conor wood hayes

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Summary

Hands-on robotics and embedded systems engineer with extensive experience building & deploying real-world hardware, autonomy stacks, and mission-critical embedded systems end-to-end. Background includes ROS2 perception & manipulation systems, spacecraft avionics, and PCBA & firmware for medical wearables; strong focus on field testing & reliability in harsh environments.

Skills

Manipulation: ROS2, inverse/forward kinematics & dynamics, path planning, control theory, foundation models (VLA/VLM)
Perception: computer vision, SLAM, state estimation, kalman filters, particle filters, IMUs, GPS, RGB-D camera
Firmware/Hardware: microcontroller development, protocol design (wired, memory, BLE), PCB design, PCB bring-up & debug
SWE/ML/AI: OpenCV, NumPy, Pandas, Matplotlib, pytorch, SciPy, scikit-learn, linux, git, Docker, AWS, API design
Languages: Python, C, C++, CMake, Makefile, Bash/Zsh, Rust, SQL, TypeScript, Verilog, assembly, linker scripts

Education

Northwestern University – *M.S. Robotics* 2025–Aug 2026 (expected)
Focus on perception, manipulation, and embodied AI. Selected Coursework:
- *Robotic Manipulation (Kevin Lynch)*
- *AI & Machine Learning for Robotics (Brenna Argall)*
- *Reasoning & Planning in the Foundation Model Era (Li Manling)*
- *Sensing, Navigation, & ML for Robotics (Matthew Elwin)*

University of Southern California – *B.S. Computer Engineering & Computer Science* 2015-2019
Magna Cum Laude. Minor in Chinese for the Professions, Thematic Option (Honors in Liberal Arts)

Projects

Northwestern University | *PenPal – Franka Panda 7DoF Manipulation System* Nov-Dec 2025
- Developed perception -> planning -> control pipeline in ROS2 for real-time handwriting on arbitrarily-oriented moving surface.
- Implemented camera calibration, pose estimation, online trajectory generation, and closed-loop visual cartesian control.
- Tuned controllers, handled noise, delays, and system constraints to ensure consistent physical performance.

USC Rocket Propulsion Lab | *Traveler IV - First 100% undergrad-made rocket to fly to space* 2015-2019
- Built & led 30-person engineering team. Oversaw all software (C++), hardware (Altium), and EGSE for multiple iterations of custom avionics system, which successfully flew to, survived, and returned from space.
- Designed, tested, and hand-assembled avionics boards robust enough to operate in desert + space + high-G environments.
- Led analysis effort to determine flight path, published Traveler IV Whitepaper concluding the rocket crossed the Karman Line.
- Co-designed launch procedures coordinating 100+ engineers in remote desert environment, resulting in a successful launch.
- Debugged electrical, software, and radio issues in the field under timing constraints, inclement weather, and poor infrastructure.
- Wrote still-in-use software providing fault+radiation-tolerant telemetry storage on a NOR flash memory chip.
- Kicked off lab-wide cultural reform after handling an internal harassment case to help the lab be a safer space for young engineers.

Northwestern University | *Algorithms from Scratch - ML algorithms implemented without ML libraries in Python* April 2025
- Implemented particle filter, developed measurement+control model, and applied to MRCLAM dataset for robot localization.
- Implemented online A* planning + trajectory control to navigate simulated diff-drive robot around an arena.
- Proposed, implemented, and trained 97% accurate SVM-based algorithm for landmark visibility prediction on MRCLAM dataset.

CHSC + UCLA | *AustereChain - Blockchain-Based Resource Management for Autonomous Systems in Austerity* April 2025
- Proposed blockchain-based framework to enable decentralized resource negotiation for autonomous systems in low-resource environments (i.e. space stations), to be submitted to IEEE-SMC-IT 2026.

CHSC + UCLA | *MIDI Glove - Wearable Accelerometer-Based Human Pose Detection* April-May 2025
- Researched methodologies for ML-based human pose estimation to create a low-cost MIDI instrument controller.
- Created initial hardware prototype of arm+hand pose-estimator glove.

Independent | *Rust Letterboxd Solver* April 2025
- Designed & implemented A*-based algorithm in Rust to optimally solve *New York Times* letterboxd puzzles.
- Optimized runtime down to <1ms for NYT puzzles; extended to arbitrary puzzle size+geometry.

