

Ali Harakeh

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SKILLS

- **Languages:** Python, Bash Scripting, LaTeX, Matlab/Octave, C++
- **DevOps:** Git, Docker, Singularity
- **Frameworks:** PyTorch, Tensorflow, Scikit-learn, OpenCV, PCL, ROS

EXPERIENCE

- **Mila - Quebec AI Institute** Montreal, QC, Canada
IVADO Postdoctoral Research Fellow *July 2021 – Present*
 - Established a new state-of-the-art in non-parametric uncertainty estimation for monocular depth predictors by designing and implementing a novel predictive distribution estimator in PyTorch using sample generation, proper scoring rules, and optimal transport theory.
 - Initiated two research projects on continual learning and few-shot learning by acquiring more than 80,000 CAD in research grants through partnerships with the public and private sectors.
 - Achieved a 10 times speedup in my group's machine learning infrastructure through utilizing Docker, Singularity, and Slurm.
- **Markovian AI** Toronto, ON, Canada
Machine Learning Research Engineer *Mar. 2021 – June 2021*
 - Developed the company's core product by creating software for certifying and testing 3D autonomous vehicle perception stacks using uncertainty estimation, out-of-distribution (OoD) detection, and active learning algorithms, implemented with PyTorch and ROS.
- **Huawei Technologies Co., Ltd.** Markham, ON, Canada
Associate Researcher *May 2019 – Dec. 2019*
 - Boosted the LiDAR 3D object detection performance of the company's self-driving vehicle by 4% through designing and implementing an uncertainty-aware feedback 3D object detector using PyTorch.
- **University of Toronto** Toronto, ON, Canada
Doctoral Researcher *June 2018 – June 2021*
 - Authored a pioneering work on the theoretical foundations for estimating and evaluating bounding box predictive distributions using proper scoring rules. PyTorch code for this project can be found at [this link](#).
 - Increased the performance of anchor-based probabilistic object detectors by 9.77% to 13.13% through deriving a probabilistic replacement to Non-maximum Suppression (NMS) using Bayesian inference. PyTorch code for this project can be found at [this link](#). Tensorflow 2 code can also be found at [this link](#).
 - Improved the performance of monocular 3D object detection by up to 33.75% over the state-of-the-art on the Waymo dataset through designing and implementing a fully differentiable end-to-end approach for joint depth estimation and monocular 3D object detection in PyTorch.
- **University Of Waterloo** Waterloo, ON, Canada
Team Lead, Autonomous Vehicles Perception *Sep. 2016 – May 2018*
 - Enabled the [Autonomoose](#) self-driving car to drive autonomously for more than 100 Km on public roads by leading the design, implementation, and deployment of the car's real-time 3D object detection and tracking components using Tensorflow and ROS.

EDUCATION

- **University of Toronto** Toronto, ON, Canada
PhD in Aerospace Science and Engineering *Sep. 2016 – June 2021*
 - **Thesis Title:** *Estimating and Evaluating Predictive Uncertainty in Deep Object Detectors.*
 - **Supervisor:** Steven L. Waslander

• **American University of Beirut**
MSc in Mechanical Engineering

Beirut, Lebanon
May 2014 – Aug. 2016

• **American University of Beirut**
BE in Mechanical Engineering

Beirut, Lebanon
Jan. 2010 – Apr. 2014

SELECTED PUBLICATIONS

For a full list of publications, please see my [google scholar page](#).

1. J. Willes, J. Harrison, **A. Harakeh**, C. Finn, M. Pavone, and S. L. Waslander, *Bayesian Embeddings for Few-Shot Open World Recognition*, The IEEE Transactions on Pattern Analysis and Machine Intelligence (**PAMI 2022**)
2. **A. Harakeh** and S. L. Waslander, *Estimating and Evaluating Regression Predictive Uncertainty in Deep Object Detectors*, International Conference on Learning Representations (**ICLR 2021**)
3. 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)
4. 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 (**T-ITS 2021**)
5. **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**)
6. 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**)
7. **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**)
8. **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**)