Bahaa **Aldeeb**

Research Staff at the University of Minnesota

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Education

M.S., Robotics · University of Michigan, Ann Arbor · *GPA 3.896* — *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 Staff · Prof. Karthik Desingh · University of Minnesota — *Sep 2022 - Present*

- Researching ways to use generalizable perception models as foundations for learning mobile robot manipulation.

Directed Study

NeRF For Directed Design · RSS Workshop — *Winter 2022*

- Presents a new use of differentiable representations to optimize object design toward improving pose estimation.

Dense Descriptor Learning · Lab4Progress — *Summer & Fall 2021*

- Explored the unsupervised learning of Dense Descriptors for achieving category-level generalization. The goal is to facilitate manipulation using "Affordance Coordinate Frames".
- Experimented with learning Dense Descriptors through contrastive, augmentation-based, methods.

Course Projects

Planning With Hierarchical Reinforcement-Learning · Motion Planning — *Winter 2022*

- Demonstrated a way for using the intermediate layers of a hierarchical actor-critic to model environment dynamics.
- Developed a Rapidly-exploring Random Tree algorithm that used the RL agent to roll out plans and constrain the allowed Q-values or agent confidence.

Multi-Target Tracking Using a P.H.D. Filter · Mobile Robotics — *Winter 2021*

- Implemented a Gaussian Probability Hypothesis Density Filter for tracking multiple bounding boxes without the need to associate detections.

Others · Adversarial Augmentation for detection · Differentiable particle filter for 6-DoF pose estimation · Hazard detection using optical flow · Dense-Topological Hybrid SLAM

Teaching Experience

Graduate Student Instructor · University of Michigan — *Fall 2020 - Fall 2021*

- Instructed the Robotic Systems Laboratory under Prof. Benjamin Kuipers in the Fall 2020 term and under Dr. Peter Gaskell through the Winter and Fall 2021 terms.
- Advised students on topics in robot control, occupancy grid mapping, particle filter localization, forward and inverse 5-DoF arm kinematics, among others.
- Developed code and assignments, built rubrics, graded work, and maintained the inventory of robots.

Work Experience

Software Engineering Intern · Gatik *May 2022 - Present*

- Surveyed learning-based 3D box detection and sensor fusion literature.
- Implemented and tested the benefit of training with teacher/pseudo labels.

Research Assistant · University of Michigan *Jan 2022 - April 2022*

- Improved particle-filter based localization and set up asynchronous communication for a SLAM code-base.

Algorithm Engineer in Perception · Zenuity *Aug 2018 - Aug 2020*

- Implemented LIDAR-based algorithms to estimate ground height using loopy belief propagation and identify 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.

Integrated Vehicle Systems Co-op · Toyota Technical Center *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.

Low Voltage and Integrated Systems Intern · Tesla *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.

Passive Safety Software Intern · ZF TRW *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.

Software Development Intern · Metro Property Group *May 2013 – May 2015*

- Developed software and soldered components for a Bluetooth-controlled custom lock based on Arduino framework.
- Maintained and developed the company websites and portals.

Awards

- **University of Michigan:** University Honors 2016, 2018 | Dean's list 2016 - 2018
- **Washtenaw Community College:** Dean's High Honor Roll 2013 - 2015 | Phi Theta Kappa
- **First Lego League:** Champions - Lebanon 2011 | Top Programming and Design - Arabia 2010 - 2011 & Europe 2011

Skills

- Proficient in C++, C, Python, and MATLAB
- Experience with Pytorch and Bash scripting
- Knowledge of Verilog and ARM assembly

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