

Ali Harakeh

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EDUCATION

Ph.D. Aerospace Science & Engineering 2021

University Of Toronto Institute for Aerospace Studies (UTIAS), Toronto, ON, Canada

- **Thesis Title:** [Estimating and Evaluating Predictive Uncertainty In Deep Object Detectors](#).
- **Thesis Advisor:** Steven L. Waslander
- **Doctoral Examination Committee:** Raquel Urtasun, Kilian Q. Weinberger, Timothy D. Barfoot, and Angela Schoellig

M.Eng. Mechanical Engineering (Thesis Option, Mechatronics Track) 2016

American University of Beirut, Beirut, Lebanon

- **Thesis Title:** [Towards Fully Self-Supervised Free Space Estimation For Unmanned Ground Vehicles](#).
- **Thesis Advisors:** Daniel Asmar and Elie Shammas

B.Eng. Mechanical Engineering (Mechatronics Track) 2014

American University of Beirut, Beirut, Lebanon

- **Thesis Title:** [Retrofitting an 1983 IBM 7540 SCARA Robot Through a Full Controller Overhaul](#).
- **Final Project Advisors:** Daniel Asmar and Elie Shammas

PROFESSIONAL APPOINTMENTS

IVADO Postdoctoral Research Fellow Current

Mila - Quebec AI Institute, Montreal, QC, Canada

- Funded by the [IVADO Postdoctoral Research Funding](#).
- Working as a part of the [Dependable and Explainable Learning \(DEEL\)](#) project.
- Advised by Liam Paull.

REFEREED JOURNAL ARTICLES

- J1. D. Feng*, **A. Harakeh*** (*co-first authors), S. L. Waslander and K. Dietmayer, “[A Review and Comparative Study on Probabilistic Object Detection in Autonomous Driving](#)”, *The IEEE Transactions on Intelligent Transportation Systems* , pp 1-20 (2021).
- J2. **A. Harakeh**, D. Asmar, and E. Shammas, “[Self Supervised Free Space Estimation in Outdoor Terrain](#)”, *Robotica* , pp 1-23 (2018).

REFEREED CONFERENCE ARTICLES

- C1. **A. Harakeh** and S. L. Waslander, “[Estimating and Evaluating Regression Predictive Uncertainty in Deep Object Detectors](#)”, *International Conference on Learning Representations* , (**ICLR 2021**).
- C2. C. Reading, **A. Harakeh**, N. Chae, and S. L. Waslander, “[Categorical Depth Distribution Network for Monocular 3D Object Detection](#)”, *2021 Conference on Computer Vision and Pattern Recognition* , (**CVPR 2021**, Oral Presentation).

- C3. **A. Harakeh**, M. Smart and S. L. Waslander, “[BayesOD: A Bayesian Approach for Uncertainty Estimation in Deep Object Detectors](#)”, *2020 IEEE International Conference on Robotics and Automation* , (**ICRA 2020**).
- C4. J. Ku, M. Mozifian, J. Lee, **A. Harakeh**, and S. L. Waslander, “[Joint 3D Proposal Generation and Object Detection From View Aggregation](#)”, *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems* , (**IROS 2018**).
- C5. M. Angus, M. ElBalkini, S. Khan, **A. Harakeh**, O. Andrienko , C. Reading, S. L. Waslander, and K. Czarnecki, “[Unlimited Road-scene Synthetic Annotation \(URSA\) Dataset](#)”, *The 21st IEEE International Conference on Intelligent Transportation Systems* , (**ITSC 2018**).
- C6. J. Lee, S. Walsh, **A. Harakeh**, and S. L. Waslander, “[Leveraging Pre-Trained 3D Object Detection Models For Fast Ground Truth Generation](#)”, *The 21st IEEE International Conference on Intelligent Transportation Systems* , (**ITSC 2018**).
- C7. J. Ku, **A. Harakeh**, and S. L. Waslander, “[In Defense of Classical Image Processing: Fast Depth Completion on the CPU](#)”, *15th Conference on Computer and Robot Vision* , (**CRV 2018**).
- C8. A. Pon, A. Adrienko, **A. Harakeh**, and S. L. Waslander, “[A Hierarchical Deep Architecture and Mini-Batch Selection Method For Joint Traffic Sign and Light Detection](#)”, *15th Conference on Computer and Robot Vision* , (**CRV 2018**).
- C9. **A. Harakeh**, D. Asmar, and E. Shammas, “[Identifying Good Training Data for Self-Supervised Free Space Estimation](#)”, *2016 Conference on Computer Vision and Pattern Recognition* , (**CVPR 2016**).
- C10. **A. Harakeh**, D. Asmar, and E. Shammas, “[Ground Segmentation and Occupancy Grid Generation Using Probability Fields](#)”, *2015 IEEE/RSJ International Conference on Intelligent Robots and Systems* , (**IROS 2015**).

WORKSHOP ARTICLES

- W1. J. Willes, J. Harrison, **A. Harakeh**, C. Finn, M. Pavone, and S. L. Waslander, “[Open-Set Incremental Learning via Bayesian Prototypical Embeddings](#)”, *Workshop on Meta-Learning* , (**NeurIPS 2020 Workshops**).
- W2. **A. Harakeh** and S. L. Waslander, “[How Should We Evaluate Probabilistic Object Detectors?](#)”, *Workshop on The Importance of Uncertainty in Deep Learning for Robotics* , (**IROS 2019 Workshops**).

