Carlton G. Cort

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Education

Carnegie Mellon University | Pittsburgh, PA *Aug 2026 – Present*
M.S. in Robotics (MSR), CMU Rales Fellow
Georgia Institute of Technology | Atlanta, GA *August 2022 – May 2026*
B.S. in Electrical Engineering, Minor in Computer Science – **GPA 4.00**

Honors

2026-2028 CMU Rales Fellow: Full-ride graduate fellowship, 1 of 25 incoming CMU graduate students selected
2026 Georgia Tech College of Engineering Provost's Academic Excellence Award: Awarded to top COE graduating senior
2026 HKN Outstanding Electrical Engineering (EE) Senior Award at Georgia Tech: Awarded to top EE graduating senior
2026 College of Engineering's Outstanding Undergraduate Researcher Award: 1 of 5 COE undergrads selected
2025 Presidents Undergraduate Research Award: $1,500 funding for Adaptive RL Param Tuner project in the IVALab
2022-2026 Georgia Tech Honors Program: Member of selective John H. Martinson Honors Program

Skills

Robotics/ML: State estimation, PyTorch, deep reinforcement learning (RL), SLAM, mobile navigation, CUDA, representation learning
Programming Languages: Python, C++, Java, MATLAB, C, VHDL
Software: Linux, ROS 1, ROS 2, Gazebo simulation, PX4, git, Autodesk Fusion 360, Docker, Vivado
Hardware: Cameras (RGB & Depth), LiDAR, Microcontrollers (Arduino, Mbed, ESP32), FPGA, oscilloscope, function generator, DMM
Courses: Deep RL, Nonlinear Systems & Control, ML, Random Processes, Optimization, Intro Cog Sci, Autonomous Mobile Robotics

Research

AirLab | Carnegie Mellon University
Learned Proprioceptive Inertial State Estimation for Legged Robots *Jun 2025 – present*

- Developed a learned proprioceptive state estimator utilizing self-supervision framework (IMU preintegration and iterative training + PGO cycles conditioned on network outputs) as well as traditional supervision for test-time adaptation
- Implemented deep learning and model-based sensor fusion methods for multi-IMU, joint encoder, and contact data
- Engineered robust real-world data pipeline to synchronize quadruped's multi-rate sensors (70-400 Hz) and apply extrinsic calibration and outlier rejection to correct spatiotemporal misalignment and MoCap artifacts for 1.4 million samples
- Simulated Unitree G1 humanoid & Go2 quadruped in NVIDIA Isaac to generate synthetic data for training and evaluation

Structured Information for Precision Neuroengineering Lab (SIPLab) | Georgia Tech
Natural Neuron Network System Identification Under Closed-Loop Control (Project Lead) *Jan 2025 – present*

- Designed learned linear dynamical system (LDS) model of neuron population dynamics with GRU-driven inputs and partitioned latent representations that distinguish naturally observed dynamics from opsin-stimulus-induced dynamics
- Developed differentiable real-Schur-form and nonnegative matrix parameterizations in PyTorch to enforce state-space stability and guide the network with more informative gradients
- Integrated our model with gradient-based nonlinear MPC (optimizing LQR-like control effort and tracking cost through differentiable LDS and input GRU via backprop), improving reference tracking by 15% over SOTA linear model
- Leading team of 8 and will be first author of manuscript in preparation for the Journal of Neuro Engineering

Intelligent Vision and Automation Lab (IVALab) | Georgia Tech
Adaptive Online RL Parameter Tuner for Robot Navigation (Project Lead) *Oct 2024 – Feb 2026*

- Developed deep reinforcement learning (RL) policy to dynamically adjust hyperparameters of model-based navigation methods to the local environment, increasing success rate in tight, cluttered maze environments to 79% and outperforming best-static-parameter (55%) and default parameter (45%) baselines
- Overhauled Gazebo simulation pipeline for batch data collection, offline RL pretraining, and bootstrapped online RL
- Designed system as reusable framework and integrated SLAM system lifecycle management with dynamic parameter bindings for SLAM Toolbox to facilitate future lab research into adaptive SLAM tuning

Survey of Closed-Loop Robot Navigation Systems with SLAM *Jan 2023 – Jun 2024*

- Integrated a complete ROS 1-based autonomy stack on physical mobile robots and in Gazebo simulation
- Performed closed-loop benchmarking of robotic systems' visual and LiDAR-based SLAM and navigation algorithms
- Interfaced OpenCV-based Aruco Tag detector with the mobile robot to issue motion commands

Publications

Yuheng Qiu, Yutian Chen, Carlton Cort, Weison Huang, Shibo Zhao, Pieter Abbeel, Rocky Duan, Koushil Sreenath, C. Karen Liu, Carmelo Sferrazza, Junyi Geng, Sebastian Scherer, Guanya Shi. **Self-Supervised Inertial Odometry**. arXiv preprint arXiv:2610.25988, 2026. Under review at ICRA 2027.

