SADRO TEHRANI

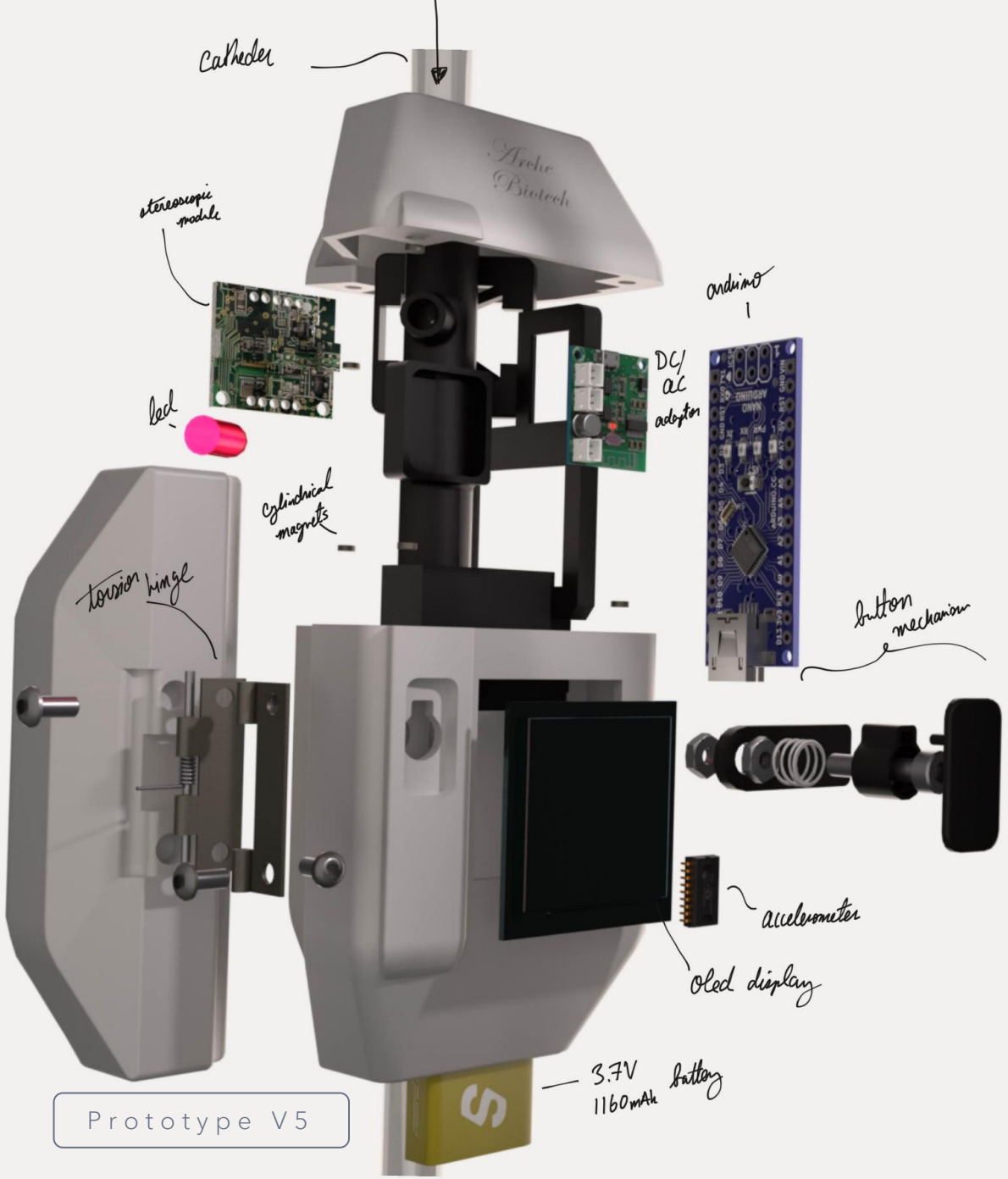
ENGINEERING RESUME + PORTFOLIO

Watch Project Demos here!

MCMASTER BAJA RACING

SE CATIA SW

MAC FORMULA ELECTRIC



Prototype V5

2024

ARCHE BIOTECH

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What?

