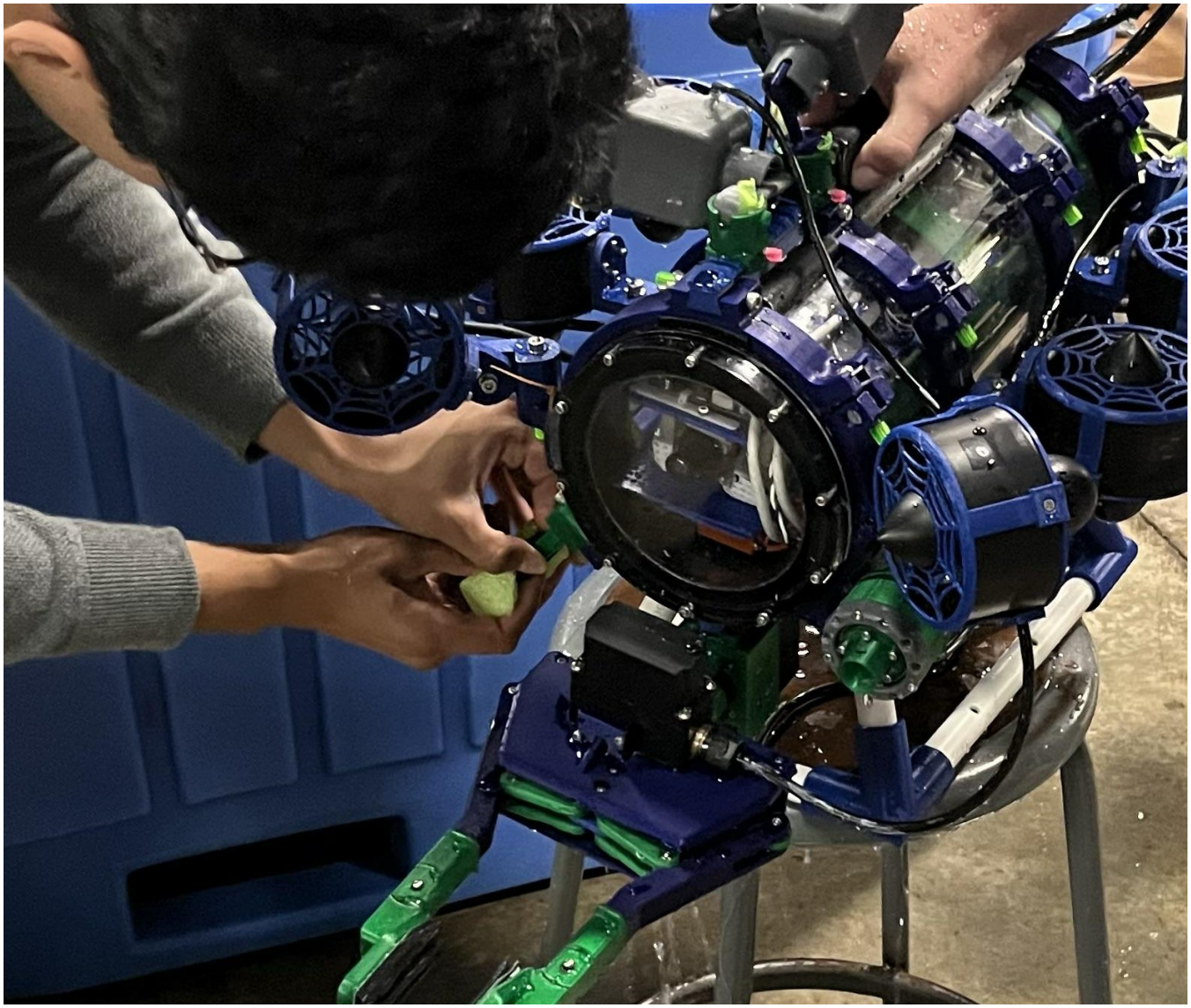
LUKE SALAZAR

Mechanical Engineering · University of California, Davis



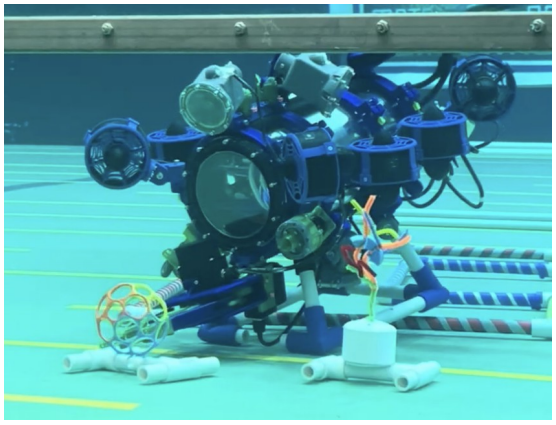
CONTACT

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Crush Depth 2026

Overview

As Co-CEO and Chief Design Officer I created the team's design philosophy (function, form, maintainability, manufacturability, safety) and standardized M3/M5 hardware across the 4 mechanical sub-teams to simplify assembly and field repair. 48 members, 3,532 build hours, $5,383, under 15 kg, eight thrusters, 6-DOF. 2026 MATE ROV World Championship, Explorer class, St. John's, Newfoundland.

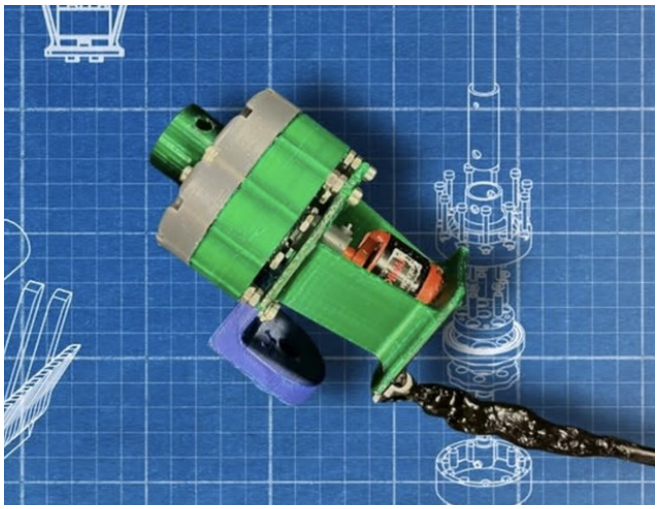






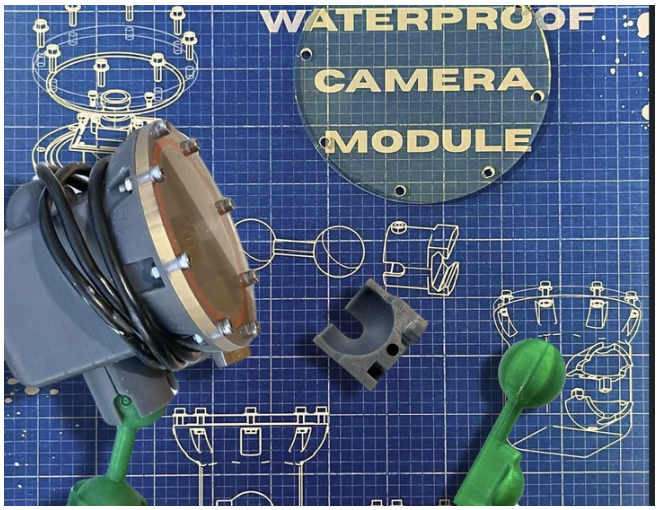
Cable Penetrators

The 2025 season's commercial WetLink penetrators leaked repeatedly due to assembly error, maintenance error, and manufacturer defects. I phased them out for epoxy-potted pass-throughs and wrote procedures to ensure a dependable seal no matter who made it. I also created neon green TPU “pigtail” cable strain relief to protect pass throughs from any potential ROV impacts. At the backplate I incorporated Subconn wet-mateable connectors, setting requirements and test criteria with a manufacturer's applications engineer, so the vehicle could be easily broken down for the flight to Newfoundland and remated on site.



Cycloidal Drive

I designed and manufactured a cycloidal drive for the BLDC-powered rotating end effector used in biofouling removal. The drive was a 10:1 ratio SLA printed for high accuracy and reliability.



