

# TOYA TAKAHASHI

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## EDUCATION

### Massachusetts Institute of Technology (M.I.T.)

Expected in May 2026

B.S. in Electrical Engineering and Computer Science — GPA: 5.0/5.0

Relevant Coursework: Robotic Manipulation, Autonomous Navigation, Accelerated Computing, Deep Learning, Controls, Operating Systems

## EXPERIENCE

### MIT Sensing, Perception, Autonomy, and Robot Kinetics (SPARK) Lab

Undergraduate Researcher

September 2024 - Present

Cambridge, MA

- Implemented tools using the Robot Operating System (ROS 2) that expose robot state to LLM agents, enabling grounded reasoning and context-aware responses for LLM-driven autonomous robot navigation.
- Integrated learning-based keypoint extraction with SuperGlue and LightGlue into a visual loop-closure module for SLAM.
- Built a software platform for mobile robots supporting RTK positioning and LiDAR-inertial odometry to generate maps using 3D scene graphs.
- Evaluated camera-LiDAR calibration algorithms to reduce reprojection errors and improve 3D scene mapping accuracy.

### MIT EECS Department

Teaching Assistant / Lab Assistant

February 2024 - Present

Cambridge, MA

- Guided students through labs on computer vision, state estimation, motion planning, and control using real robotic platforms.
- Assisted students with lab assignments on designing a pipelined RISC-V processor in the Minispec hardware description language.

### NVIDIA Isaac ROS

Systems Software Robotics Solutions Intern

May 2025 - August 2025

Santa Clara, CA

- Developed a CUDA-accelerated suite of ROS 2 nodes for running a TensorRT-optimized Grounding DINO open-set object detection model, including a text tokenizer, text and image tensor encoders, and an output tensor decoder with visualization.
- Implemented benchmarking scripts to measure latency and throughput of the Grounding DINO detection graph across multiple GPUs.
- Integrated Segment Anything (SAM, SAM<sub>2</sub>) and Grounding DINO into a robotic manipulator workflow using behavior trees to segment and detect arbitrary objects for perception-driven pick-and-place tasks.
- Implemented a C++ ROS node to align Realsense depth images from the IR to RGB frame, enabling deep-learning-enhanced stereo disparity matching for accurate pose estimation.

### MIT Arcturus Robotics

Autonomy Software Team Co-Lead

September 2022 - March 2025

Cambridge, MA

- Led a software team of approximately 20 students in developing an Autonomous Surface Vehicle (ASV) autonomy stack using C++ and Python with ROS 2 and Mission Oriented Operating Suite (MOOS-IvP) middlewares.
- Developed an algorithm to overlay clustered LiDAR point cloud onto the camera frame to match obstacles with detected objects.
- Implemented an Extended Kalman Filter to fuse GPS and IMU data for global robot localization with centimeter-level accuracy.
- Created a visual navigation algorithm for buoy traversal, integrating the YOLOv5 object detection model with a PID controller.

### NVIDIA Isaac ROS

Systems Software Robotics Solutions Intern

May 2024 - August 2024

Santa Clara, CA

- Enhanced an end-to-end robot manipulator object-following workflow by improving stability of object pose estimations from a deep neural network.
- Implemented ROS nodes for post-processing pose streams via averaging, stability analysis, outlier detection, and Kalman filtering.
- Developed and optimized a CUDA-accelerated alpha compositing ROS node, enabling efficient GPU-based image blending without redundant CPU-GPU memory transfers.

### MIT Sea Grant College

Undergraduate Researcher

January 2023 - May 2024

Cambridge, MA

- Modeled an oyster farm simulation environment in the Gazebo robotics simulator to test and validate an ASV autonomy stack.
- Created Unified Robot Description Format (URDF) and Simulation Description Format (SDF) files for ships, oyster baskets, and ocean waves to generate realistic simulation models.
- Designed and built a cross-hull electrical wiring system for integrating microcontrollers, stepper motors, and sensors.

## TECHNICAL SKILLS

### Computer Languages Tools

Python, C/C++, NumPy, CUDA, MATLAB, SystemVerilog, RISC-V Assembly

Git, Docker, Linux, Robot Operating System 2 (ROS 2), PyTorch, Drake, Computer-Aided Design (CAD)