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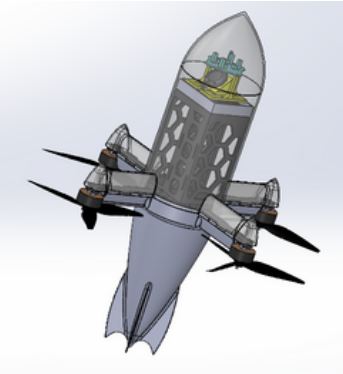
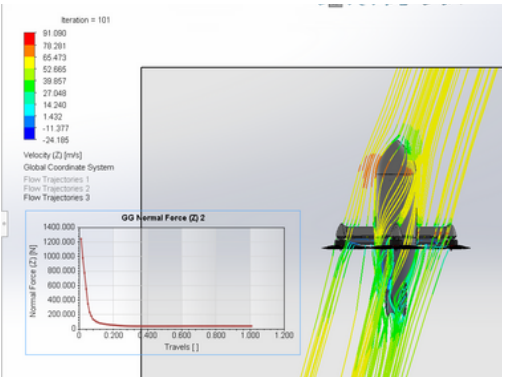
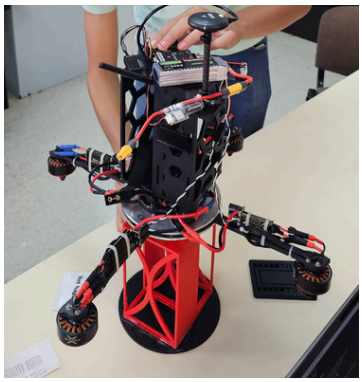
HIGH SPEED DRONE - RESEARCH ASSISTANT







What?

- Designed and prototyped a **high-speed** UAV **optimized** for **aerodynamic** efficiency, stability, and propulsion.
- It's purpose is to detect and report anomalies quickly and **autonomously**.

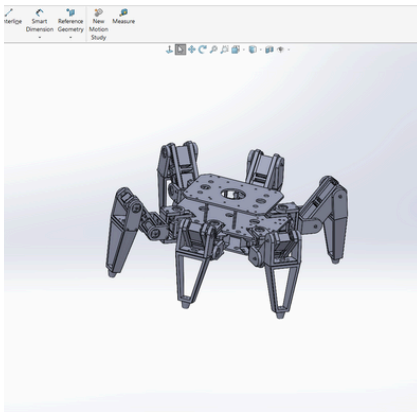
How?

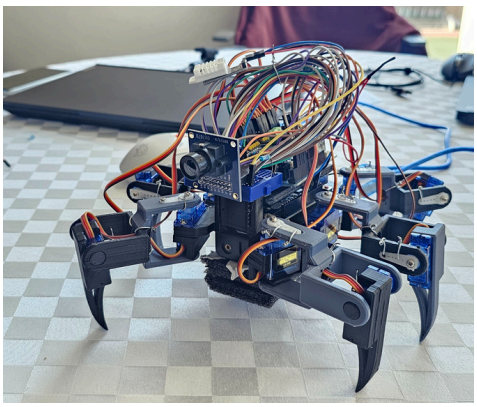
- Built and refined geometry using **CAD, FEA**, and f**low simulations** in **SolidWorks**, validating structural strength and minimizing drag.
- Conducted motor and **propeller performance testing**, iterating through **wind-tunnel** validation to optimize thrust-to-weight ratio.
- Integrated electronics and **calibrated flight control systems** for stability at high velocity.

Results

- Achieved a validated prototype demonstrating stable flight at high speed with **aerodynamic efficiency gains**, by achieving a **drag reduction of 21%** over past designs, supporting scalability for autonomous **UAV application**.

SPIDEYLEAKS - 1ST PLACE BUILD-IT WEEKEND





What?

- **Designed** and **built SpideyLeaks**, a spider-inspired **robot** capable of detecting and repairing leaks in tight and hard-to-reach spaces.

How?

- Used **servo actuators**, **Arduino microcontroller**, and **servo drivers** for simple, reliable locomotion
- integrated **sensors** and a live feedback **camera** for real-time leak detection

Results

- Delivered a fully functional prototype in just **48 hours**, winning **1st place.**
- An efficient, practical, and **autonomous** solution for maintenance and safety.