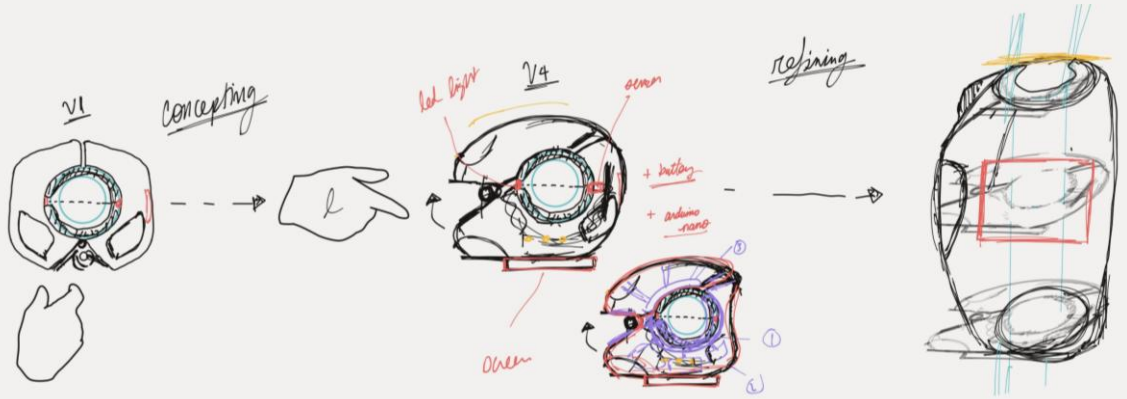
- Developed a biomedical device to measure blood/saline flow rates and hematuria (hemoglobin) levels through a catheter.

How?

- **Design & Prototyping**: integrated mechanical components like torsion hinges, magnets, and a custom button mechanism into an ergonomic ABS casing.
- **3D Printing & Testing:** printed multiple prototypes, tested, and refined with clients and stakeholders as needed.
- **Component Integration:** Included Arduino, OLED display, voltage adapters, and a stereoscopic sensor for blood hematuria measurement.

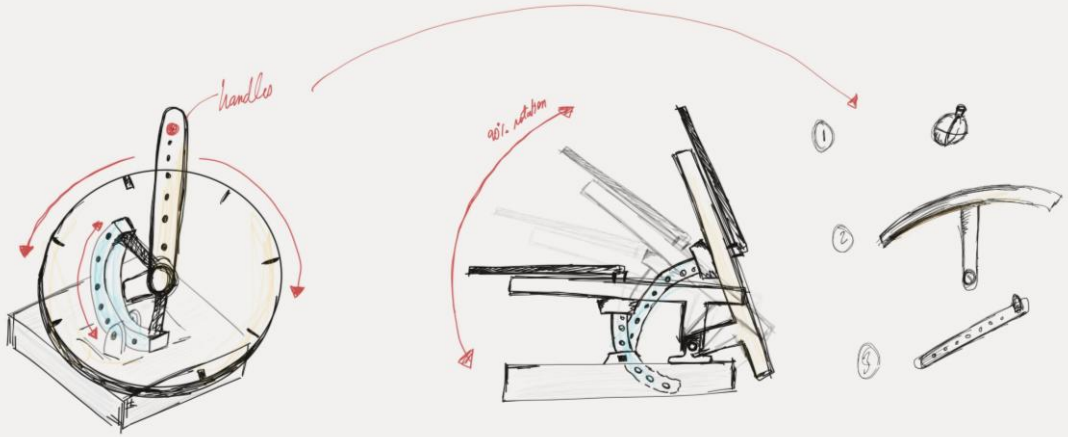
Results

- Device prototype is functional and is advancing towards testing and commercial production as of 01/13/25



What?

- Designed an at home physiotherapy device to help stroke survivors regain shoulder and arm motor control through **progressive assistive and resistive** exercises.



How?

- **Design**:
  - Modelled components in **SolidWorks**, integrating a **DC Motor** with spring-plungers **hard stops for** lateral ROM
  - Created single-handed setup and adjustment via a pin and friction hinge mechanism
- **Adjustability**: Designed adjustable handles for a variety of physio-recommended exercises, allowing for 90% anthropomorphic compatibility.

Results

- Presented the device Infront of a panel and judges, winning **1st place** in the competition.

Watch Video!

4-STROKE DESIGNS

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2024

2023-2024

MCMASTER

FORMULA E

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What?