Yanwei Du, Shiyu Feng, Carlton Cort, Patricio A. Vela. **Task-driven SLAM Benchmarking for Robot Navigation.** IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2025. arXiv:2409.16573.

Carlton Cort, Aditya Dalal, James De Ocampo, Yanwei Du, Shiyu Feng, Dr. Patricio A. Vela. **Low-Cost Real-World Benchmark Framework for Closed-Loop Robot Navigation Systems with SLAM.** Accepted to IEEE ORSS 2024

Robotics & Systems Projects

Mobile Quadcopter Catch | Senior Design Capstone *Oct 2025 – May 2026*

- Integrated custom quadcopter, Dynamixel pitch gimbal, PixHawk flight controller (PX4), and onboard Orange Pi 5 (ROS2), achieving autonomous landing on a platform moving at 1-2 m/s as a last-mile-delivery drone minimum viable product
- Estimated relative state by fusing visual pose estimate correction with EKF-filtered GPS/IMU telemetry from both vehicles
- Designed PD + feed-forward pose-based visual servoing (PBVS) controller to aim gimbaled camera at landing pad AprilTags
- Validated flight dynamics, control, and estimation in custom digital twin using PX4 Gazebo prior to real-world deployment

Scaled-Down F1Tenth Autonomous Racecar *Jan – May 2025*

- Implemented full mobile autonomy stack with ROS2 middleware for an Ackerman-drive racecar
- Designed multi-waypoint, dynamics-constrained RRT path planner with Savgol filter smoothing, modified Stanley nonlinear trajectory-tracking controller, and integrated a particle-filter for planar LiDAR localization
- Navigated real-world, scaled-down city street environment completely autonomously (only of 8 teams to do so) while demonstrating the most reliable localization and 3rd fastest reactive navigation

Internship Experience

Intelligent Vision and Automation Lab (IVALab) | Georgia Tech

Robotics Research/Lab Assistantship *May – Sept 2025*

- Migrated lab robots to ROS2 and made a low-bandwidth teleop framework using selectively bridged network domains
- Contributed to a scene-graph SLAM pipeline with semantic, topological, and view-centric data for lightweight mapping
- Built hardware stacks and 3D-printed sensor mounts for four wheeled mobile bases for SLAM and manipulation

Sandia National Labs | Livermore, CA

FPGA Firmware & Design Intern *May – Aug 2024*

- Researched and implemented firmware-based radiation hardening strategies for FPGAs in harsh environments
- Accelerated the team's EDA design cycle by 8 times by optimizing external libraries and scripting them into Vivado
- Designed reusable, reliable, and customizable firmware components, including an I2C Controller for deployment on FPGAs

Dynamics and Controls System Laboratory (DCSL) | Georgia Tech

Lab Assistant - Robot Sensor and Power Electronics Integration *Aug 2023 – Feb 2024*

- Developed buffered asynchronous comms software using Simulink-wrapped C/C++ for precision IMU connected via UART
- Designed unit tests and prototyped PCBs for power, actuation, and embedded processing on an air-bearing robot

Southwest Research Institute | San Antonio, TX

Embedded Systems Student R&D Assistant Jun – Aug 2023

- Wrote library to generate thousands of transmissions to validate a cutting-edge telecom satellite under a new IP
- Implemented an automatically maintained containerized database that aggregates data from various IoT devices
- Debugged a custom OS Kernel and device drivers for specialized hardware used in satellite computer firmware

Cotsworks | Highland Heights, OH

Electrical and Manufacturing Engineering Intern Jun – Aug 2022

- Designed analog printed circuit board schematics and layout for a design verification and testing board for rugged sensors
- Eliminated manufacturing bottleneck by reducing procedure time by 35% through improved lens alignment automation

Leadership/Outreach

Georgia Tech Student Foundation (GTSF)

Chief Executive Officer *May 2024 – Jun 2025*

- Lead a 150+ member organization managing the country's largest student-run philanthropic endowment ($2.5M)
- Coordinate with university Alumni Association leadership on campus-wide philanthropy initiatives, raising $8M/year
- Oversee strategic initiatives, including enhancing campus presence, membership growth, and committee independence

Allocations Committee Director *May 2023 – May 2024*

- Managed the biannual allocation process of $80,000 to 25+ student organizations
- Organized weekly committee meetings and improved the allocations process through bylaws changes and new initiatives

Peer Instructor (Volunteer) at the Georgia Tech ECE Makerspace (The HIVE) *Jun 2023 – May 2026*

- Maintained facility and provided technical mentorship in 15,000-square-foot student-run engineering makerspace
- Trained students to safely operate laser cutters, 3D printers, embedded systems, and electronic benchtop test equipment
- Completed technical projects, including dorm room improvements and an RC car