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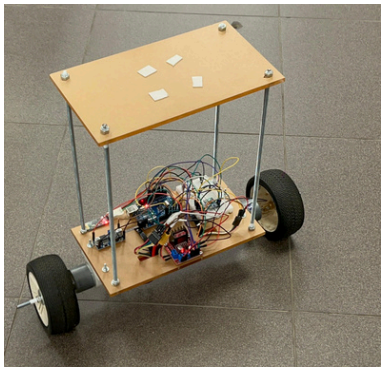
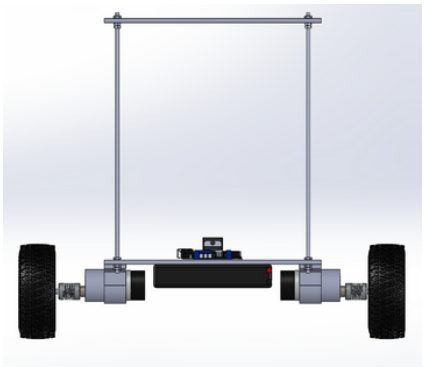
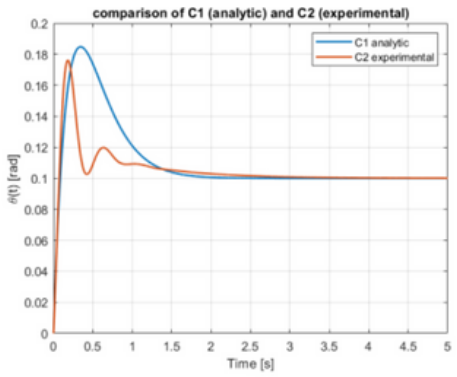
SELF STABILIZING ROBOT - CONTROL SYSTEMS







What?

- Designed and built a **two-wheeled self-balancing robot** optimized for dynamic stability and **autonomous control.**
- Utilizes inverted pendulum physics to maintain vertical equilibrium through real-time sensor feedback and **PID control** algorithms.

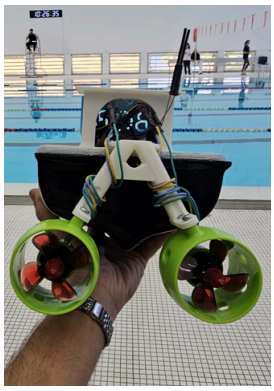
How?

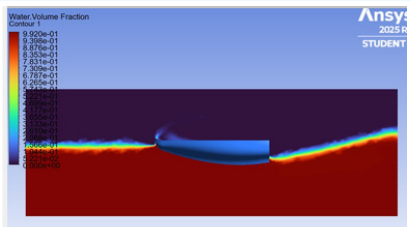
- CAD modeled chassis in **SolidWorks** and constructed using dual acrylic sheets joined by threaded rods and bolts.
- Implemented **MPU6050** gyroscope with **Kalman filter** and cascaded **PID controller** by an **Arduino Uno**.
- Integrated **GB37Y3530 encoder motors**, **L298N H-bridge driver**, and **HC-06 Bluetooth module** for wireless control and telemetry.

Results

- Achieved stable autonomous balancing with **<50ms response** time and recovery from **30° disturbances.**
- Demonstrated adaptive weight compensation, maintaining stability with **450g payload**.
- Implemented racing mode with steering and **encoder-based odometry** for position tracking and autonomous navigation.

RC BOAT - COMPETITION WINNERS





What?

- Built a **high-speed radio-controlled racing boat** featuring optimized V-hull geometry.
- Focused on achieving maximum velocity through advanced materials, **computational simulations**, and **hydrodynamic design** for competitive racing.

How?

- **CAD modeled in SolidWorks** and optimized V-hull using **ANSYS flow simulations.**
- Fabricated **fiberglass hull** with drag-reducing coating.
- Designed **3D-printed watertight** cover.
- Integrated twin **brushless motors**, **ESC controllers**, and **radio control system.**

Results

- **Won first place** for fastest boat in university competition through optimized design and dual-motor configuration.
- Validated **ANSYS simulations** with real-world performance, confirming hydrodynamic efficiency.