Work Experience

Conor Hayes Software Consulting (CHSC) | *Independent Consultant* 2023 - 2025, IN/NY/CA

- Provided architecture guidance and hands-on implementation for a reusable hardware testing framework (Python) and its application to two $500K high-speed test racks (SMU, PSU, PDU, Pickering simulators; CAN, USB, ethernet, GPIB, SCPI) for space & nuclear fusion projects, driving successful on-time delivery after 8mos.
- Designed high-level control software, database, and cloud architecture for a digital-twinned battery test system (Python, SQL, AWS); assisted 8-person team to develop, ship, & deploy the system to the assembly line of a $22B satellite firm.
- Redesigned BLE protocol (C, TypeScript) for NRF52-based wearable. +2 sensors, +800% bandwidth, -10% power consumption.
- Provided initial computer vision support for autonomous refueling robot for self-driving electric vehicles.
- Set up CI/CD pipelines using AWS+GitHub Actions for backend of an IoT startup, completely automating a previously 3-hour manual deployment process.
- Prototyped a low-latency peer-to-peer telepresence platform for controlling robots via web client (WebRTC, AWS, TypeScript)
- Created Deep Tech Product Management slide deck to introduce research-oriented tech startups to product design & development best practices.
- Built self-sustaining consulting business as solo entrepreneur; sourced clients, negotiated contracts, ran S-Corp.

Wesper, Inc | *Software Engineer (8th employee @ startup)* 2020 - 2022, New York City

- Owned firmware development (C, NRF5X) to support multiple hardware iterations of a sleep apnea diagnosis wearable, from late-stage prototypes to FDA-approved, mass-produced revenue-generating product.
- Integrated new sensors, developed on-device algorithms, and expanded BLE interface to enable low-power real-time reporting of patient heart rate, blood oxygen level, and sleep posture.
- Developed hardware-in-the-loop simulation infrastructure (C, Python) over JTAG to enable algorithm development in firmware.
- Created automated board programming+testing software used to mass-produce the product in China.
- Improved supply chain resilience by enabling firmware to target multiple MCU's (C, Makefile, linker scripts).
- Led a team of 3 to build backend from scratch (AWS ECS, EC2, λ, S3, RDS MySQL, Python) to ingest and process all patient data.
- Served as devops engineer for the company; owned responsibility for all backend deployments.
- Worked directly with CTO, VP of Engineering, and Director of Algorithms, supporting growth from 8 -> 23 employees, 0 -> 1000+ patients per month
- Worked with iOS team to funnel real-time logging from the firmware, iPhone app, and backend into a single logging aggregator (logz), enabling end-to-end traceability for live support.

Honeybee Robotics | *Software & Electrical Engineering Intern* May - Aug 2018, Pasadena, CA

- Developed drivers, middleware (C++, ZeroMQ), GUIs (Qt), and PCB's (Altium) for robotic assemblies for extreme environments (Mars, Venus, Europa, Arctic circle)
- Worked directly with project teams of mechanical, electrical, and systems engineers to spec & implement new features in an internal ROS-like testing framework, with 200+ source files and 100,000+ lines of C++ code.
- Designed, tested, and validated PCB (Altium) to provide human-in-the-loop control of small drills on remote oil rigs.
- Wrote python data processing library on own initiative to save up to 10min/experiment, adopted by 50+ mechanical engineers across company.

NASA Jet Propulsion Laboratory | *Flight Electronics Intern (Group 349E)* Jan - Aug 2017, Pasadena, CA

- Developed the automated hardware and software test suite (C, Python, SPARC Assembly) for the first deep-space-capable cubesat C&DH board (Sphinx).
- Supported initial board bring-up, discovered & documented critical bugs in novel rad-hardened NAND flash controller and other peripherals.
- Credited inventor on NASA Copyright of Invention NPO 51462-CP for the above.

Awards

American Institute of Astronautics and Aeronautics | *Achievement Award* Oct 2019
National Academy of Engineering/USC | *Grand Challenges Scholar* May 2019
University of Southern California | *Renaissance Scholar (0.9% of graduating class)* May 2019
University of Southern California | *Trustee Scholar (4-year, 1/2 tuition merit scholarship)* Apr 2015

Hobbies

Recorded Music: Accumulated 700,000+ Spotify streams on original music under artist name *Wise John* (39 songs, 2 albums, 1 EP).
Live Music: Sold 170 tickets across bill at NYC's Mercury Lounge (2024). Performed 20+ live shows in NYC, LA, and elsewhere.
Travel & Sports: backpacking (wilderness & urban), swimming, basketball, tennis.
Languages: English (native), Mandarin Chinese (conversational)