

# Bahaa Aldeeb

PERCEPTION · MACHINE LEARNING · ROBOTICS

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*I am a researcher and engineer interested in robotics & learning. I am actively seeking positions in computer vision, machine learning, and robotics, eager to apply my years of experience as a Perception Algorithm Engineer and Academic Researcher.*

## Education

**M.S., ROBOTICS** · University of Michigan, Ann Arbor · GPA 3.90 May 2022

- Focus areas: Perception and Reasoning
- Courses: Advanced Computer Vision, Unsupervised Visual Learning, and Mobile Robotics

**B.S.E., COMPUTER ENGINEERING** · University of Michigan, Ann Arbor · GPA 3.58 May 2018

- Courses: Autonomous Robotics, Machine Learning, Computer Vision
- Electives: Computer Vision Directed Study, Ethics in Robotics, Embedded Control

**Skills** — Languages: Python, C++ — Libraries: Pytorch, Torch3d, PCL — Tools: ROS, Docker, WandB, CMake —

## Professional Experience

**QUANERGY SOLUTIONS** · Perception Researcher & Development April 2022 - ongoing

- Improve calibration of sparsely mounted LIDARs and their use towards detection and tracking.

**UNIVERSITY OF MINNESOTA** · Researcher in CV, ML, & Rob · Prof. Karthik Desingh Sep 2022 - Dec 2023

- Published a workshop paper on domain adaptation for 3D perception using GANs.
- Researched efficient mobile manipulation task learning using pre-trained perception and skill chaining.
- Built ROS tools for collecting data and running robot experiments.
- Demonstrated ML-based task-learning models on a Boston Dynamics' Spot Robot.
- Reviewed papers, proposed several projects, and instructed undergrad & grad students through directed research.

**GATIK** · Perception Machine Learning Intern May 2022 - Aug 2022

- Surveyed learning-based 3D box detection and sensor fusion literature.
- Implemented and demonstrated the benefit of using self-ensemble for training single-shot 3D detectors.

**UNIVERSITY OF MICHIGAN** · Research Assistant · Prof. Chad Jenkins Jan 2022 - April 2022

- Improved a particle-filter-based localization implementation using informed noise addition.
- Developed an asynchronous interface between a SLAM code-base and phone app.

**ZENUITY** · Perception Algorithm Engineer Aug 2018 - Aug 2020

- Implemented LIDAR-based algorithms to estimate ground height using loopy belief propagation and identify the object-free area in real-time using C++.
- Worked on radar-based perception, improving barrier detection, and maintaining object tracking code-base.

**TOYOTA MOTOR NORTH AMERICA R&D** · Software Engineering Intern Sep 2017 - Dec 2017

- Processed RTK-GPS data to visualize and evaluate the lane-keeping performance of Toyota Safety Sense.
- Demonstrated the use of LIDAR reflectivity for in-lane-localization by clustering and fitting lane-lines.

**TESLA** · Software Engineering Intern May 2017 - Aug 2017

- Set up over-the-air tests of the Model-3 Restraint Control Module (RCM) ECU and upgraded the hardware-in-loop tester.

- Introduced the Michigan office to new software tools by collaborating with teams in Germany, India, and Poland.

## Academic Projects

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### PUBLICATIONS

#### TALK THROUGH IT: END USER DIRECTED MANIPULATION LEARNING

Feb 2024

C. Winge, A. Imdiek, **B. Aldeeb**, D. Kang, K. Desingh  
IEEE Robotics and Automation Letters

#### GANOCs: DOMAIN ADAPTATION OF NOCS USING GENERATIVE-ADVERSARIAL NETS

Nov 2023

**B. Aldeeb**, S. Chada, K. Desingh  
CoRL Workshop · Out-of-Distribution Generalization in Robotics

#### NERF-FRENNEMY: NERF FOR DIRECTED DESIGN

July 2022

S. Lewis, **B. Aldeeb**, A. Pipari, E. Olson, C. Kisailus, O. C. Jenkins  
RSS Workshop · Implicit Representations for Robotic Manipulation

### COURSE PROJECTS

#### PLANNING WITH HIERARCHICAL REINFORCEMENT-LEARNING · Motion Planning

Winter 2022

- Proposed using a Hierarchical Actor-Critic (HAC) agent to inform long-horizon path planning.
- Demonstrated using a Rapidly Exploring Random Tree (RRT) that leverages the HAC's knowledge of the agent's dynamics and environmental constraints implicit in the HAC's Q-functions.

#### DENSE DESCRIPTOR LEARNING · Lab4Progress

Fall 2021

- Experimented with augmentation-based contrastive learning of Dense Descriptors, as well as using auxiliary losses.

#### MULTI-TARGET TRACKING USING A P.H.D. FILTER · Mobile Robotics

Winter 2021

- Implemented a Gaussian P.H.D. Filter for tracking multiple bounding boxes without associating detections.

OTHERS · Adversarial Augmentation for detection · Differentiable particle filter for 6-DoF pose estimation · Hybrid SLAM

## Teaching Experience

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#### RESEARCH PROFESSIONAL · University of Minnesota

May 2023 - Dec 2023

- Proposed a project in mobile manipulation and led six undergraduate students through directed research on the topic
- Directed a Masters student through a research project focused on 3D perception learning.

#### GRADUATE STUDENT INSTRUCTOR · Dr. Peter Gaskell · University of Michigan

Winter 2021 - Fall 2021

- Assisted in running the **Robotic Systems Laboratory** and helped build and maintain the fleet of robots.
- Helped students understand SLAM, Kinematics, and Computer Vision and develop related code.

#### GRADUATE STUDENT INSTRUCTOR · Prof. Benjamin Kuipers · University of Michigan

Winter 2020

- Assisted in running and further developing the course on **Introduction to Autonomous Robotics**.
- Helped students understand course topics and work through capstone projects.