Emiliano Villicaña Brugada

evillicanabrugada@gmail.com • (661) 378-0410 • linkedin.com/in/emilianovillicana

EDUCATION

Columbia University, School of Engineering and Applied Science — New York, NY
B.S in Mechanical Engineering — Expected May 2025

- Coursework: Machine Design, Machine Learning, Mechatronics, Computed Aided Design, Dynamics & Control Systems, Advanced Manufacturing Processes, Heat Transfer, Thermodynamics, Robotics Studio
- Extracurriculars: SHPE, ASME, Spanish Translator for *Flipping Physics* YouTube channel, CU Tae Kwon Do

EXPERIENCE

RObotics And Rehabilitation Laboratory (ROAR Lab) — New York, NY
Undergraduate Researcher — January 2025 – Present

- Designing and manufacturing robotic exoskeleton components for cerebral palsy rehabilitation
- Developing robotics controls, implementing force modulation and sensor feedback for patient comfort

Columbia Space Initiative — New York, NY
Lead Mechanical Engineer; NASA Lunabotics — September 2024 – Present

- Managing full robot lifecycle including design, CAD modeling, FEA analysis, and fabrication of autonomous robotic excavator
- Leading multidisciplinary team, coordinating with electrical and software teams to integrate sensors, actuators, and control systems

Caterpillar Inc, — Waco, TX
MSOD Intern; Automation Team — May 2024– August 2024

- Repurposed antiquated AutoBagger; fabricated custom parts designed in Creo, resulting in 4x increase output rate (product/min)
- Trained and maintained 3 autonomous mobile robots (AMR), integrating with existing automation despite non-communicating systems, ensuring seamless operation
- Performed preventative maintenance & troubleshooting of 30+ AutoStore robots to prevent downtime
- Conducted safety audit; identified safety risks in heavy hoist work areas; designed multipurpose work tool for safer operation, enhancing workplace safety

Columbia University Formula Racing — New York, NY
Powertrain Engineer, Cooling Hardware and Drivetrain — September 2021 – May 2024

- Designing eccentric tensioner to replace current tensioning technique
- Redesigning & machining crossmember with 10% weight reduction and increased strength; SolidWorks FEA
- Streamlined cooling loop testing process & methods documentation; Communicated feasibility and timeline

Emerson — Sidney, OH
Mechanical Engineering Co-op / Advanced Manufacturing Engineering Co-op — May 2023 – August 2023

- Designed and prototyped fittings, lift device & infrastructure for production
- Created python inventory management system; data analysis & graphical representation; diminished inventory shortages, increased production rate by 30%, reduced 10% waste
- Redesigned production line layout to meet end-of-year projections, being implemented as of August 2024
- Performed MDM tests; time studies; operated laser welder; PLC programming

Skills and Expertise

- **Skills**: Mechanical Design, Design for Manufacturing (DFM), SolidWorks, PTC Creo, Siemens NX, Onshape, Teamcenter, AutoCAD, Finite Element Analysis (FEA), Circuit Design, Circuit simulation, Microcontroller programming, PLC programming, Control theory, Java, Python, MATLAB, Excel, Thermal Simulation
- **Machining & manufacturing**: CNC Mill, Laser cutting & welding, Lathe, 3D Printing, water jet

Awards and Certifications

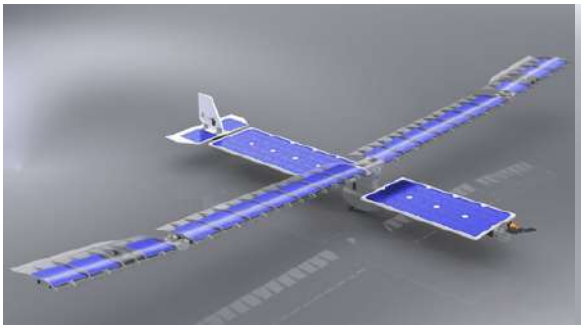
- HSF Scholar, STEM Summit Scholar, High Desert Branch APWA, OSHA 10 certification, Seal of Biliteracy, NSE Gold Medalist, Columbia Dean's List

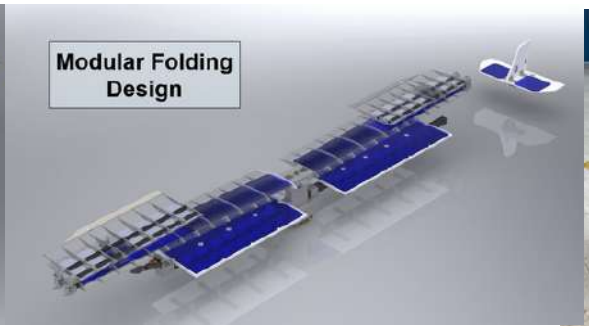
EMILIANO VILLICANA

MECHANICAL ENGINEERING AT COLUMBIA UNIVERSITY

evillicanabrugada@gmail.com
linkedin.com/in/emilianovillicana
661 378 0410

AUTONOMOUS SOLAR-ELECTRIC UAV





What?