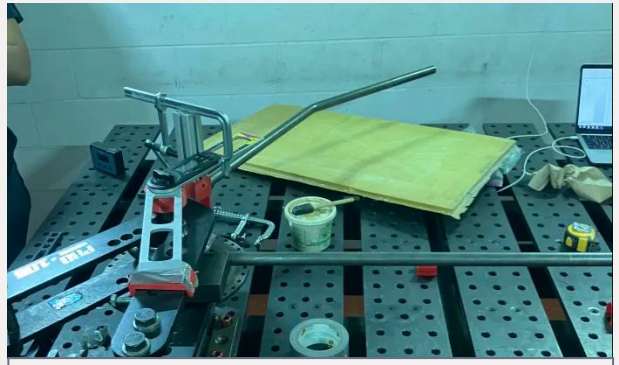
- Joined McMaster Formula Electric as part of the chassis sub team, contributing to the design, manufacturing, and assembly of the EV5 electric vehicle for the yearly SAE competition.

How?

- **Design:** Contributed to the main hoop and Jack bar design, using **SolidWorks** with **FEA** and **GD&T** to optimize chassis components for PO's and in house manufacturing

- **Manufacturing:**
  - Performed carbon fiber layups for chassis panels, ensuring proper resin infusion and curing.
  - Assisted in bending, notching, and assembling steel tubes for the main hoop to specification

- **General Assembly:** Helped install mechanical components, sanding, fitting, and aligning parts during the final assembly



Steel Tube Bending

Female Monocoque

Results

- Successfully completed EV5, meeting mechanical inspection and placing 41st in the competition

2024

ERGONOMIC JACKBAR

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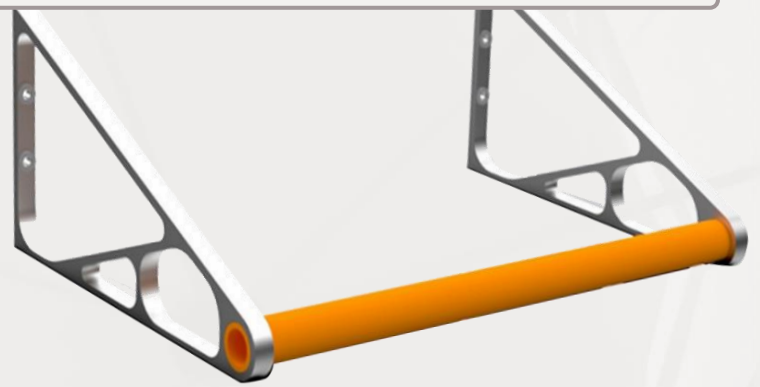
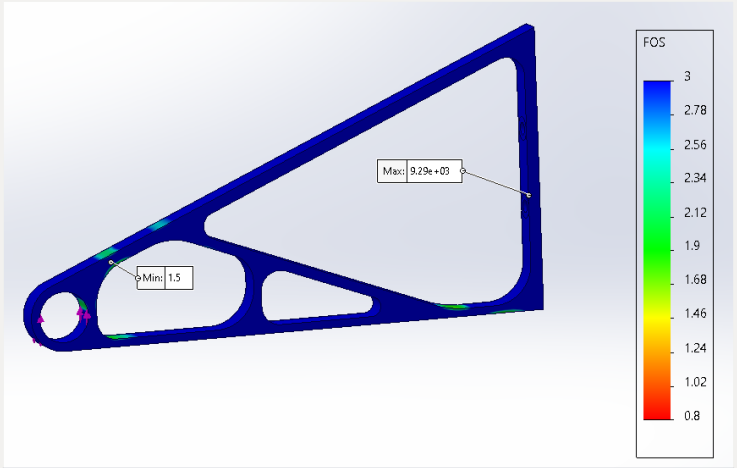


What?

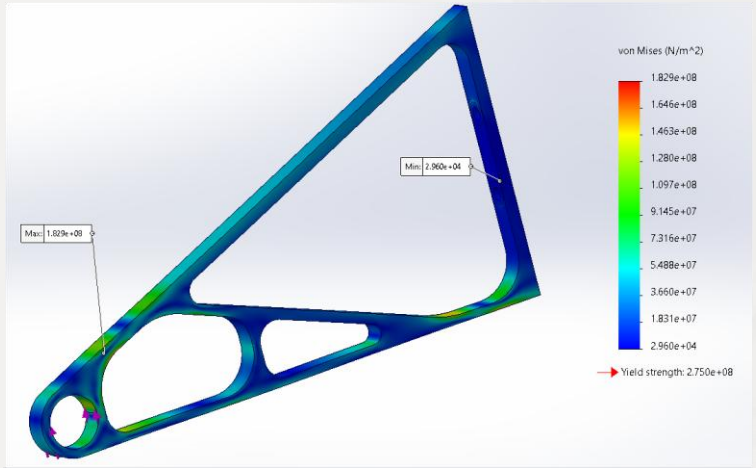
- Designed and manufactured Aluminum Jack bar supports, decreasing net weight by ~64% via a combination of FEA, material selection and topology optimization as well as housing radiator.

