Julian Millan

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I am a fourth year undergraduate studying mechanical engineering at Caltech in Pasadena, CA. My main interest is in robotics, but I am open to new experiences and opportunities within automation, controls, and mechatronics. I have a passion for cost effective, safe, and practical robotics compatible with humans in everyday life.

EDUCATION:

California Institute of Technology **Sept. 2021 - June 2025**

- B.S. in Mechanical Engineering, GPA 3.4 / 4.0 (in progress)

Notable Coursework:

- ME 134 (Robotic Systems), ME 169 (Mobile Robots), ME 133ab (Classic Manipulators, Kinematics, Planning), CDS 110 (Feedback Control Systems), ME 008 (Rapid Robotic Prototyping), ME 72a (Capstone Project Design), ME 014 (Mechanical Design and Fabrication)

Upcoming: **Before Apr. 2025**

- ME 72b (Capstone Project Competition), ME/CDS 234 (Advanced Robotics: Planning)

RESEARCH:

Caltech AMBER Lab: **June - Aug. 2023**

- Worked with Professor Aaron Ames to design an actuated ankle and foot for a bipedal robot
- Utilized skills in FEA, mechanical design, SOLIDWORKS, and motor choice

Autonomous Robotics and Controls Lab at Caltech: **June - Aug. 2024**

- Worked with Professor Soon-Jo Chung to develop Behavior Cloning and Offline Reinforcement Learning controller models for a bipedal robot
- Utilized skills in Linux, ROS, Python, Machine Learning, Neural Networks, and Mujoco simulation

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MAJOR PROJECTS:

Carrom Robot: **Jan. - Mar. 2024**

- Led hardware design, fabrication, and implemented collision-aware kinematic controller for 5-DOF manipulator that played a multiplayer board game with humans.
- Implemented and verified game-play state machine, safety, and vision detectors via thorough experimental testing. Integrated recovery modes and behaviors for robust gameplay.
- **Skills Utilized:** Kinematics, beam theory, dynamics, CAD, 3D printing, machining, computer vision, Linux
- **Video:** https://youtu.be/ghnqkQhqNAI

Autonomous Maze Solver: **Apr. - June 2024**

- Self-localizing and planning robot capable of solving a random maze (both known and unknown layout).
- Led all software and robotic fabrication. Placed 3rd in the class competition.
- **Skills utilized**: ROS2, SLAM, algorithm design, Python, Probabilistic Roadmapping, and motion planning.
- **Video**: https://youtu.be/JR84L-bYDIU.

Planted SPOT Ball Catching: **Nov. - Dec. 2023**

- Simulated SPOT being able to catch a bouncing ball without moving its feet in ROS2 Humble.
- Led programming, URDF model creation, and ball catching algorithm.
- **Skills Utilized**: XML, inverse kinematics, ROS2, and MATLAB
- **Video**: https://youtu.be/MOWTQnGmksY

Solving Locked Door Mazes with EST and RRT: **Feb. - Mar. 2024**

- Simulated and tested different growing/planning algorithms to solve mazes with keys and locked doors
- Organized lock door generation, four different algorithms to test, experiments, and key generation
- **Skills Utilized**: Python, planning, Probabilistic Roadmapping, networks, node connection/generation
- **Video**: https://youtu.be/bAizg2_v2O0

TECHNICAL SKILLS:

- **Machining:** Laser cutting, water jetting, rapid 3D print prototyping, milling, lathing, and drill pressing.
- **Robotics:** Projects are on my personal website. Actuators/motors, Gazebo, Mujoco, RoboClaw, Raspberry Pi, DIY remote control, and Arduino. PID and non-linear feedback control. Trajectory generation/tracking.
- **Engineering:** SOLIDWORKS, Onshape, ANSYS, FEA, and AutoCAD. Team projects with a BOM, PDR, CDR, reports, and final demos. Mechatronics/circuit design.
- **Programming:** Jupyter, C/C++, Java, and MATLAB. Recursion, Algorithms, Binary Trees. Virtual Box, URDF/RVIZ, and Ubuntu. Machine Learning using Offline Reinforcement Learning and Behavior Cloning.

PUBLICATIONS AND PRESENTATIONS:

Design and Control of a Passive-Ankle Bipedal Robot - Sorina Lupu, **Julian Millan**, Leo Zhang, Soon-Jo Chung

- In-progress publication based on my research with the Autonomous Robotics and Controls Lab (ARCL)

Designing a Learning-Based Controller for a Bipedal Robot **- Julian Millan**

- Completed final report and oral presentation given at SFP Seminar Day August 2024 based on my research with the ARCL during summer 2024.

Designing an Optimized Robotic Ankle for a Bipedal Robot **- Julian Millan**

- Completed final report and poster presentation given at SFP Seminar Day October 2023 based on my research with the AMBER Lab during summer 2023.

TEACHING EXPERIENCE:

- **Mechanical Prototyping TA**: Worked directly with students demonstrating and teaching shop practices and safety during summer 2023 and 2024. Techniques taught include milling, lathing, and assembly.
- **Dimensional and Data Analyses in Engineering TA:** Created course content, graded exams and assignments, and held office hours. Improved average grade and course feedback compared to a year prior.

COMMUNITY AND SERVICE:

- **Caltech Health Advocate:** Volunteer certified EMR and first responder for Caltech and Pasadena.
- **Caltech FCC**: Volunteer orientation small group leader for incoming Caltech freshmen.
- **Caltech Waiter:** Employment that requires setting up, providing, and cleaning up after dinners for students
- **Blacker House Social Chair**: An elected position in a dorm that required the organization and funding of student-organized social events and the management of a ten person social team.
- **Caltech Grill Master**: Employment that entails grilling meals for students and managing a team of grillers
- **Caltech Admissions Ambassador**: Position that requires answering incoming student Caltech questions.
- **Clubs**: Member of Caltech's LGBT+ club PRISM, Caltech Hispanic and Latino Association, SHPE, and the Caltech Robotic Manipulation Club

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HONORS AND AWARDS:

- **Larson Scholar:** Named SURF title given for my research during summer 2023 with the AMBER Lab.
- **Class of '52 SURF Fellow**: Named SURF title given for my research during summer 2024 with the ARCL.
- **FCC Appreciation Award**: Certificate and dinner received for going "above and beyond" as a mentor.

References Available Upon Request