Jake Marcus

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Education

Florida A&M University – Florida State University College of Engineering **May 2026**
Bachelor of Science, Mechanical Engineering

- **Current 3.6 GPA**

Experience

Aero Thermal Simulation Intern, Danfoss Turbocor Tallahassee FL **June 2024 - Current**

- Implementing agentic AI systems to automate engineering tasks, achieving a 90%+ reduction in execution time (2.5 hours → 15 minutes).
- Developed machine learning models (neural networks, support vector regression, random forest regression) in TensorFlow to predict aerodynamic performance metrics such as efficiency, Mach number, and compressor speed across multiple centrifugal compressors.
- Translated compressor rating methodology into a graphical user interface using Dash and Python; compiled into executable files for use by the aero team.
- Redesigned centrifugal compressor seals in SpaceClaim, optimizing geometries for improved performance achieving a 35% improvement compared to the baseline.
- Conducted computational fluid dynamics(CFD) simulations in ANSYS Workbench, including meshing, setup, and solution, to evaluate seal designs.
- Collaborated with the mechanical engineering team to ensure manufacturability of new seal designs for potential future iterations.

Projects

NASA Psyche Asteroid Sampling and Caching System **Fall 2025-Spring 2026**

- Designed a sampling and caching system to collect iron–nickel surface and subsurface material from NASA's M-type asteroid Psyche.
- Implemented a peck drilling strategy optimized for micro-gravity environments to minimize reaction forces while producing subsurface metal chips.
- Designed a pneumatic gas-blast transport mechanism utilizing solenoid-actuated valves and directional nozzles for controlled material capture.
- Achieved a per-site sample capacity of 9 cm^3, representing a novel approach to metallic asteroid subsurface sampling.

Single-legged SLIP Model for Varying Gravity Environments, Florida State University College of Engineering **Spring 2025**

- Designed and implemented a Matlab simulation of a Spring Loaded Inverted Pendulum(SLIP) model to study robotic locomotion under varying gravitational conditions.
- Applied ODE solvers(ODE45,ODE15) to simulate stance and flight phases, incorporating damping and hip actuation via proportional-derivative(PD) controller.

Gear Driven Lifting Device, Florida State University College of Engineering **Spring 2025**

- Designed a compact gear system (12" × 12" × 6" footprint) that amplified a motor output of 0.045 lbs to deliver up to 20 lbs of lifting force.
- Built a motorized lifting device capable of raising loads 150 mm, successfully lifting 5 lbs unassisted and 10 lbs assisted using a single 6V DC motor powered by 4 AA batteries.
- Modeled, 3D printed, and assembled a lightweight yet durable gear housing and lifting platform.

Automated Remote-Control Car, Florida State University College of Engineering **Summer 2024**

- Developed an autonomous RC car capable of driving to specified GPS coordinates and navigating through multiple checkpoints.
- Utilized an Arduino and programmed in C to integrate various sensors and components, including GPS, compass, ultrasonic sensors, LEDs, DC motors, servo motors, LCD screen, and buttons.
- Programmed the car to use real-time sensor data for autonomous navigation, avoiding obstacles and reaching targets, while allowing user interaction through the LCD screen and control buttons.

Skills

- Python, C,C+ +, MatLab, TensorFlow, Dash, Matlab Simulink, CREO, Solid Works, ANSYS Applications, Turbotides, Excel