

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.

PEER-REVIEWED 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. Shamma, “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. Shamma, “Ground Segmentation and Occupancy Grid Generation Using Probability Fields”, *2015 IEEE/RSJ International Conference on Intelligent Robots and Systems*, (IROS 2015).

PEER-REVIEWED 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. Shamma, “Self Supervised Free Space Estimation in Outdoor Terrain”, *Robotica*, pp 1-23 (2018).

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 the 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 highest academic standing at the University of Toronto Institute for Aerospace Studies.

FELLOWSHIPS AND SUCCESSFUL GRANT PROPOSALS

- **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.

SELECTED 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 |

RESEARCH EXPERIENCE

Research Supervisor 2021-Current
University of Montreal, Montreal, QC, Canada

- Supervising two Ph.D. and two Master’s students working on Continual Robot Learning and Probabilistic Modeling.

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.

Research Intern 2016
King Abdullah University of Science and Technology, Thuwal, KSA

- Research on 3D object detection for autonomous driving at [IUVL](#) headed by [Bernard Ghanem](#).

Research Intern

2013

University Of Wisconsin, Madison, WI, USA

- Designed and built a cost efficient microfluidics chip using EWOD (Electrowetting) technology under the supervision of [John G. Webster](#).

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](#).

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: *Teaching Assistant, ME 640 Autonomous Mobile Robotics*, (~30 students)
- Fall 2017: *Lab Instructor, MTE 544 Autonomous Mobile Robotics*, (~60 students)
- Spring 2017: *Course Designer and Instructor, ME 780 Perception for Autonomous Driving*, (~10 students)

American University of Beirut

Department of Mechanical Engineering

- Spring 2016: *Teaching Assistant, MECH 642 Computer Vision*, (~25 students)
- Spring 2015: *Teaching Assistant, MECH 650 Autonomous Mobile Robotics*, (~25 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).

REFEREES

Liam Paull

Assistant Professor, Département d'informatique et de recherche
opérationnelle (DIRO)

Director, Montreal Robotics and Embodied AI Lab

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Steven L. Waslander

Associate Professor, Institute for Aerospace Studies

Director, Toronto Robotics and AI Laboratory

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Director, Waterloo Intelligent Systems Engineering Lab

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