How?

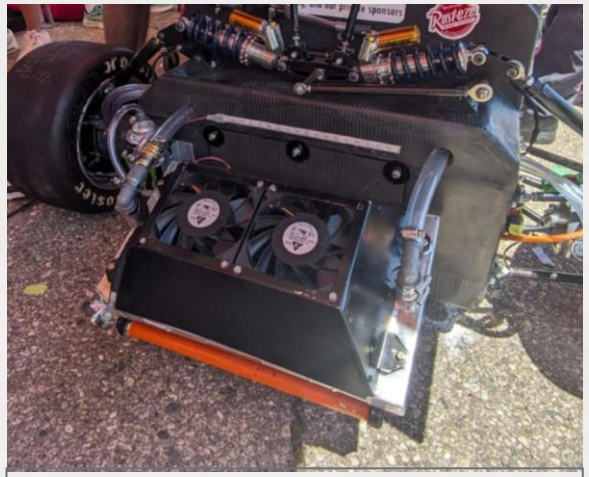
- **Hand Calculations and FOS:** Performed simple torque calculations to estimate bar load during vehicle jacking (1500N) and applied a 1.5 FOS.
- **Material Selection:**
  - The part was designed using ½ inch Aluminum 6061-T651 because of its high strength-to-weight ratio and heat treatment (T6).
  - This material choice allowed for a 64% weight reduction compared to the previous steel model, reducing the weight from 1.6 kg to 0.9 kg for two bars.
- **FEA and Topology Optimization:**
  - Performed FEA in SolidWorks and optimized model using topology optimization, successfully further reducing the weight by an additional 35%



FOS Verification



Bracket Stress Distribution



Final Assembly

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BAJA SAE

PRINTED JIGS

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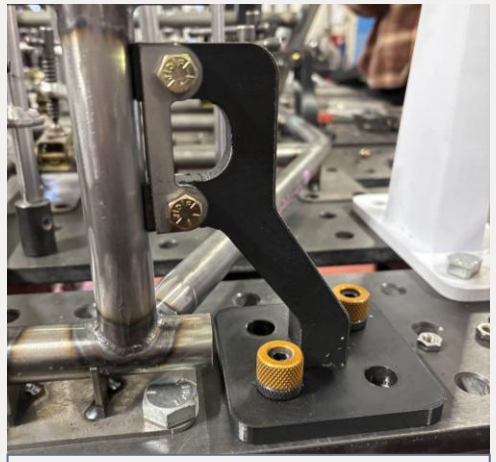
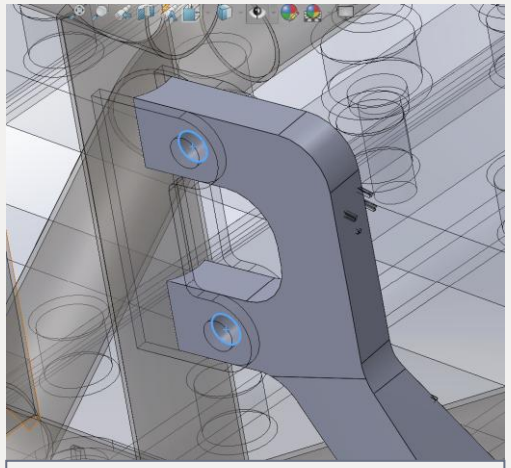
What?

- Designed, 3D printed and installed Jigs for welding suspension tabs to the steel tube chassis.



Jig and Tab installation



SolidWorks Model

How?

- Design & Prototyping:
  - Chassis was mounted and jigged onto +-0.001-inch accurate weld table.
  - The tab jigs were designed with this weld table as reference allowing the team to precisely place and weld tabs
- TIG Welding

Results

- Successfully welded rear suspension (camber link) tabs to chassis and removed jig upon completion