MANUSCRIPTS IN SUBMISSION

- S1. **A. Harakeh**, J. S. Hu, N. Huang, S. L. Waslander, and L. Paull, “[Estimating Predictive Distributions with OT-regularized Sample Networks](#)”, *Submitted to the Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS)* , (2022).
- S2. J. Willes, J. Harrison, **A. Harakeh**, C. Finn, M. Pavone, and S. L. Waslander, “[Bayesian Embeddings for Few-Shot Open World Recognition](#) ”, *Submitted to the IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)* , (2021).

AWARDS AND HONORS

- **G. N. Patterson Student Award**

2021

University of Toronto

- Awarded to **one** most outstanding Ph.D. candidate to have finished their degree at the University of Toronto Institute for Aerospace Studies in the academic year of 2020-2021.

- **Molson Kenneth Fellowship Award** 2021
University of Toronto
 - Awarded to Ph.D. candidates with the highest academic standing at the University of Toronto Institute for Aerospace Studies.

SUCCESSFUL GRANTS AND FELLOWSHIPS

- **Samsung AI Research Grant** 2022
Mila - Quebec AI Institute
 - Co-written with Liam Paull (PI).
 - **56,000 CAD** for one year.
- **Compute Canada Resource Allocation Competition** 2022
Mila - Quebec AI Institute
 - Co-written with Liam Paull (PI).
 - Compute resources valued at **24,601 CAD**.
- **IVADO Postdoctoral Research Funding** 2021
Mila - Quebec AI Institute
 - **70,000 CAD/year** for two years.

INVITED TALKS

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| 1. Carrefour DEEL Seminar on Uncertainties for Object Detection | Virtual Event, 2022 |
| 2. RSS 2021 Pioneers Workshop (Selected as an RSS 2021 Pioneer) | Virtual Event, 2021 |
| 3. University of Toronto Robotics Institute AV Workshop | Virtual Event, 2021 |
| 4. IROS 2019 Workshop on Uncertainty in Deep Learning | Macao, China, 2019 |
| 5. UofT Robotics Institute Inaugural Fall Workshop | Toronto, Canada, 2019 |
| 6. Toronto Machine Learning Summit | Toronto, Canada, 2018 |
| 7. Vector Institute Endless Summer School | Toronto, Canada, 2018 |

INDUSTRY EXPERIENCE

- Machine Learning Research Engineer** Apr-Jun 2021
RydeSafely, Toronto, ON, Canada
- Designed tools to perform uncertainty estimation, out-of-distribution (OOD) detection, and active learning for 3D object detectors in the context of autonomous vehicles.
- Associate Researcher** May-Dec 2019
Noah's Ark Labs (Huawei Technologies), Markham, ON, Canada
- Designed perception algorithms that were deployed as part of a real-time autonomous vehicle stack.
- Subject Matter Expert** May-Oct 2018
Coursera, Toronto, ON, Canada
- Created slides, video scripts, and coding projects for the massive open online course (MOOC) titled [Visual Perception for Self-Driving Cars](#).

RESEARCH EXPERIENCE

Research Supervisor

2021-Current

University of Montreal, Montreal, QC, Canada

- Supervising six research projects on Robot Perception and Planning.

Research Supervisor

2019-2021

University Of Toronto Institute for Aerospace Studies (UTIAS), Toronto, ON, Canada

- Supervising two Master's students working on monocular 3D object detection and incremental learning for image classification.
- Lead to publications C2, W1, and S2.

Perception Team Lead

2017-2018

Autonomoose Project, University Of Waterloo, Waterloo, ON, Canada

- Supervised a group of 9 undergraduate and Master's students working on the following topics: 3D Object Detection, Semantic Segmentation, Synthetic Data Generation, Human-In-The-Loop 3D Data Labeling.
- Provided perception algorithms for several autonomous driving demos in [CES 2017](#) and [VTC 2017](#).
- Lead to publications C4, C5, C6, C7, and C8.

TEACHING EXPERIENCE

University of Waterloo

Department of Mechanical and Mechatronics Engineering

- Spring 2018, Spring 2017: *Tutorial Instructor, MTE 203 Advanced Calculus*, (~100 students)
- Winter 2018: *Lab Instructor, ME 640 Autonomous Mobile Robotics*, (~30 students)
- Fall 2017: *Lab Instructor, MTE 544 Autonomous Mobile Robotics*, (~60 students)
- Spring 2017: *Course Instructor, ME 780 Perception for Autonomous Driving*, (~10 students)

American University of Beirut

Department of Mechanical Engineering

- Spring 2016: *Tutorial Instructor, MECH 642 Computer Vision*, (~50 students)
- Fall 2015: *Lab Instructor, MECH 530 Mechatronics System Design*, (~60 students)
- Fall 2014: *Lab Instructor, MECH 430 Instrumentation and Measurements*, (~120 students)

CONFERENCE/WORKSHOP ORGANIZATION

[Robotics Science and Systems \(RSS\) 2022](#), [Pioneers Chair](#)

2022

New York City, NY, USA

ACADEMIC SERVICES

- Guest Editor for [Frontiers in Computer Vision Journal](#).
- Reviewer for CVPR, ICCV, ECCV, ACCV, ICRA, IROS, ICLR, and NeurIPS conferences.
- Member of Toronto Machine Learning Summit ([TMLS](#)) steering committee (2018 - 2019).