

SIMBA GAO

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TECHNICAL SKILLS

Mechanical Design: SolidWorks, GD&T, Tolerance Analysis, DFM/DFA, Engineering Drawings, BOMs
Analysis & Simulation: Abaqus, HyperWorks, ANSYS Maxwell, FEMM, Thermal/Structural FEA, MATLAB, Python, DOE
Mechatronics & Test: LabVIEW, Sensors & Encoders, Arduino/C++, CAN, Data Acquisition
Robotics & Controls: ROS2, FK/IK, MuJoCo, PID, LQR, MPC, State-Space, Kalman Filtering, QP/Optimization
Manufacturing: Mill, Lathe, CNC, Waterjet, Laser Cutting, FDM/SLA
Precision & Microfabrication: ALD, MEMS, Lithography, Flexures, Precision Positioning

EDUCATION

Carnegie Mellon University *M.S. in Mech Eng - Advanced Study in Robotic and Control Systems* | 3.8/4.0 **Aug 2025 - Dec 2026**
University of Michigan - Ann Arbor *B.S.E. in Mech Eng • Electrical Eng Minor | Magna Cum Laude, 3.6/4.0* **Aug 2021 - May 2025**

PROFESSIONAL EXPERIENCE

Mechatronics Engineering Intern **May 2026 - Aug 2026**
Aerotech, Inc., Mechatronics R&D Group *Pittsburgh, PA*

- Developed, validated analytical+FEA models in Python, FEMM, and ANSYS Maxwell to predict eddy-current effects in voice-coil actuators
- Automated **6,000+ DOE-based parametric simulations** to map model-validity spaces and developed engineering tools for eddy-current prediction, mitigation, and closed-loop performance analysis
- Implemented mitigation strategies; improved existing actuator frequency-response magnitude and phase degradation by **up to 70%**

Robotics Intern **Sep 2025 - Apr 2026**
Origami Robotics *Pittsburgh, PA*

- Designed and manufactured a compact, cost-efficient **6-DOF robotic arm** using 3D-printed and CNC components with modular actuation
- Developed custom **low-backlash strain-wave gearbox**, achieving **~20 arcmin backlash** with selectable **8:1 or 64:1 reduction ratios**
- Developed the **Jetson Nano/ROS2 integration** for an omnidirectional mobile base, implementing CAN communication, LiDAR integration, teleoperation, and pose-command workflows toward autonomous navigation

Mechanical Design Intern **Jan 2024 - Dec 2024**
UMich Multidisciplinary Program • ASML *Ann Arbor, MI*

- Quantified **dynamic behavior** of rolling loops under high-g motion on ASML's DUV linear stage to reduce CoG and mass uncertainty
- Designed **crank-slider test fixture; experimentally verified** theoretical kinematics and captured changing effective mass during dynamic motion within 13% error; identified improvement opportunities for future iterations to ASML
- Developed **synchronized data acquisition and processing** pipeline (1.6 kHz) for system characterization and model refinement
- Led team planning using **Agile Scrum**; ensured timely delivery of **executive summaries** and technical **design reviews**

Research Assistant **Aug 2025 - May 2026**
Precision Hexapod Design & Optimizer | Mechatronics & Instrumentation Group, Dylan Yan

- Developed a **Python multi-objective Stewart-platform optimizer**, evaluating **32,000+ geometries** across workspace, stiffness, actuator loads, dynamics, collision clearance, and packaging to identify feasible design tradeoffs
- Designed and refined a **6-DOF precision hexapod positioning stage** using parametric CAD, mechanical modeling, and FEA, integrating actuators, joints, sensors, structural components, and packaging constraints
- Built a **virtual calibration and error-compensation framework** to study the effects of manufacturing variation, encoder error, structural compliance, thermal drift, and external loading on positioning accuracy

Novel Flexure Architecture | Precision Systems and Design Lab, Prof. Shorya Awtar **Aug 2024 - Jan 2025**

- Designed, manufactured, and tested novel **flexure-based mechanisms** using a linear actuator, capacitive probe, and LabVIEW
- Improved actuation&bearing performance by **42% and 470%**, with experimental results agreeing with analytical predictions to within **9%**
- Applied **tolerance stack-ups, DFM/DFA/DFT, and dimensional optimization** to balance performance, manufacturing, and assembly

Product Development Intern **May 2024 - Aug 2024**
Robotics Startup *Ann Arbor, MI*

- Designed and iterated **compact packaging systems** for a hand-held robotic device using SolidWorks, CNC, and 3D-printing; constraining multi-DoF motion for reliable air/land transport, balancing packaging volume, structural requirements, assembly, and manufacturability
- Supported **phase-gate design reviews** and engineering documentation for product-development and IP activities

PROJECTS

Compact Low-Cost Dynamic Drone Propeller Balancer **Aug 2025 - Dec 2025**

- Led the mechanical design and sensor integration for a portable, low-cost dynamic **drone propeller balancing system**; implemented MEMS accelerometer, encoder-based rotor tracking, **motor control** via ODrive and custom GUI
- Device capable of detecting vibrational imbalance in blades and returning corrective weight recommendations (magnitude and direction) to within **approximately 12%**