Alvaro Daniel Callata Suxo

Mechatronics Engineer — Robotics, AI & Computer Vision Research

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Summary

Mechatronics engineer with experience in robotics, AI, and applied research. Contributed to national and academic projects, including Bolivia's first CubeSat (UNOOSA) and neural network-based trajectory prediction for NASA's Astrobee. Founder and lead engineer of the Robotic Chess project integrating a KUKA arm with ROS and electronic circuits design. Authored and presented peer-reviewed papers on additive manufacturing, and STEM outreach at international conferences. Skilled in CAD design, prototyping, and system simulation, with SolidWorks certifications (CSWA, additive manufacturing, sustainability). Seeking opportunities to advance interdisciplinary research in robotics, intelligent systems, and computer vision.

Education

Universidad Mayor de San Andrés (UMSA) **2025 – Present**
Bachelor of Science in Biology (in progress) *La Paz, Bolivia*

- Engineering consultant at the Limnology Unit, applying mechatronics principles to develop bio-inspired systems, particularly in aquatic environments.
- Research intern at the Limnology Unit, focusing on aquatic ecology and bio-inspired robotics. Exploring freshwater ecosystems with applications in aquatic robotics and environmental automation.

Universidad Católica Boliviana "San Pablo" **Feb. 2019 – Jul. 2024**
Bachelor of Engineering in Mechatronics Engineering *GPA: 3.06/4.0* *La Paz, Bolivia*

- Graduated *Magna Cum Laude*. Thesis Score: 3.88/4.0.
- Long-time member of the university's R&D Center, participation in multiple robotics and software development projects.
- Team representative at NASA Human Exploration Rover Challenge, awarded 'Most Improved Performance'.

Research & Conference Publications

1st Author: *Mechanical Design and Testing of 3D-Printed Non-Pneumatic Wheels for Human-Powered Vehicles: A NASA HERC Case Study.*
Presented at the 23rd LACCEI International Multi-Conference for Engineering, Education and Technology, 2025.

2nd Author: *Additive Manufacturing for Tire Treads Design for Outer Space Challenging Terrains. Case: NASA HERC.*
Presented at the Casablanca International Conference on Additive Manufacturing (CASICAM), 2025.

4th Author: *STEM Program Management and Outreach in Different Locations of a Country. Case: Bolivian NASA HERC STEM Activities.*
Presented at the IEEE Integrated STEM Education Conference (ISEC), 2025.

Experience

Limnology Unit – Universidad Mayor de San Andrés **La Paz, Bolivia**
Engineering Consultant *Jul. 2025 – Present*

- Contributed to the design of a low-cost zebrafish research facility with IoT-based monitoring and automation.
- Provided technical guidance on instrumentation and system development in interdisciplinary projects.

Research Associate (Biology) *Jul. 2025 – Present*

- Worked on projects integrating robotics, computer vision, and AI with freshwater biology.
- Applied neural networks and image processing to biological imaging and classification tasks.

FIAB – Fundación de Investigación Aeroespacial **La Paz, Bolivia**
R&D Engineer – Structural & Thermal Analysis *Jul. 2024 – Present*

- Designed thermal and structural subsystems for Bolivia's first CubeSat (UNOOSA Access to Space initiative).
- Simulated orbital thermal conditions in ANSYS; contributed to EXOpod integration documentation.
- Developed mechanical interfaces following CubeSat standards for deployment and material selection.

PRINT3D **La Paz, Bolivia**
Additive Manufacturing Intern *Feb. 2023 – Jul. 2023*

- Maintained and upgraded 15+ FDM 3D printers, improving print quality by 60%.
- Upgraded firmware using Sonic-Pad controllers and put old equipment back into operation.
- Modeled 100+ functional mechanical parts for clients in SolidWorks.

Thesis Researcher – ABS Printing Optimization *Jul. 2023 – Jul. 2024*

- Led a research–industry collaboration with PRINT3D to improve manufacturing quality in additive manufacturing.
- Designed and Implemented post-processing tools adopted by PRINT3D for internal use and graded 97/100 *(Magna Cum Laude)*.

SEDNA SRL **La Paz, Bolivia**
Software Development Intern *Jul. 2022 – Jan. 2023*

- Developed biometric access control software using C#/.NET and SQL Server.
- Contributed to full-stack solutions in Java and JavaScript for healthcare and business systems.

Projects

Computer Vision Segmentation Project | *Python, OpenCV, Machine Learning* **Aug. 2025 – Present**
- Creating custom datasets and implementing semantic segmentation and ML detection models, evaluated on real-world data.
- Integrating IoT-sourced environmental data from in-house prototypes for model validation.

Point Optimization in NASA HERC | *ML, Probabilistic Modeling, Graph Optimization* **Jun. 2025 – Present**
- Developing ML models to predict rover task success, time, energy, and points.
- Integrating probabilistic outputs into graph-based planners for optimized routes under user constraints.