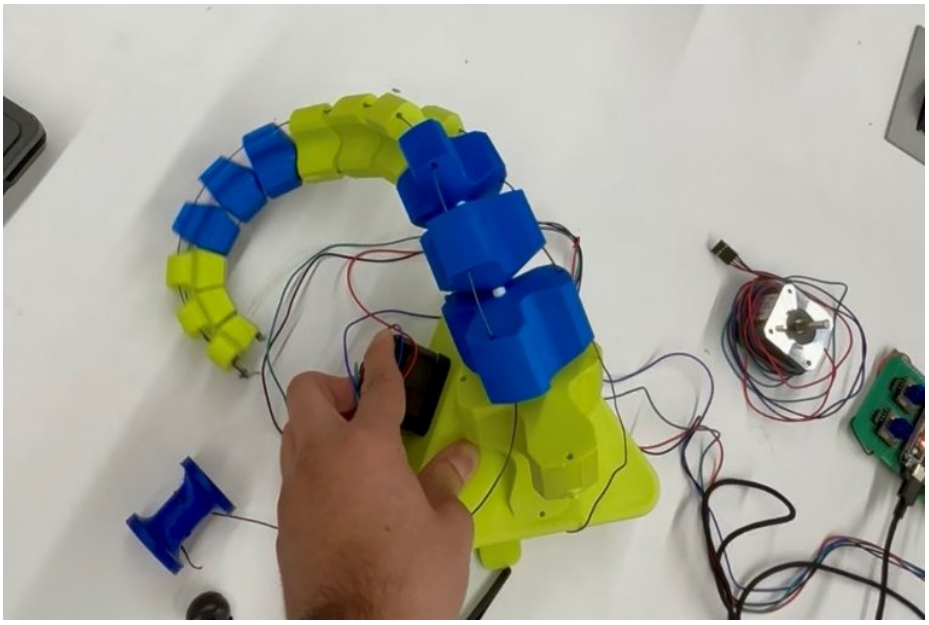
Camera Cases

Eight FDM printed and acetone sealed iterations failed leak testing. After comparing to Davis' RoboSub team's approach, I redirected the design to an SLA compression-ring housing. Four housings were finished, leak-free through the season.

Logarithmic Gripper

Project Overview

Designed and prototyped a meter long bio-inspired gripper that mimics the curling motion of animal appendages. The arm's closed path follows a logarithmic spiral, commonly found in nature for its efficient growth and motion. The project drew inspiration from the SpiRobs project from the University of Science and Technology of China

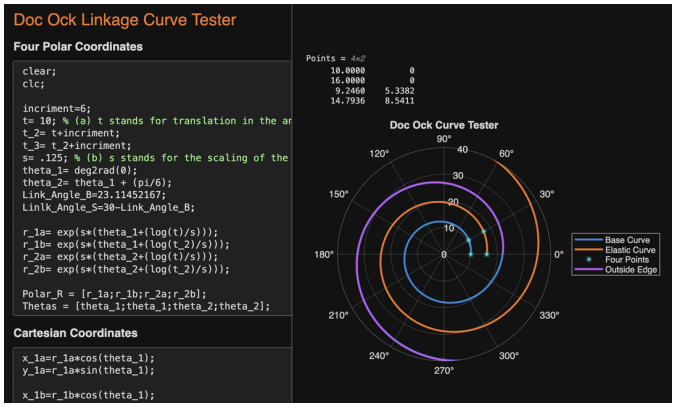


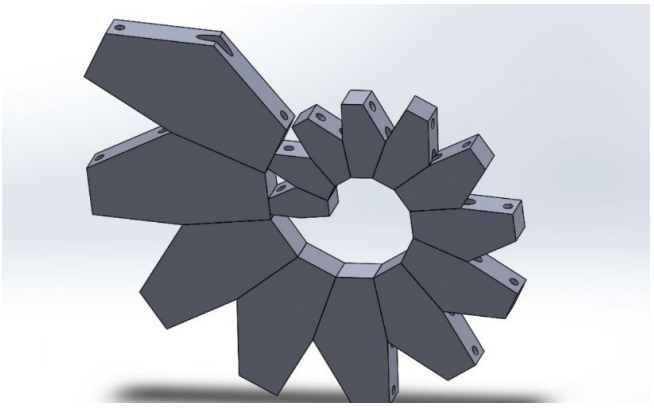
Parametric Modeling

I developed a fully parametric SolidWorks model where the arm's geometry is driven by logarithmic spiral equations. I derived, tested, and verified the geometry first in a MATLAB live script before moving the parametric equations into SolidWorks global variables.

Physical Prototype

The arm is composed of linkages 3D printed in ABS. The joints connecting the linkages are printed in TPU, providing the elastic layer to allow the arm to uncurl and remain erect. The arm uses three 0.8mm UHMWPE cords to translate the motion from stepper motors at the base through the arms.





