won 1st place in Toronto's competitive men's basketball league (Picture) |
| 2022 F | Designed billboards using DALL-E for Grammy Award recipient Sean Leon (Pic1/ Pic2) |
| 2022 S | Organized paintball social event for Robotics Institute at the University of Toronto (Picture) |
| 2022 S | Won 1st place in Toronto's competitive men's basketball league (Pic 1/Pic 2) |
| 2021 F | Won 2nd place in Toronto's recreational men's basketball league (Picture) |
| 2019 S | Photographer of the Local Organization Committee for the 14th IEEE ICCSE Conference |
| 2018 S | Featured in Apple's Shot on iPhone photography campaign (Pic 1/Pic 2) |

## ACADEMIC TRAINING

2025 Incoming — Postdoctoral Fellow, Stanford University, USA
Assistive Robotics and Manipulation Laboratory
Advisor: Monroe Kennedy

2019-2024 — Doctor of Philosophy, Robotics Institute, University of Toronto, Canada
Specialization: Development of Inference-driven Decision Making for Mobile Robot Navigation and Exploration
CGPA (4.0/4.0)
Advisor: Goldie Nejat (Link)

2017-2019 — Master of Applied Science, Ontario Tech University, Canada
Specialization: Mechatronics Option with Internship
President's List, CGPA (4.3/4.3)
Advisor: Haoxiang Lang, Moustafa El-Gindy

2012-2017 — Bachelor of Engineering with Highest Distinction, Ontario Tech University, Canada
Specialization: Mechatronics Option with Internship
President's List, CGPA (4.0/4.3)

## PROFESSIONAL EXPERIENCE

Click Each Item for Reference

**Syncere**
Founder
2024 Q4 – Now
- Building robots for modern hospitality.
- Website: https://www.syncereai.com

**Scholarply**
Founder
2023 Q3 – Q4
- An LLM agent that accelerate the scholarship application process for students.
- Selected by Microsoft Startup Hub, receiving grants worth $150k.
- Article / Newsletter / TikTok / Demo
- Website: https://www.scholarply.com

**ONE800**
Founder
2023 Q1 – Q2
- A personalized assistant integrated in to iMessage.
- Led a team of 10 across engineering, design and operations.
- Twitter / Instagram / Demo / Team (Pic1 / Pic2)
- Website: http://3.230.3.191/

**Toronto Eye**
AI Researcher
2022 – Now
- Working with neuro-ophthalmologists in developing AI tools to support early disease detection and enhance cataract surgery.
- Published medical papers.

**SmartARM**
ML Consultant
2021 Summer
- I worked closely with the to identify key operational metrics, and design reviews.
- Website: https://www.smartarm.ca

**General Motors**
Internship
2 Appointments
2016/2017
- Designed wearable hardware and developed ML models to predict driver behavior based on vital signs.
- Designed an adjustable camera system for trailers to provide drivers with greater awareness.
- Project Video: https://www.youtube.com/watch?v=WCD9Q_Y4WIA

## REFERENCES

PhD Supervisor: Dr. Goldie Nejat, goldie.nejat@utoronto.ca
MASc Supervisor: Dr. Haoxiang Lang, haoxiang.Lang@ontariotechu.ca
Collaborator: Dr. Edward Margolin, Edward.Margolin@uhn.ca

## PERSONAL INFORMATION

Languages: English, Python, Mandarin
Hobbies: Basketball, Photography, Music, Food
Citizenship: Canadian