

Krenicki Arts and Engineering Portfolio

Elliot Bushman

Woodworking

Woodworking was the first medium of expression I explored. Sensibly, the material is easy to work, versatile, and can produce beautiful results. However, precision is still important especially when working on multiple parts that must fit together. I started out restoring old tools and making new handles. From there I branched out into more complex projects as my confidence grew.



Woodworking Furniture

I think that it is fitting to surround yourself with things made by your own hand. They are then of perfect form and function to your particular likes and needs.



I made the above butcher block table from scratch for a record play I restored



Bed frame with arched sides and bent cedar trim

Simple stool out of cherry and denim

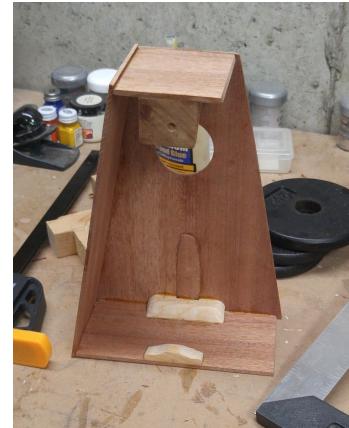
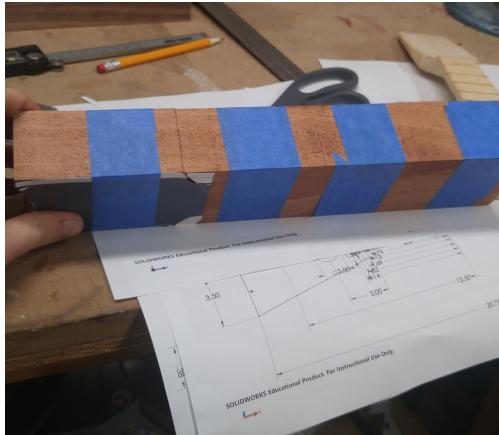
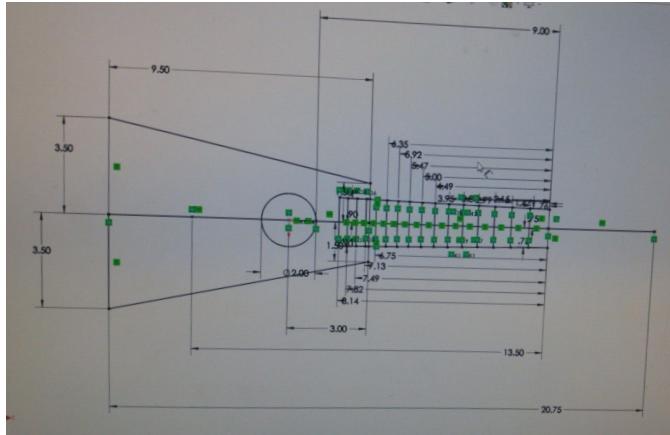


The desk I made on a pair of Singer sewing machine legs



Woodworking Ukulele Process (Highschool)

Knowledge of CAD helped approaching a project of this scale for the first time.



This is the most complex woodworking project I had taken on and it has helped me learn to take on projects like an engineer. In fact, I don't play any instruments so this was very new territory that warranted a lot of research. The number of parts and all the different features that could affect sound quality were daunting. As such, building my design first in CAD proved hugely valuable, being able to plan the build process and iterate the design as needed.

Woodworking Ukulele Product

While the final product is far from perfect it gave me the confidence to take on larger projects. I did dodge the complexity of a more rounded body requiring bent pieces though I hope to take this on in the future.



Woodworking Violin Scrolls

First attempt out of softer pine and a second attempt out of mahogany, this pushed the limits of my carving skills a long way. I hope to complete a full violin in the future.



Blacksmithing The Forge

It's not that easy to buy a coal forge so I made my own. It's constructed from a truck brake drum with a steel table top and legs I welded together in my high school machine shop. Its has some electronics integrated for the forced air and to run tools on location. I also made my anvil from scrap pieces of steel. I would consider most of my forging endeavors more artistic in nature though my engineering skills have been very helpful in fabricating tools and plannings projects. For example, many of the processes we discuss in UConn's material science engineering class, I have actually performed when working at the forge or hardening tools.