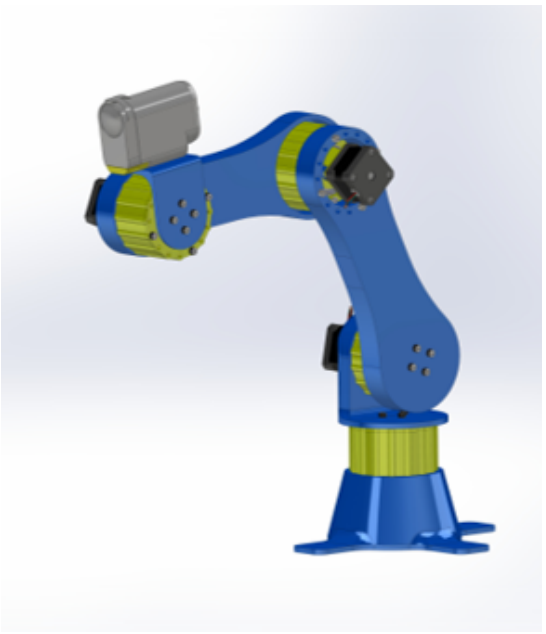
Left: MATLAB Geometry Verification | Right: 2D Kinematic Test

Cycloidal Robotic Arm

Project Overview

A bespoke four degrees of freedom robotic arm designed for smooth, repeatable camera motion. Each joint: wrist, elbow, shoulder, and the trunk are driven by NEMA 17 stepper motors through compact cycloidal drives, enabling high torque and precise motion control with near zero-backlash.





Left: Arm set up at an outreach event | Right: Full 3D CAD Assembly

Cycloidal Drive Design & Implementation

I generated the disc profile using Me Virtuoso's online cycloidal simulator. The finalized drives employ a dual cycloidal disc configuration positioned 180 degrees out of phase to compensate for unbalanced forces and to ensure smoother operation speed. The final drive assembly uses a combination of ball bearings, bronze bushings, and heat-set inserts for structural rigidity.



Exploded View Of the Cycloidal Drive

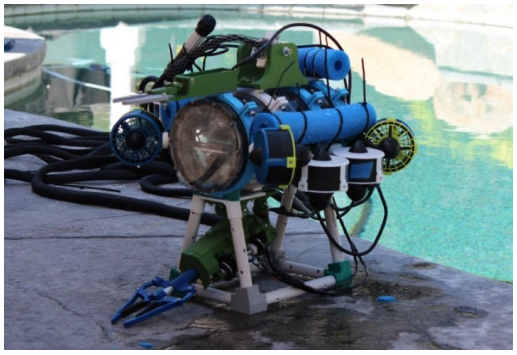
Outcomes

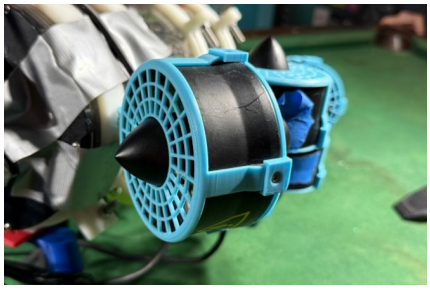
This project significantly deepened my expertise in designing, applying, and optimizing speed reduction systems, mechanical tolerance management, and motion transmission efficiency.

Crush Depth 2025

Overview

For the Clovis Community College MATE ROV team, Crush Depth, I served as the lead designer for the Vertical Profiling Float (PERRY), the lead additive manufacturer for all ROV components, and a general mechanical designer for the ROV (SCYLLA).



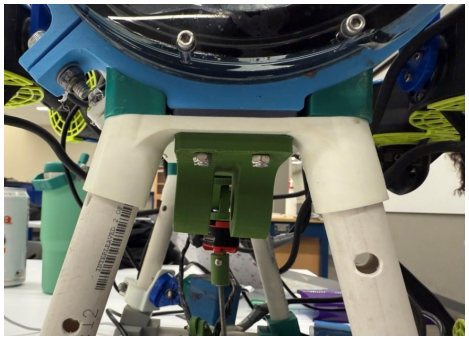


Thruster Shrouds

I designed protective shrouds for Blue Robotics T-200 thrusters. The design focuses on safety, water flow, and serviceability. The design utilizes pre-existing mounting hardware, to simplify assembly and maintenance, ensuring rapid part replacement during competition testing.

