ERIC DAVID VETHA

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ABOUT ME

I am an aspiring robotics engineer with a strong foundation in computer, electrical, and mechanical engineering. I have hands-on experience with autonomous systems, RF-based sensing, and digital signal processing. In my research as a undergraduate and graduate student, I developed a novel ultra-wideband sensing system to measure soil moisture, and I am currently working on expanding its capabilities. Additionally, I have completed numerous projects such as flight dynamics simulation, imitation learning with robotic arms, and autonomous navigation with wheeled robots. I am now seeking an opportunity to join an interdisciplinary team to tackle new and exciting challenges.

EDUCATION

MS. in Electrical and Computer Engineering   September 2024 - Present
University of California, Santa Cruz, MS.   Santa Cruz, CA
- Concentration in Robotics, Control, and Cyberphysical Systems
- **Coursework:** Models of Robotic Manipulation, Linear Dynamical Systems, Convex Optimization, Small-Scale UAV Theory and Practice, Digital Signal Processing, Machine Learning

BS. in Robotics Engineering   September 2020 - June 2024
University of California, Santa Cruz, BS.   Santa Cruz, CA
- GPA: 3.81, Cum Laude Honors
- **Coursework:** Logic Design, Data Structures and Algorithms, Embedded Systems and C Programming, Signals and Systems, Microcontroller System Design, Mechatronics, Feedback Control Systems, Sensors and Sensing Technology

HONORS

2023	Earth Frontiers Institute Frontiers Fellowship recipient	EFI
2024	Carbon Fund Research Award recipient	Carbon Fund
2024	Graduate Student Researcher funding, University of California, Santa Cruz	
2025	Presenting at International Workshop on Energy Harvesting & Energy-Neutral Sensing Systems	ENSsys
2025	Agricultural Experiment Station (AES) Graduate Student Research Fellowship recipient	AES

PROFESSIONAL EXPERIENCE

Embedded Systems & Signal Processing Research Engineer (Graduate)   Santa Cruz, CA
jLab in Smart Sensing @ University of California, Santa Cruz   June 2024 - Present
- Designed a novel soil health sensing system using PCB ultra wideband radar and ultra low-power backscatter tags.
- Deployed real-time digital signal processing algorithms in C on embedded BeagleBone Black running Linux.
- Optimized signal processing pipeline using MATLAB's code generation and Simulink applications.
- Developed ROS2 wrapper for IMX IMU in C++ and set up RTK corrections using radio modem for long-range accurate localization of drones and quadruped robots.

Teaching Assistant in Embedded Systems   Santa Cruz, CA
University of California, Santa Cruz   January 2025 - March 2025
- Assisted students in developing embedded projects using various sensor technologies, including ping sensors, IMUs, and resistive sensors.
- Tutored students on fundamental issues in sensing of temperature, motion, sound, light, position, etc.

Autonomous Sensing & Embedded Systems Research Engineer (Undergraduate)   Santa Cruz, CA
jLab in Smart Sensing @ University of California, Santa Cruz   March 2023 - August 2024
- Designed autonomous interfacing scripts using MATLAB to streamline data processing with embedded BeagleBone Black.
- Improved novel soil moisture sensing system though experimental validation of various RF components.

PROJECTS

UAV Simulation for Drones   UCSC
quadrotor-vtol   Github
Control and UAV Theory, Python
- Developed a custom physics-based simulation modeling the dynamics and aerodynamics of a quadrotor drone.
- Designed a modular platform for inputting and simulating various drones as needed.

Convex Optimization for Signal Denoising   UCSC
Enhancing Backscatter Localization Using Convex Total Variation   Report
Convex Optimization Theory, Python
- Successfully demonstrated the application of convex optimization in signal denoising.
- Achieved an 8.5% improvement in soil moisture measurement accuracy with minimal preprocessing time.

Imitation Learning in Robotic Manipulations   UCSC
Grab-o-Matic 3000   Demo   Github
Machine Learning, Robotic Manipulation Kinematics, Python
- A robotic system for ball-catching tasks, employing imitation learning and inverse kinematics.
- Uses imitation learning to imitate expert-like ball-catching actions based on visual observations.
- Automatically uses inverse kinematics calculations to determine optimal joint velocities for the robotic arm to intercept projected ball trajectories smoothly.

Sensor Based Instrumental Gloves   UCSC
Slug Symphony   Demo   Github
Embedded C, State Machines, Sensor Programming
- Gloves that emulate the saxophone, guitar, drums, piano, and trumpet.
- Flex and 9-DOF sensors integrated with UNO 32 microcontroller for accurate instrument replication.
- Uses state machines to transition between instruments, ensuring user-friendly interaction seamlessly.

Autonomous Ball Shooting Robot   UCSC
Slug World Cup   Demo   Github
Embedded C, Mechatronics, State Machines
- An autonomous robot capable of autonomously traversing a field an dispensing balls in a defended goal.
- Uses state machine architecture, ensuring the robot's precise navigation, goal detection, and autonomous scoring capabilities.

SKILLS

Languages: MATLAB (Proficient), C (Proficient), ROS2 (Experienced), Python (Experienced), Linux (Experienced), C++ (Experienced), Docker (Moderately Experienced).

Technologies: Experience with embedded programming and communication methods (I2C, SPI, UART); worked with Gazebo simulation tools; created imitation learning models and flight control systems; experience with PCB tools (KiCad and Altium); worked with RF Hardware.

General: Capable of working well both individually and in groups; Comfortable with technical writing.

Projects: UAV Simulation for Drones; Convex Optimization for Signal Denoising; Imitation Learning in Robotic Manipulations; Sensor Based Instrumental Globes; Autonomous Ball Shooting Robot.

ACADEMIA

Improving Low-Cost In-Ground Soil Moisture Sensing System Using Backscatter Tags for Sustainable Agriculture   Santa Cruz, CA
Honors Thesis   Read Thesis