

LENWORTH "TJ" THOMAS

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EDUCATION

Carnegie Mellon University <i>Doctor of Philosophy in Mechanical Engineering</i>	Expected Dec 2026 Pittsburgh, PA
Carnegie Mellon University <i>Master of Science in Mechanical Engineering, Robotics Concentration</i>	May 2024 Pittsburgh, PA
University of Florida <i>Bachelor of Science in Mechanical Engineering</i>	May 2021 Gainesville, FL

TECHNICAL SKILLS

Programming Languages: Python, MATLAB, C++, C, LaTeX
Software/Packages: CAD (SolidWorks, NX, Onshape), Arduino, KiCAD, ROS1/ROS2, Gazebo, OpenCV, Ansys Fluent, PyTorch, Sci-Kit Learn, Linux
Manufacturing: 3D Printing (SLA and FDM), Soldering, Laser-Cutting, PCB Assembly, CNC Machining, Lathe Machining

THESIS RESEARCH

CMU Microrobotics Lab, Advised by Dr. Sarah Bergbreiter

Autonomous 3D Wind Field Mapping with Whisker-Inspired Wind Sensor Pair	Nov 2025 – Present
- Developing a novel, whisker-inspired wind sensor pair that uses magnetic transduction to estimate 3D wind vectors for environmental sensing on < 50 g quadrotors - Designed and manufactured a dual-whisker architecture that resolves planar wind measurements into a 3D vector in winds as low as 0.2 m/s - Designed and soldered a 1.6 g custom PCB with an I²C multiplexer and onboard microcontroller to interface two 3-axis magnet sensors with the quadrotor - Training a neural network using PyTorch to map change in magnetic-field to wind velocity and direction - Implementing a SLAM algorithm in ROS2 to autonomously generate a wind and occupancy map in indoor and outdoor environments with the quadrotor	
Wind Informed Plume Tracing for Odor Source Localization on a 50g Quadrotor	Oct 2024 – Apr 2026
- Developed a bio-inspired autonomous plume tracing algorithm for the Crazyflie quadrotor that leveraged onboard wind and gas sensing to navigate upwind toward an ethanol source in indoor and outdoor settings - Miniaturized a whisker-inspired wind sensor, reducing weight from 15.6 g to 9.6 g, and replaced the steel spring with a 3D printed silicone membrane improving precision by 30% and reducing the natural frequency from 124 Hz to 6 Hz - Designed, fabricated, and validated a PCB containing a metal-oxide gas sensor, microcontroller, and connection points for the wind sensor for integration with the quadrotor - Developed embedded C firmware to acquire synchronized data packets from the wind and gas sensors then stream telemetry to a radio link at 100 Hz - Designed a UKF-based wind estimator that resolved ambient wind vectors and compensated for quadrotor motion enabling closed-loop plume tracking in winds as low as 0.2 m/s - Implemented PID yaw alignment using the wind sensor to continuously align the gas sensor upwind whenever a wind-driven plume was detected by the UKF and a gas signal was detected by the differentiation-based gas event algorithm	

EXPERIENCE

Amazon Robotics <i>Hardware R&D Intern</i>	May 2023 – Aug 2023 North Reading, MA
- Developed a mechanism to lay fiducial stickers on fulfillment center floors for ground robot localization - decreasing installation time from 3 minutes to 30 seconds and reducing strain on technicians - Met with stakeholders in multiple fulfillment centers to iterate the mechanism and procedures across different workstations using their feedback to guide changes	
Apple <i>Audio Product Design Intern</i>	May 2021 – Oct 2021 Cupertino, CA
- Developed iPhone-based computer vision workflow to capture the pose of earbuds to relate in-ear fit to performance metrics and inform design changes for better fit equality in future products - Designed and down-selected dynamic O-ring dimensions for the AirPods Pro 2 case and defined validation processes for life cycle reliability testing - Collaborated with international contract manufacturers and cross-functional teams to determine manufacturing feasibility of various components and systems for the AirPods 3 and AirPods Pro 2	

Fiat-Chrysler Automobiles (Currently Stellantis)