2022

LOCOMOTIVE ROBOT

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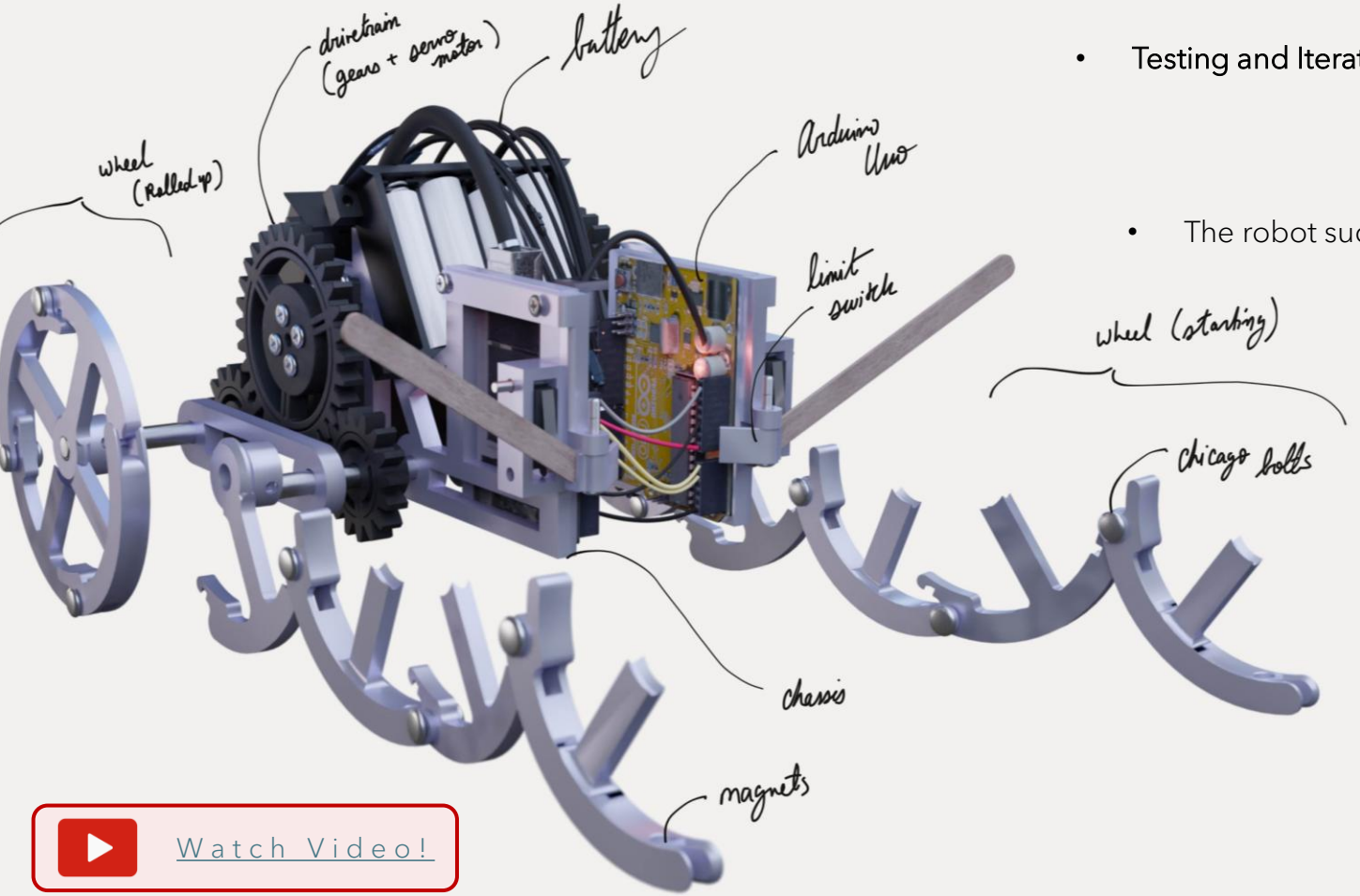


Watch Video!

What?

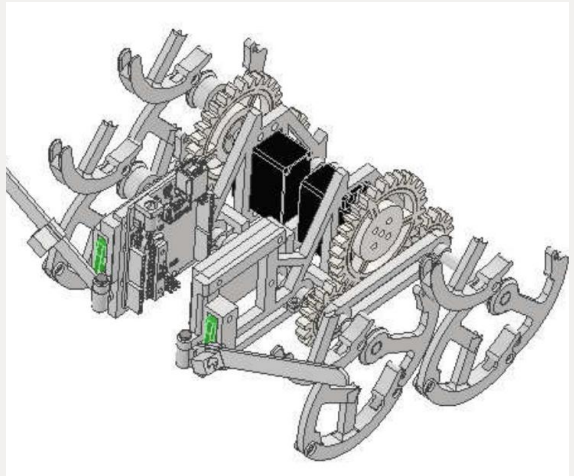
- Created a robot which could complete a T-shaped course in a speedy manner, the only catch being that the starting position could not have any active wheels.