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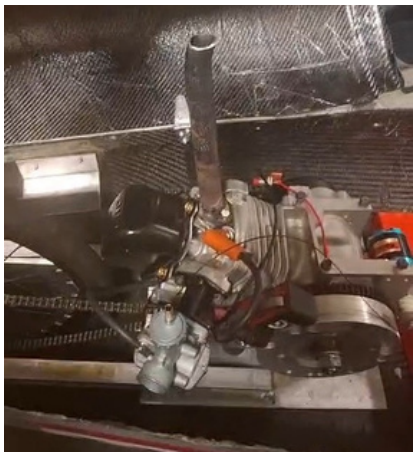
SUPERMILEAGE CAR - MANIFACTURING ADVISOR



What?

- **Restored** and **optimized** an ultra-efficient **carbon fiber** vehicle for the **Supermileage** competition, targeting maximum fuel economy and lightweight performance.

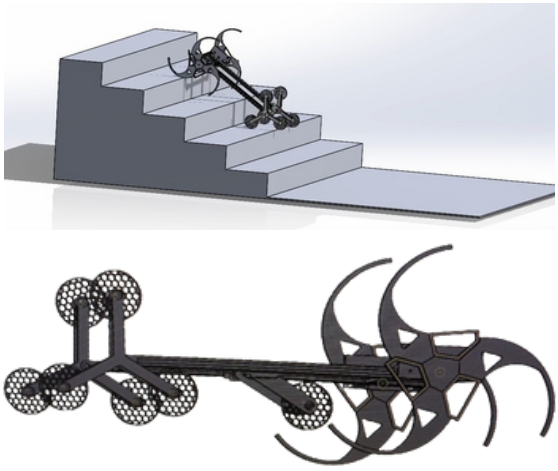
How?

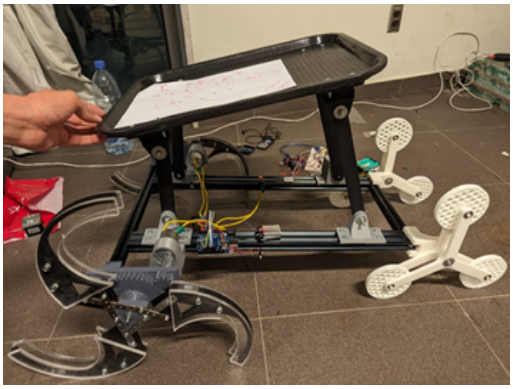
- Performed **carbon fiber composite** repairs to restore chassis integrity maintaining lightweight performance.
- Rebuilt the steering and braking systems.
- Diagnosed and corrected **engine malfunctions**, enabling consistent operation

Results

- Delivered a fully functional, competition-ready vehicle that demonstrated efficiency, reliability, and extended lifecycle through effective system-level restoration

STAIR CLIMBING ROBOT - MECHANICS OF MACHINES





What?

- **Designed** and **built** an **autonomous** stair-climbing **robot** intended to deliver goods (e.g., food or drinks) between floors in environments such as restaurants or offices.

How?

- Powered by **dual high-torque motors,** modeled and stress-tested using **CAD and FEA in SolidWorks.**
- Integrated a **gyroscope + stepper motor** with a **four-bar linkage** actively stabilizing the payload plate
- Applied **3D printing** for custom components and rapid iteration

Results

Produced a functional prototype demonstrating the **feasibility of stable, autonomous stair-based delivery**, offering a practical path toward multi-floor service robotics

