Alan Bonilla Santos

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Education

Boston University, College of Engineering — Boston, MA

Bachelor of Science in Mechanical Engineering, Nanotechnology Concentration — *Expected June 2028*

Honors: QuestBridge Scholar (full-ride), POSSE Scholar Finalist (Top 20 of 13,000), Richard L. Hildreth Scholarship ($10,000 annually)

Technical Skills

Software: MATLAB (Simulink), SolidWorks, Onshape, OpenRocket, RASAero, Python, C++, MATLAB, Arduino (C)

Manufacturing: CAD modeling, FEA simulation, 3D printing, PCB design, laser alignment, optical calibration, soldering

Laboratory: Photolithography, cleanroom procedures, spin coating, UV exposure, metal deposition (Ti/Au)

Language: English (Fluent) and Spanish (Fluent)

Research and Leadership Experience

Boston University Photonics Center — Bifano Lab — Boston, MA | Sept 2024 – Present

Undergraduate Researcher, CELL-MET NSF Program

- Developed a MATLAB sub-pixel localization tool using precision methods adapted from aerospace applications
- Developed MATLAB code increasing tissue-tracking capacity from 1 to 96 samples simultaneously
- Selected to present research at the 2026 Emerging Researchers National (ERN) Conference (AAAS/NSF)

Rocket Flight Simulation & Fin Optimization Lead — BURPG — Boston, MA | Sept 2024 – Present

- Simulated rocket aerodynamics using RASAero and OpenRocket to model stability and predict flight performance
- Directed fin optimization process to enhance stability margin and minimize drag; validated models with CAD and mass-prop data
- Coordinated cross-functionally to integrate flight simulation results with design and testing teams

CompuDopt Club — Houston, TX | Aug 2022 – Jun 2024

Founder & President

- Secured a $10K grant from COMP-U-DOPT INC. to cover tuition/fees for 30 students; distributed 30 laptops for engineering/computer science workshops
- Hosted digital literacy and computer-building workshops; arranged $20K in scholarships for members educational development
- Provided laptops for students to use in academic and personal projects, supporting long-term STEM engagement

Madison Outreach Program — Houston, TX | Aug 2022 – Jun 2024

Founder & President

- Founded a 500 sq. ft. community garden to address malnutrition in Harris County and increase food accessibility
- Led 30+ volunteers in 10+ food and donation drives, collecting over 200 boxes of essentials for homeless individuals and single mothers
- Organized environmental cleanups across Houston, promoting sustainability and community engagement

Projects

MEMS deformable mirror - Boston Micromachines Corporation — Boston, MA | Sept 2024 - Present

- Operated MEMS deformable mirrors to shape optical wavefronts and control the direction of light for precision alignment
- Developed MATLAB scripts for mirror actuation, wavefront analysis, and system calibration
- Built applied expertise in adaptive optics through mirror calibration, surface-response characterization, and imaging-system optimization

Engineered Tissue Microscope — Bifano Lab — Boston, MA | Sept 2024 – Present

- Developed a microscope imaging system that tracks engineered tissue movement using MATLAB-based optical tracking algorithms
- Achieved imaging fidelity comparable to FDA tissue-imaging protocols; system enhances throughput and precision for regenerative tissue research
- Designed and implemented image-processing pipelines for detecting Gaussian centers and quantifying tissue displacement

Wafer Photolithography & Nanofabrication — Optoelectronic Processing Facility (OPF) — Boston, MA | Summer 2025

- Designed and fabricated a custom wafer using photolithography techniques in the OPF (cleanroom)
- Executed full lithographic process including spin coating, UV exposure through photomask, metal deposition (Ti/Au), and lift-off
- Gained hands-on experience with photolithography chemistry, thin-film deposition, and nanofabrication alignment techniques

Hybrid Rocket Nozzle Design & Testing — BURPG — Boston, MA | Sept 2024 - May 2025

- Designed, 3D-printed, and tested hybrid rocket nozzles; performed FEA simulations to analyze pressure and thermal stresses
- Developed nozzle geometry using isentropic flow equations and validated with chamber-pressure simulations
- Integrated results into BURPG's propulsion hardware and safety documentation for future hot-fire tests

Awards

Selected for UROP Year-Long Research Award (Fall 2025 – Spring 2025)

Selected 1 of 60+ applicants to conduct research in the Bifano Lab (Fall 2024 - Summer 2025)

Rice University Engineering Challenge — 1st Place (National)

Rice University STEM Presentation — 1st Place (National)

Rice University Engineering Competition — 1st Place (National)

Designed and presented a model representing Exxon Carbon Capture Systems