- Design and fabricate an **autonomous** solar-powered electric unmanned aerial vehicle (UAV) with 4hr flight
- On-board **machine learning algorithm** & thermal imaging

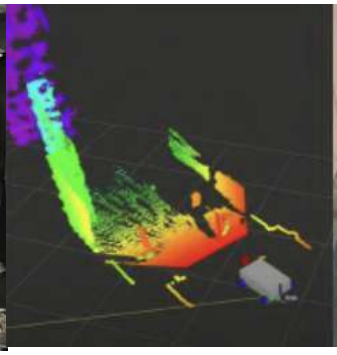
How?

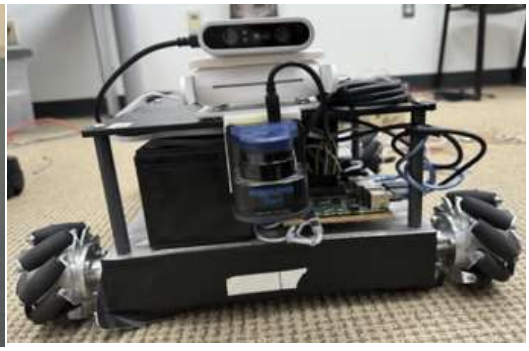
- Performed a **needs analysis**
- Used **surface modeling** features in **SolidWorks**
- Preformed Finite Element Analysis **(FEA)**
- Linux based Raspberry Pi control

Results

- The design fulfilled its purpose with 6+ hours of sustained flight
- Machine learning algorithm consistently achieved 88% accuracy
- ASME and FAA standard compliant

AUTONOMOUS LUNAR ROBOT - ATLAS





What?

- Designing, building, operating a robot capable of traversing simulated terrain and constructing a regolith-based berm
- Follow NASA's systems engineering process

How?

- Designed on **SolidWorks**
- Fabricated chasis via **abrasive water jetting** and **break forming**
- **Arduino** motor control and sensor interfacing & Ubuntu **RaspberryPI** with **ROS2**
- **Digital twin** with RVIZ2 & **Simulink**

Results

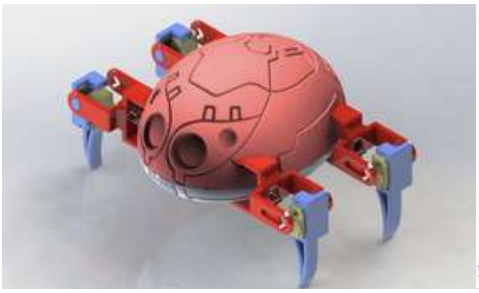
- Successfully manufactured test chasis and integrated electronics
- Achieved Lidar data visualization

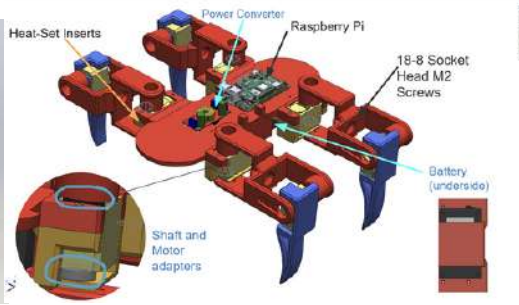
EMILIANO VILLICANA

MECHANICAL ENGINEERING AT COLUMBIA UNIVERSITY

evillicanabrugada@gmail.com
linkedin.com/in/emilianovillicana
661 378 0410

REINFORCEMENT LEARNING LEGGED ROBOT





What?

- Design and build a **Python**-based legged robot
- Optimize locomotion speed while maintaining aesthetic design

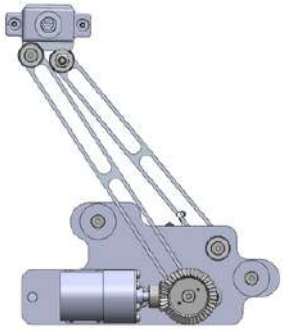
How?

- Designed using **SolidWorks**
- Creep gait optimized with **reinforcement learning**
- Headless **RaspberryPI** motor control

Results

- Robot achieved locomotion
- Robot passed all stability tests

AUTOMATED ROBOTIC LINKAGE SYSTEM



What?

- Worked in a team to design, build, and control a 4-bar linkage system
- Kinematic planning, **CAD modeling**, manufacturing, **signal processing**, **transmission** design, **controls**

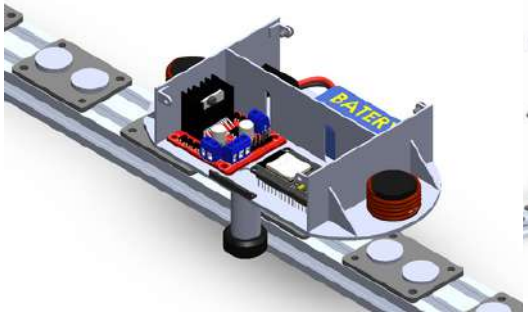
How?

- Designed in **SolidWorks**
- Inertia matching to choose proper transmission ratio
- water jet, cnc mill, and lathe
- **C++ Arduino PID Control**

Results

- Reliable operation meeting all design objectives.
- Real-time control system tuning achieved precise motion with maximum angle deviation of 10˚

AUTOMATED ELECTROMAGNETIC ITEM TRANSPORTATION SYSTEM



What?

- Design an expandable electromagnetic replacement for conveyor belts.

How?

- Designed using **SolidWorks,** used **sheet metal features**
- **C++ contro**l using ESP32 microcontroller
- **Circuit design** using **KiCad**