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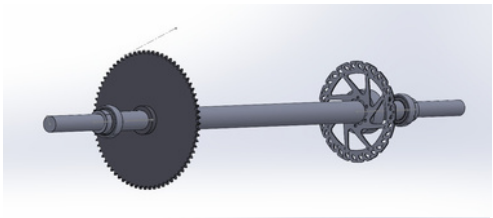
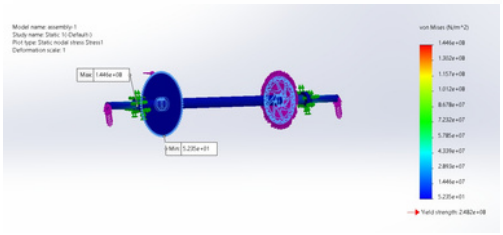
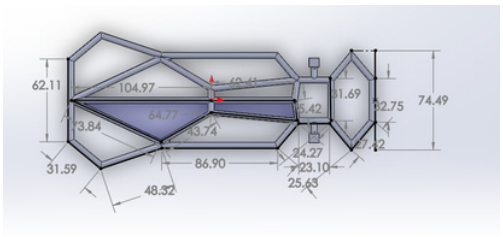
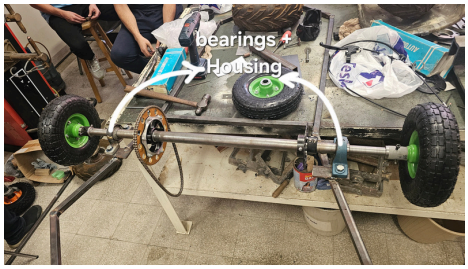
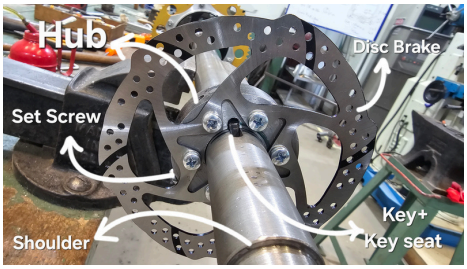
GO KART REAR AXLE - MECHANICAL DESIGN

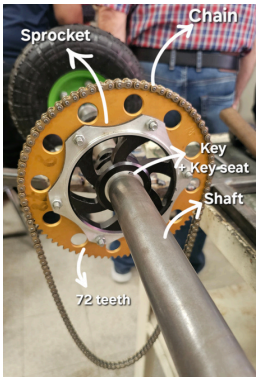












What?

- Designed and analyzed a **rear axle** and **chassis** system for a go-kart, ensuring strength, reliability, and performance under **acceleration** and **deceleration** loads.

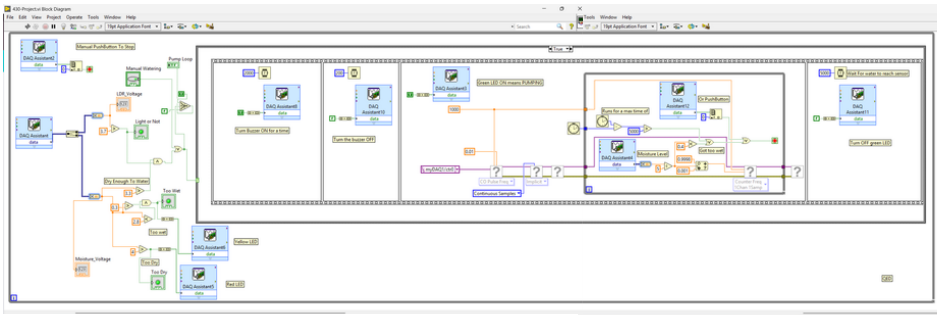
How?

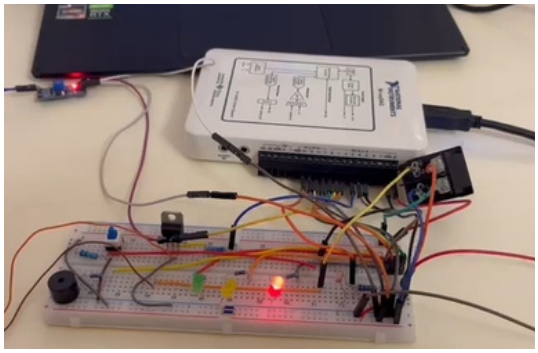
- Conducted **torque** and **load calculations** validated with **FEA** on **solidworks**
- Engineered component retention with **keys, keyseats, collars, shoulders, grooves, bearings, and tolerances.**
- Aligned the design with **metal machining** processes for **manufacturability**.

Results

- Delivered a validated **design** where **theoretical analysis** matched **simulation** outcomes, serving as the foundation for the adopted final build.

PLANT IRRGATION SYSTEM - INSTRUMENTATION





What?

- Designed and implemented a **smart irrigation system** capable of **automatically** watering plants by **monitoring** environmental conditions and soil moisture.

How?

- Used **LabVIEW** with **NI myDAQ** for real-time control;
- Integrated **light** and **humidity sensors**, **LEDs**, **buzzers**, and a **pump** to irrigate when sunlight decreases and adjust water flow **dynamically** based on soil moisture.

Results

- Delivered a functional prototype providing **adaptive, water-efficient** irrigation with **continuous monitoring,** demonstrating potential for sustainable automated plant care