# Ryan Barry

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## Education

**Rochester Institute of Technology**, Rochester, NY
Master of Science in Electrical Engineering — Cumulative GPA: 3.92
*Specialization in Robotics and AI/ML*

**Rochester Institute of Technology**, Rochester, NY
Bachelor of Science in Electrical Engineering, *Summa Cum Laude* — Cumulative GPA: 3.86
**Tau Beta Pi Engineering Honor Society**

## Technical Skills

**Languages:** Assembly, C/C++, HTML/CSS, JavaScript, PLC Ladder Logic, Python
**Libraries & Tools:** CUDA, Git, Jupyter, Keras, NumPy, OpenCV, Pandas, PyTorch, ROS/ROS2, Scikit-Learn, TensorFlow
**Software:** Altium Designer, AutoCAD, Creo, Inventor, LTSpice, MATLAB, SOLIDWORKS
**Hardware:** Microcontrollers, Motor/Sensor Control, PCB Design, SMT & TH Soldering, 3D Printing

## Professional Experience and Research

**Robotics Research Engineer II**, *Robotics and Automation Design Lab*, Bryan, TX — *March 2025 – Present*
- Designed fault-tolerant robotic manipulators for microgravity environments, emphasizing modularity and resilience to extreme temperature shifts and radiation.
- Designed custom PCBs in Altium for testing and spaceflight applications.
- Built a Python SDK atop an existing ROS2 EtherCAT wrapper to expose a joint-indexed API for real-time telemetry and multi-mode actuator control (e.g., position, torque, current, impedance). Auto-parses Xacro files to map joint IDs, load actuator-specific coefficients, and structure PDO data into clean, queryable dictionaries. Fully abstracts ROS2, enabling intuitive scripting for prototyping and environmental testing, and reducing setup time by hours across the lab.
- Built real-time data acquisition tools using embedded C++ and Python, enabling reliable telemetry streaming from microcontrollers to host machines for diagnostic logging, fault response validation, and system performance analysis.

**Researcher**, *RIT Adaptive Human-Robot Teaming Lab*, Rochester, NY — *August 2023 – May 2024*
- Developed a custom reinforcement learning (RL) environment in ROS and Gazebo for terrain-aware velocity control of a quadruped robot in a physics-based simulator.
- Built a custom PPO reinforcement learner in PyTorch with LSTM-based policy and value networks; integrated the full pipeline into ROS for trajectory planning.

**Robotics Graduate Teaching Assistant**, *Rochester Institute of Technology*, Rochester, NY — *August 2023 – May 2024*
- Facilitated student learning of high-level robotics concepts and ROS through lab work and research projects.

**Software Technical Lead**, *RIT University Rover Challenge Team*, Rochester, NY — *June 2023 – May 2024*
- Led architecture and full-stack ROS software development for an autonomous planetary rover; managed subsystem integration and testing across a 5-person team.
- Integrated a Python ROS application with embedded C++ microcontrollers via CAN to control distributed subsystems.
- Led cross-functional design reviews to ensure electromechanical subsystems aligned with software architecture requirements.

**Electrical Engineer**, *RIT Electric Vehicle Team*, Rochester, NY — *August 2021 – May 2024*
- Designed a CAN interface board for a BeagleBone Black to communicate with the network of custom electric motorcycles.
- Led a team of undergraduate electrical engineers to develop a CAN based IMU board in Altium.
- Engineered and documented gate driver + control architecture for a 3-phase BLDC motor from first principles, enabling powertrain control for brushless coolant pump; mentored junior team members in implementing the full motor controller in Altium as a foundation for future high-power traction systems.

**Machine Learning R&D Intern**, *Penn State ARL*, University Park, PA — *May 2023 – August 2023*
- Built synthetic data generation pipeline for active acoustic ML models in unmanned undersea vehicles (UUVs), reducing dependency on scarce labeled datasets.
- Designed Python application for scenario development and interface with UUV simulation software.
- Developed an acoustic range and angle of arrival regression model to support transfer learning hypothesis.

