

WORK EXPERIENCE

Lead Mechanical Design Engineer | March 2025 - Current

TetherIA AI | Santa Clara, CA

- Leading the design of compact dexterous hands with all mechanisms contained above the wrist joint
- Developed novel continuously variable cable transmission that provides high speed under no load and high torque under load for a tendon actuated finger
- Maximized finger tip force through free body force analysis based on cable routing
- Increased cable transmission force output by 15% by reducing cable friction, utilizing rolling contact joints and replacing all bowden tubes with minimal pulley systems.
- Lead thumb architecture design over several novel iterations
 - Iteration 1: Designed a pull-pull mechanism with an easy to adjust tensioning system to drive the CMC grasp. Used direct drive to control the abduction/adduction and bowden tube routed cable to control the mcp/distal grasp.
 - Iteration 2: Developed a novel parallel 3D pulley system that keeps cables rolling over pulleys instead of sliding over plastic to drive the thumb CMC grasp and thumb abduction/adduction. The FLEXX hand and Optimus hand implement a similar architecture, however their design allows cable to slide/rub causing unnecessary wear and variable changes in cable length depending on the thumb state. This design maximized thumb grasp force due to the parallel nature of the mechanism. The third cable was routed through a pulley system that kept the cable through the center of all of the joints to remove coupling between CMC grasp and proximal/middle grasp cables.
 - Iteration 3: Switched to a linkage driven abduction/adduction and routed the CMC grasp and MCP/distal grasp cables around a 3D pulley system to maintain contact with pulleys at any state and remove any coupling (or create known coupling behaviour around defined radii).
- Developed a hybrid linkage/cable system to drive fingers that enables dexterity (abduction/mcp grasp) with the linkage system and high grasp force for the entire finger with the cable. The linkage system is driven with very tiny linear actuators mainly to provide dexterity while the middle/distal cable uses a larger motor to generate large grasp force. The cable generates a moment at all three finger joints enabling it to generate force at the MCP joint which doesn't provide a lot of force from the small linear actuators.
- Designed a novel circular cable transmission that wraps a metal cable around a spool and enables pull and push of the cable without jamming and ensures that the cable is always wrapping around a known radii, not on top of itself. The transmission uses a screw profile the same pitch as the cable helix to ensure the cable fleet angle doesn't change while wrapping 3-4 times around.
- Collaborated with an Industrial design studio to match exterior surfaces with the technical engineering structures, refining our products aesthetic value while maintaining technical performance.
- Designed and prototyped a removable glove to protect foam and hand components. The glove integrated soft goods with hard shells to snap into datuming locations and maintain specific shapes throughout the range of motion.
- Spec'd BLDC motor + planetary transmission to optimize speed and force of fingers and thumb with our custom cable transmission system.
- Designed spring linkage systems to reduce instances of sliding/bending springs in joints. Optimized spring force to return the fingers to a natural state without losing too much force output during grasping.
- Designed and optimized an extremely compact nitinol finger return leaf spring design that eliminated the need for traditional extension or torsion springs.
- Wrote motor control firmware in C++ and spec'd/wired electronic drive systems to control prototype hands with lower cost brushed motors through our teleoperation setup. Implemented position control, current control and automated zeroing protocols to better control the prototype hands.
- Developed 4-bar linkage calculator to optimize speed and force output for linkage driven hand
- Designed and released a 7 DOF [open source hand](#) that can be built for ~\$300 with off the shelf parts in under one month. The hand is able to generate 10 N tip force, 1 Hz open-close speed, backdriveable, weighs <400g and contains all actuators in the human form factor hand.
- Wrote firmware and designed a custom PCB for the open source hand.

Mechanical Design Engineer Intern | May 2023 - August 2023

Mill | San Francisco, CA

- Designed components in NX for the Mill kitchen bin, a product that recycles household food waste into chicken feed

- Created engineering drawings using GD&T for injection/compression molded and die cut parts
- Prototyped multiple seal concepts and tested them using CO2 leak tests and salt fog tests
- Traveled to Mexico to oversee manufacturing and assembly of parts for EVT build

Mechanical Design Engineer | September 2022 - May 2023

CLEANR | Cleveland, OH

- Designed bio-inspired microplastic filtration technology for washing machines, the largest polluters of microplastics
- Prototyped 3D printed water tight assemblies using o-rings and custom silicone molded seals
- Inventor on core technology [patent](#) (WO2024123769), helped develop the novel filtration technology/concepts

Mechanical Engineering Intern | May 2022 - August 2022

Honda Powersports R&D | Columbus, OH

- Designed snap fit injection molded components with CATIA for off-road powersport vehicle accessories
- Used Visual Basic to scrape legacy fastener databases to create a fastener mass calculator
- Reviewed and modified engineering drawings for mass manufactured injection molded components

PROJECTS

Semi-Autonomous Computer Vision Controlled CNC Welding Machine

Personal Project | September 2023 - May 2024

- Designed and built an open source autonomous CNC welding machine that cost <\$1500 to make
- Wrote software in python using OpenCV to identify weld joints with a monocular camera
- Used ARUCO tags to scale and transform the image coordinate system to CNC coordinate system
- Generated G-Code over serial to operate the CNC machine and control the MIG welder

CWRU Motorsports | Baja SAE

Chassis Lead | September 2020 - May 2023

- Designed a tube chassis for an off-road race car integrating a newly mandated 4WD system and 30% larger engine while only increasing the frame weight by 0.5lbs
- Created cheap modular weld fixturing that decreased weld time from 4 weeks to 2 while maintaining frame accuracy
- Completed bending strength/stiffness calculations to select tube material and optimize tube diameter/thickness
- Built test rig to find the torsional stiffness of our tube chassis in order to validate ANSYS FEA simulation results and improve chassis torsional stiffness
- Our 2023 car with the frame I designed won 1st place overall over 100 other universities at the 2023 Ohio competition

Miata Engine Rebuilds

Personal Project | September 2019 - August 2020

- Taught myself how to rebuild engines on 2 different Mazda Miatas in under 3 months with no prior experience
- Resold car parts from free cragslist listings online for profit to completely fund both projects
- Proved rebuild reliability by participating in local autocross racing events before selling both cars for a profit