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Summary

Hardware robotics engineer and technical co-founder with a Ph.D. in physics and 4+ years building and shipping commercial automation products. Sole designer of four machines including a vision-guided 6-axis harvesting arm, tabletop seeder, germination robot, and tray washer — all mechanical design, electrical design, PCBs, firmware, and CV pipelines. Took company from \$0 to \$700K/year in revenue. Strong in ROS, Python, C++, depth sensing, and closed-loop motion control. U.S. Citizen.

Professional Experience

Jan 2022–Present **Co-Founder & CTO**, *Rooted Robotics (formerly Urban Farms Inc.)*, Boulder/Denver, CO. Raised \$1.2M through USDA SBIR grants and private investors. Led a team of 5 engineers to design, manufacture, and bring to market four CEA automation products generating \$700K/year in revenue. Products achieved CE certification (EU market clearance); 3 patents pending.

- **Mechanical & Electrical Design:** Sole designer of all mechanical and electrical systems for all four products — tabletop seeder, germination robot, vision-guided 6-axis harvesting arm, and tray washer. Full DFM, BOM management, tolerance analysis, PCB design, wiring harness design, and enclosure fabrication.
- **Firmware & Motion Control:** Wrote all machine firmware and motion control software in Python and C++. Implemented closed-loop control systems for DC, servo, and stepper motors, conveyors, linear actuators, and vision-guided pick-and-place.
- **Computer Vision & ML:** Deployed production CV pipelines using Intel RealSense depth cameras, YOLO V5, AWS Rekognition, Azure Vision, and LAVIS BLIP with custom-labeled datasets for crop quality control, yield prediction, and automated harvesting.
- **Manufacturing & QC:** Designed and built the company's full manufacturing process, inventory system, and warehouse operations from scratch. Established QC testing protocols for all shipped units.
- **Customer & Product:** Led customer success and product development teams. Managed technical relationships with industry customers including Kalera, Plenty, and Farm Zero.

Technical Skills

Arms & Manipulation: ROS/ROS2, Python-controlled 6-Axis Arms, Custom End Effectors, Pick-and-Place.

Sensing: Intel RealSense Depth Cameras, IMUs, Control Moment Gyroscopes, Photoeye Sensors.

Actuation: DC, Servo & Stepper Motors, Linear Actuators, Pneumatics, Control Systems Logic.

Motion Control: Closed-Loop Position & Velocity Control, Conveyor Systems, Custom Firmware.

ML Frameworks: PyTorch, YOLO V5, LAVIS BLIP.

Cloud CV: AWS Rekognition, Azure Vision.

CV Hardware: Intel RealSense, OAK-D Pro W PoE Depth Cameras.

Datasets: Custom-labeled on-site datasets, data collection pipelines.

Software: Python, C++, SQL, MATLAB, ROS/ROS2, Custom Firmware, LabVIEW.

Web / Data: HTML, PHP, Apache.

Simulation: COMSOL, Mathematica.

Mechanical: Sheet Metal Design, DFM, Tolerance Analysis, Optomechanical Design.

Electrical: PCB Design, Wiring Harnesses, Enclosures, Motor Drives.

Education

2017–2022 **Doctor of Philosophy, AMO Physics**, *Columbia University*, New York, NY.

Thesis: *Transverse Laser Cooling of Calcium Monohydride Molecules*

2013–2017 **Bachelor of Arts and Science, Magna Cum Laude**, *University of Colorado*, Boulder, CO.

Major: Physics

Research Experience

2018–2022 **Lead Graduate Researcher**, *Zelevinsky Lab, Columbia University*, New York, NY.

Built complete laser systems, custom UHV vacuum chambers, and 4K cryogenic apparatus from scratch for molecular laser cooling experiments. Wrote Python, C++, and LabVIEW experiment control software. Published first-author research in *New Journal of Physics*.

2015–2017 **Undergraduate Researcher**, *Nagle Group, University of Colorado Boulder*, Boulder, CO.

Designed and built an automated hardware QC test stand. Developed C++ data analysis algorithms used in 20+ published nuclear physics analyses.

Publications

22 publications, 1315 citations. Full list: [Google Scholar](#)

First-author S. Vázquez-Carson et al., *Direct laser cooling of calcium monohydride molecules*, NJP, 2022. [arXiv:2203.04841](#)

Languages

English Native (U.S. Citizen)

Spanish Native