Bahaa **Aldeeb**

Researcher at the University of Minnesota

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Education

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

- Focus areas: Perception and Reasoning
- Courses: Unsupervised Visual Learning, Mobile Robotics, and Non-linear Programming

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

Research Experience

Research Roles

Research Professional · University of Minnesota · Prof. Karthik Desingh *Sep 2022 - Present*

- Researched efficient mobile manipulation task learning using pre-trained perception and skill chaining.
- Built ROS tools for collecting data and integrating task-learning models.
- Demonstrated my results on a Boston Dynamics' Spot Robot.
- Explored 3D object representations and published a workshop paper on NOCS domain adaptation.
- Reviewed papers, proposed several projects, and instructed six undergraduates through directed research.

Research Assistant · University of Michigan · 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.

Workshop Publications

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-Frenemy: NeRF For Directed Design *July 2022*
S. Lewis, **B. Aldeeb** , A. Opipari, E. Olson, C. Kisailus, O. C. Jenkins
RSS Workshop · Implicit Representations for Robotic Manipulation

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

Industry Experience

Gatik · Software Engineering 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.

Zenuity · Algorithm Engineer in Perception *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.
- Developed C++11 training material for helping coworkers.

Toyota Technical Center · Integrated Vehicle Systems Co-op *Sep 2017 – Dec 2017*

- Processed RTK-GPS data to visualize and evaluate lane-keeping performance.
- Demonstrated the benefit of using reflectivity information from sparse and noisy LIDAR data for lane-line localization by clustering and successfully fitting lane-line.

Tesla · Low Voltage and Integrated Systems Intern *May 2017 – Aug 2017*

- Set up over-the-air tests of the Model-3 Restraint Control Module (RCM) ECU.
- Integrated a car computer with the RCM hardware-in-loop tester for validation.

ZF TRW · Passive Safety Software Intern *May 2016 – Sep 2016*

- Set up, documented, and demonstrated the use of a virtual Restraint Control Module at the company's Michigan location by collaborating with teams in the US, Germany, India, and Poland.

Teaching Experience

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 · University of Michigan

- **Robotic Systems Laboratory** with Dr. Peter Gaskell *Winter 2021 - Fall 2021*
  Assisted students in understanding topics in autonomous mobile robot robotics and software development. Assisted in building and maintaining a fleet of mobile robots. Helped students through their capstone projects.
- **Introduction to Autonomous Robotics** with Prof. Benjamin Kuipers *Fall 2020*
  Assisted students in understanding topics in autonomous mobile robot robotics and software development. Assisted in building and maintaining a fleet of mobile robots. Helped students through their capstone projects.

Skills

- **Languages:** Python, C++, Bash scripting
- **Tools:** Pytorch, ROS, Docker, WandB, PytorchLightning

Extracurricular Activities

- Volunteered with Brave Initiatives for introducing Detroit high school girls of color to coding.
- Participated in First Lego League competitions 2009 through 2011 in Lebanon, Jordan, and the Netherlands. Coached two teams and conducted training workshops on best practices for coaching in 2012 and 2013.

Hobbies

Snowboarding · Rock climbing · Rookie Guitar playing