1U CubeSat Development | *CVXPy, Simulink, STM32, ROS* **Jul. 2024 – Present**
- Led GNC team developing a neural network-based trajectory predictor for Astrobee and integrated it into ROS/Gazebo simulator.
- Developed PIL/SIL environments and deployed payloads via STM32 in stratospheric balloon missions for sensor validation.

Robotic Chess System with KUKA Arm | *ROS, Python, CAD, Embedded Systems* **Jul. 2023 – Dec. 2024**
- Founder and lead engineer of an autonomous chess system integrating KUKA robotic arm, ROS-based control, and a custom PCB chessboard.
- Implemented motion planning, inverse kinematics, and EKI communication.

Encapsulation and Post-Processing System for ABS | *CAD, Firebase, MicroPython, IoT* **Jul. 2023 – Jul. 2024**
- Developed IoT-enabled systems for industrial ABS printing: a thermally controlled enclosure to prevent warping and an acetone vapor chamber to improve surface finish.
- Implemented remote parameter control via mobile interface and Firebase dashboards.

NASA HERC 2024 | *SolidWorks, 3D Printing, CNC, Mechanical Design* **Nov. 2023 – Apr. 2024**
- Led rover tool design/fabrication, contributing to the "Most Improved Performance" Award.
- Produced components via CAD modeling, 3D printing, and CNC machining.
- Led the team to publish and present 3 peer-reviewed papers on NASA HERC innovations at international conferences.

Biometric Registration and Access Control System | *C#/.NET, SQL Server, Embedded Systems* **Jul. 2022 – Jan. 2023**
- Led implementation of biometric registration and entry/exit control at workplace arrival points.
- Integrated database, software, and hardware modules for reliable employee authentication.

Volunteering, Outreach & Lecture Experience

Casablanca International Conference on Additive Manufacturing **Casablanca, Morocco**
Lecturer – Virtual Conference *Apr. 2024*
- Presented *"Additive Manufacturing for Tire Treads Design for Outer Space Challenging Terrains"* to 300+ attendees, including ESA, Airbus, and universities across Europe and Africa.

International Multi-Conference on Engineering, Education and Technology **Mexico City, Mexico**
Lecturer – Virtual Conference *Jul. 2025*
- Presented *"Mechanical Design and Testing of 3D-Printed Non-Pneumatic Wheels for Human-Powered Vehicles: A NASA HERC Case Study"* to Latin American engineering researchers and academic leaders.

Universidad Católica Boliviana "San Pablo" – ITEC 2024 **La Paz, Bolivia**
KUKA Robotic Arm Workshop Lecturer *Oct. 2024*
- Delivered practical sessions on KUKA arm operation, KRL programming, and safety protocols.
- Taught inverse kinematics, path planning, and Robot Operating System (ROS) integration.

Universidad Católica Boliviana "San Pablo" – VEMEC Team **La Paz, Bolivia**
STEM Outreach Lecturer *Nov. 2023 – Apr. 2024*
- Co-led outreach team delivering STEM workshops in 8 out of 9 Bolivian departments, reaching over 7,000 participants.
- Trained students in tech-related topics during national tour *Gira STEM*, with hands-on rover engineering activities.

Technical Skills & Certifications

Programming & Frameworks: Python (TensorFlow, OpenCV, CVXPy), C/C++, C#, Java, JavaScript, SQL, MATLAB/Simulink, ROS
Tools & Platforms: Git, Docker, STM32, Raspberry Pi, Jetson Nano, ESP32, Arduino, KUKA robots
CAD & Manufacturing: SolidWorks, Blender, Cura, PrusaSlicer, RDWorks, laser cutting, 3D printing (FDM, DLP)
Languages: Spanish (native), English (B2)
Soft Skills: Leadership, teamwork, adaptability, self-motivation, quick learning, resilience
Affiliations: IEEE Robotics & Automation Society (2021–2024), IEEE Power & Energy Society (2024), Mechatronics Student Scientific Society – UCB (2021–Present), UCB Mechatronics Alumni Network (2024–Present)
Certifications:
- SolidWorks CSWA – CAD Design (Dassault Systèmes, 2024)
- Additive Manufacturing Associate (Dassault Systèmes, 2024)
- Sustainability Associate (Dassault Systèmes, 2023)
- In progress: Google Data Analytics (Coursera), Meta Full-Stack Developer (Coursera), IBM Databases and SQL for Data Science with Python (Coursera)

Awards & Recognitions

NASA HERC 2024 – Most Improved Performance Award (Huntsville, USA)
UNOOSA–EXOpod – Bolivia's First CubeSat Selected for Launch (Vienna, Austria)
LACCEI 2025 – Full Paper Presentation Certificate
Bolivian Senate – Recognition for NASA HERC Representation (2024)