How?

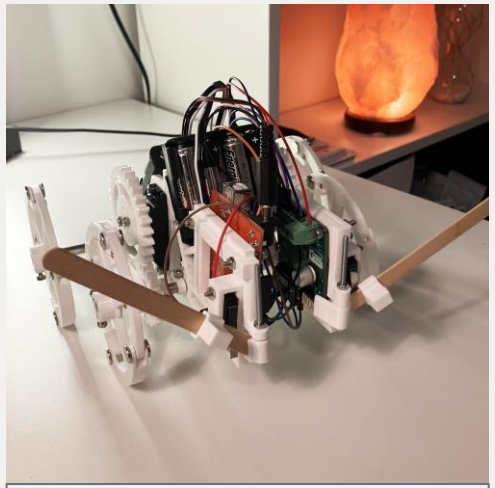
- **Fold up wheels**: Designed, and prototyped 3D printed "fold-up" wheels with press-fit magnetic connections, guiding spokes and low friction Chicago bolts.
- **Drivetrain:** Implemented a 3d printed gear train with a 1.9:1 ratio for efficient power transmission, minimizing space and cost.
- **Testing and Iteration**: Refined designs to optimize chassis space, enhance wheel function, and reduce weight.

How?

- The robot successfully completed the course in 8.87 seconds, correctly responding to obstacles with minimal wheel slippage and effective wheel folding



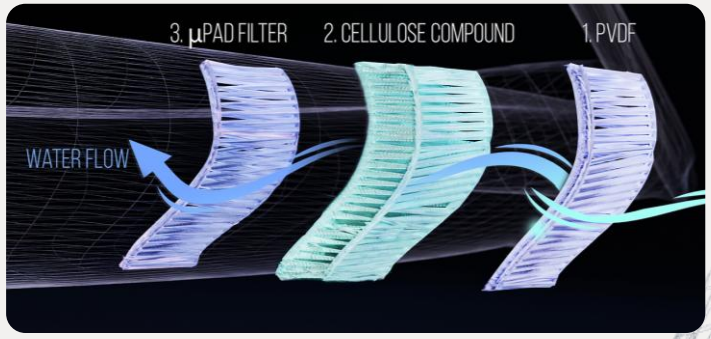
Full CAD Assembly



Assembled Prototype

What?

- Developed a *conceptual* drone-based system for detecting algal blooms to manage cyanobacteria in lake basins.



Live water sampling system

How?

- **Design and Modeling**: Used Inventor for drone design, Blender for 3D modeling, and Adobe Suite for presentation.
- **Energy Harvesting**: Proposed piezoelectric devices on wingtips to generate electricity from wing vibrations.
- **Water Sampling**: Installing retractable probes for water sampling, allowing real-time water quality analysis.

Results

- Developed a conceptual, energy-efficient drone design with potential for real-time environmental monitoring.
- Presented the concept through an animated video, showcasing its innovative approach and receiving positive feedback.

Watch Video!

AVIANAUTICS

DRONE

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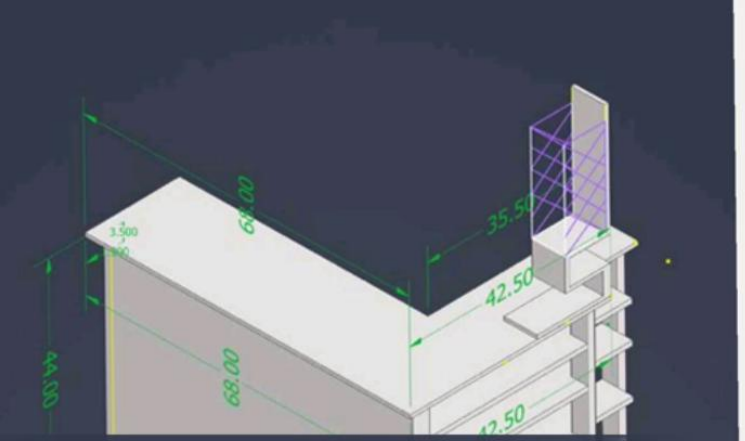
2023



2022

DIY BAR TABLE

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Prelim Design (& measurements)

What?

- Designed and built a customized Bar Table for the basement of a house

How?

- Conducted preliminary measurements of the area to ensure accurate design dimensions
- Developed a detailed model using Autodesk Inventor for precise visualization and planning
- Fabricated and assembled the frame, followed by sanding and varnishing for a polished finish.

Building process

framing

varnishing

Final Result