**Product Engineering Co-op**, *The Raymond Corporation*, Greene, NY — *January 2022 – July 2022*
- Programmed PLC-based test fixture with touchscreen UI for reliability testing of forklift control cables.
- Supported CAN system emulation for motor controller validation.

# Projects

## Highlighted Projects

**Open-Source Universal Kinematic Libraries for Generic Robots** *September 2023 – Present*
- Developed modular C++ and Python libraries for forward and inverse kinematics of both serial-link manipulators and fixed-wheeled mobile robots.
- Enabled dynamic configuration from DH parameters or wheel layouts to support arbitrary robot topologies without rewriting core math.
- Implemented forward velocity kinematics and inverse kinematics for mobile platforms using wheel geometry
- Solved numerical inverse kinematics using Jacobian pseudo-inverse methods with tolerance-based convergence on joint angles from target end-effector pose for arbitrary robot configurations.

**Multi-Agent Reinforcement Learning for Pacman Capture the Flag** *November 2023 – December 2023*
- Developed a dual-agent Q-learning system with handcrafted reward shaping and dense feature vectors to coordinate offensive and defensive roles in a 2v2 Capture the Flag game.
- Built a shared memory mechanism for real-time inter-agent communication, enabling emergent ambush and retreat behaviors.
- Implemented all learning and inference logic from scratch in a single script without external ML libraries; stored and updated network weights in script-local dictionaries.
- Trained agents via self-play and curriculum learning against rotating baseline opponents across randomized maps.
- Reached tournament finals; a late-stage regression bug in retreat logic impacted final match performance.

**Air Hockey Robot** *October 2023 – December 2023*
- Engineered a full-stack robotic system with a 3-DOF planar arm, overhead camera, and real-time closed-loop inference.
- Collected and labeled 26,627 training images to train a YOLOv8 model from scratch for puck and keypoint detection; validated with PR curves and batch predictions.
- Predicted puck trajectories using a physics model and an LSTM trained on bidirectional crossing sequences via data augmentation; tuned for end-effector interception within a 4-inch spatial margin.
- Deployed a safety-bounded inverse kinematics controller with joint angle lookup at 57 FPS inference throughput, bottlenecked only by the 60 FPS camera.

**Full-Stack Robot for Real-Time Object Interception** *February 2023 – April 2023*
- Designed and programmed a holonomic robot with real-time YOLOv8-based object tracking and trajectory alignment.
- Designed custom chassis design with 3D-printable omni wheels in SOLIDWORKS.
- Trained a custom YOLOv8 model to detect balloons and calculated their 3D velocity with a stereo camera using weighted difference method over a buffer of frames.
- Developed a ROS network for kinematic motion control and sensor integration.

## Additional Projects

- **Personal Portfolio Website *(Ongoing)*:** Designed and developed a custom HTML/CSS website hosted on GitHub Pages to showcase engineering projects, complete with interactive documentation, videos, and embedded reports.

- **Wheelchair Attachment Prototype *(In Progress)*:** Prototyping a non-invasive, low-drag wheelchair add-on with hybrid manual and powered control.

- **Speed Reader Web App (Summer 2024):** Built a fully functional, state-driven single-page reading tool in vanilla JS/HTML/CSS; implemented real-time control logic (WPM, font, UI flow) without front-end libraries.

- **Underwater Robot Motherboard PCB *(Spring 2023)*:** Designed and integrated a PCB with a 7-sensor perception suite, power distribution, and propulsion control.

- **EMG Gesture Classification Pipeline *(Spring 2023)*:** Built a real-time gesture classifier using a custom-trained neural network on self-collected EMG biosignals.

- **Baxter Robot Interactive Game *(Fall 2022)*:** Developed a ball-and-cup pick-and-place game using object tracking and occlusion-aware ID persistence.

- **Autonomous Nerf Sentry *(Fall 2021)*:** Designed a mobile robot with onboard targeting, tracking, and automated firing system.