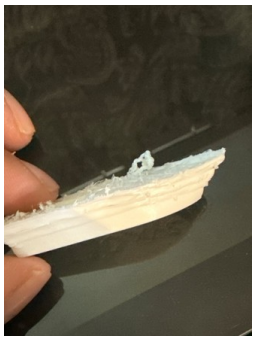
Leg Joints

I developed leg joints to provide adjustable ground clearance and impact resistance. The joints interface with existing frame bolts on the bottom of the ROV and connect with PVC Pipe to the feet. Initial prototypes printed in ABS had repeated impact failures. Transitioned to TPU filament to balance static load strength with the flexibility needed to withstand pool wall collisions.



Additive Manufacturing

I managed part fabrication using largely generic, sponsor-provided filaments with minimal documentation. Through material and slicer tuning, I established reliable print parameters for consistent dimensional accuracy and strength. This was critical for TPU components in particular. I optimized extrusion temperature, print speed, and implemented filament drying protocols, significantly improving surface finish and inter-layer bonding.



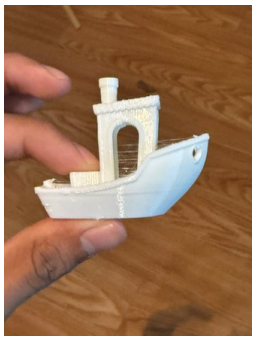
First Benchy



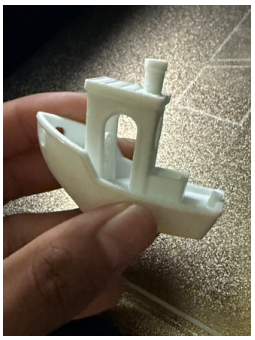
Second Benchy



Temp Tower



Fourth Benchy



Final Benchy

PERRY

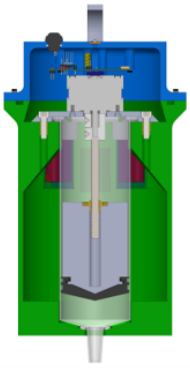
Pressure Equipped Robot for Research and Yield

Project Overview



PERRY autonomously descended to 2.5 m and logged pressure, temperature, and time data. It competed at the 2025 MATE ROV World Championship. As Float Lead, I led a 4-person team and designed PERRY's bespoke watertight housing and buoyancy engine.

Buoyancy Engine



PERRY's propulsion is driven by an internal buoyancy engine that mechanically changes its density by modulating the water volume inside a 500 mL plastic syringe. A Creality 42-34 stepper motor, coupled to a lead screw and nut assembly salvaged from a 3D printer, drives the plunger to expel and pull in water. This system was selected for its capability to deliver the power and precision needed for controlled displacement.

MultiStage Waterproofing Strategy

I developed the multi staged waterproofing system to ensure protection of internal electronics.

Main Housing Lid

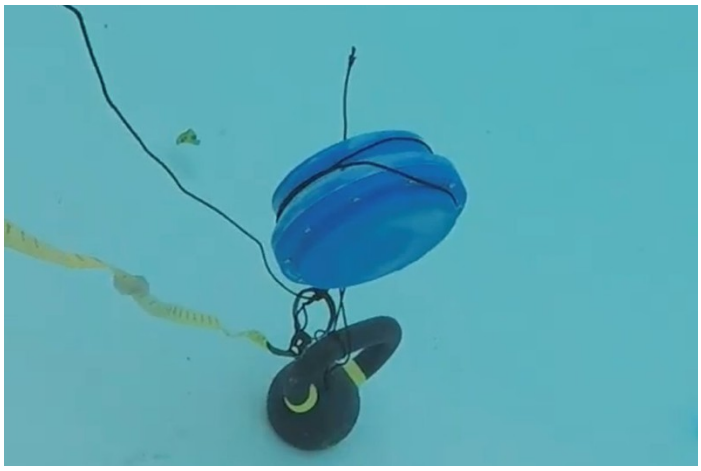
The main housing lid utilizes a PTFE O-ring coated in silicone grease, set in a flange seal calculated for 25% compression to ensure a watertight bond.

Bottom Plunger Seal

The buoyancy engine mechanism compresses a PTFE gasket at the base of the chassis to prevent water ingress around the plunger mechanism.

Material Permeability

I utilized acetone flash vapor smoothing to address the inherent porosity of ABS printed parts. This process fused the outer layer lines, creating a watertight shell, effectively mitigating permeability and preventing water seepage into the enclosure.





Left: Waterproofing test of the O-ring seal | Right: Test of the buoyancy engine and electronics