May 2019 – Aug 2019

Interior Feasibility Product Development Intern

Auburn Hills, MI

- Analyzed cross sections of the Jeep Grand Cherokee soft trim CAD and identified 11 unintentional part intersections, preventing over \$330k in potential manufacturing costs across all intersections
- Developed a gantry mechanism with an array of light sensors to create a 3D map of light intensity for interior LEDs that will be a standard test for future interior lighting

Caterpillar

May 2018 – Aug 2018

Validation Engineering Intern

Peoria, IL

- Validated prototype 13L engine by troubleshooting error codes and disassembling the flywheel ultimately discovering incorrectly torqued fasteners on the engine block
- Aided development of a future single cylinder engine test cell by placing thermistors around the experimentation room and analyzing temperature data across the engine body

ACADEMIC PROJECTS

Autonomous F1-Tenth Racing

Aug 2023 – Jan 2024

- Programmed a remote-controlled car to autonomously race other cars on a track using ROS, Python, and C++, placing 3rd place out of 8 teams
- Implemented path planning algorithms like pure pursuit and RRT in Python to follow an optimal path around the track which were validated in ROS Gazebo simulations
- Fused inputs from LiDAR and odometry through a particle filter to create a real-time occupancy map of the track
- Used OpenCV on the onboard camera feed to implement automatic braking using time to collision as a threshold parameter

Jellyfish-Inspired Robot for Aquatic Environmental Monitoring

Jan 2023 – Jun 2023

- Designed and manufactured a jellyfish-inspired robot which uses a novel magnetic pulley system to actuate a silicone flexure, propelling the robot through the water with 43% less turbulence than propellers of a similar thrust load
- Measured water turbulence using whisker-inspired sensors adapted for water use instead of air
- Designed and assembled a buoyancy system using a linear actuator and syringes that intake or repel water into the robot body depending on the desired depth
- Wrote a script in Python to detect crabs using the onboard ESP32 camera

TEACHING EXPERIENCE

Electronics for Sensing and Actuation

Jan 2026 – Jun 2026

Lead Teaching Assistant

- Led a team of 5 teaching assistants to supervise labs, grade homeworks, and grade exams for two sections of 40 students
- Designed homeworks and exams to assess students' knowledge across multiple electronics topics like op-amps, RC circuits, mosfets, and other introductory concepts

Mechanical Systems Experimentation

Aug 2025 – Jan 2026

Lead Teaching Assistant and Lab Supervisor

- Led a team of 4 teaching assistants to facilitate hands-on labs about introductory vibrations and controls topics like oscillatory dynamics, system ID, and open loop control
- Maintained torsional and rectilinear spring oscillation experimentation setups for all lab sections

PUBLICATIONS

- T. Kent, **L. Thomas**, M. Hartmann, S. Bergbreiter, "Asymmetric Whisker-Inspired Sensor Pairs for Enhanced Airflow Sensing on Drones," *Advanced Intelligent Systems*, early access, 2026.
- L. Thomas**, T. Bridges, S. Bergbreiter, "Wind Informed Plume Tracing for Odor Source Localization on a 50g Quadrotor," *Submitted - Advanced Robotics Research, Robotics for Climate and Environment Assessment Special Issue*, 2026.
- L. Thomas**, T. Bridges, and S. Bergbreiter, "Airflow Source Seeking on Small Quadrotors Using a Single Flow Sensor," in *Proc. 2025 IEEE Int. Conf. Robotics and Automation (ICRA)*, 2025.
- Y. Chen, D. Wang, **L. Thomas**, K. Dantu, and S. J. Koppal, "Design of an Adaptive Lightweight Lidar to Decouple Robot-Camera Geometry," *IEEE Transactions on Robotics*, vol. 40, pp. 2254–2271, 2024.
- D. Wang, H. Xie, **L. Thomas**, and S. J. Koppal, "A Miniature LiDAR with a Detached MEMS Scanner for Micro-Robotics," *IEEE Sensors Journal*, vol. 21, no. 19, pp. 21941–21946, 2021.
- D. Wang, **L. Thomas**, S. Koppal, Y. Ding, and H. Xie, "A Low-Voltage, Low-Current, Digital-Driven MEMS Mirror for Low-Power LiDAR," *IEEE Sensors Letters*, vol. 4, no. 8, pp. 1–4, 2020.