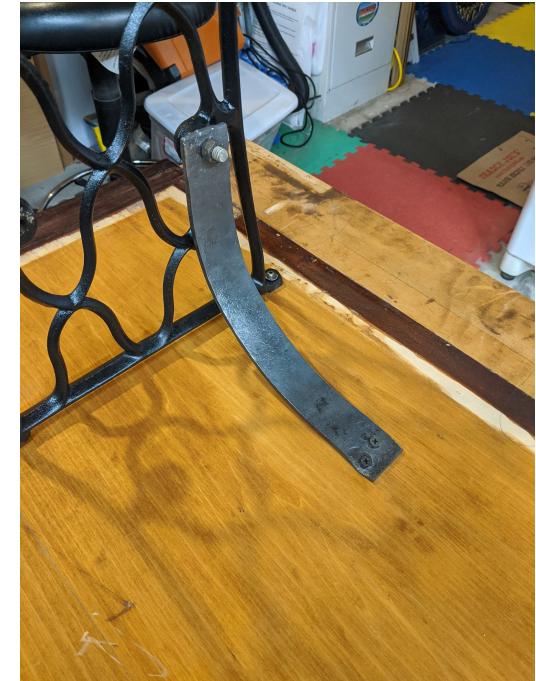


Blacksmithing Products

This is perhaps the most difficult to pick up craft I have attempted and it has taught me the importance of persistence and practice above all else.



This is a bracket I forged from the desk I made pictured in the woodworking slide. I love combining mediums whenever possible.



Metalworking

I was introduced to my high school's machine shop and have never enjoyed another medium more. With a lathe and a mill its seems that almost anything can be made. While their primary value is in their ability to hold tight tolerances, they also enable us to make things of beauty simply not possible by hand.

Steel bottle openers with brass insert



Small pen of my own design made to fit on keychain



Grappling hook

Turning a part on a 1942 Monarch 10EE



Photography

Simply for fun and to capture beautiful moments each day.



Lighting Design & Theater

I started off building sets which is very much a hands-on role fitting for an engineer. However, it was not until I started doing lighting design for the high school plays and musicals that I really took an interest in theater. I found the technical side of it natural, operating the lighting console easily through prior programming knowledge and the light fixture setup being simple electronics and resource management. Though the lighting design itself took on a more creative experience that I have not found elsewhere, merging with and enhancing the experience of the show.

I continue to work at Jorgensen Center for the Performing Arts backstage helping to run shows and maintain the theater. I try to offer the perspective of an engineer when something needs repair or a challenging rigging problem presents itself.

Postmodern Jukebox at Jorgensen



South Windsor High School View From Lighting Console



Robotics Team 177 An Introduction to Engineering

High school robotics was my introduction to engineering. I was blessed to be able to participate in the construction of the 2015 through 2018 robots on a team that became like family. I mainly focused on the control systems, troubleshooting, and manufacturing through these years. My senior year I was captain and helped lead that team to the world championship in Detroit. I continue to volunteer on the team when possible to help provide a positive experience to current students.

2015 Robot



2016 Robot



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Robotics Team 177

An Introduction to Engineering

2017 Robot



2018 Robot



UCONN Formula SAE Car



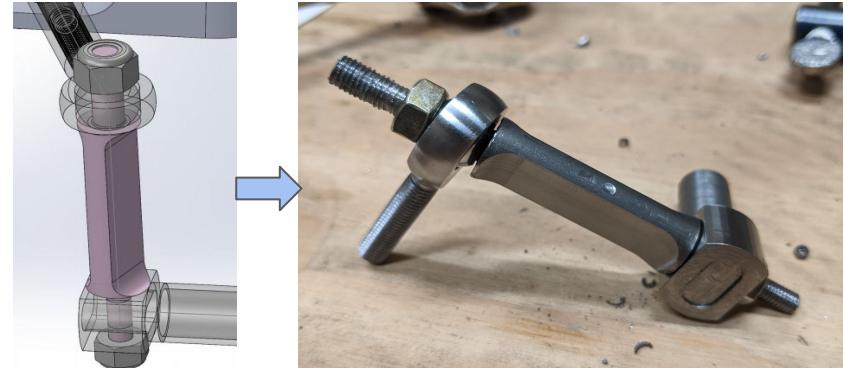
Picture I took of 2019 car in action

Brake pedal neck I machined on Haas CNC for 2022 car



Formula SAE is a collegiate design competition where each team designs and builds a formula style car to compete with. This team has pushed my engineering skills further than any other working on both the design and manufacturing ends of the car. At first on the suspension but eventually branching out to much more of the car. I help to integrate all of the individual systems into a cohesive functional package.

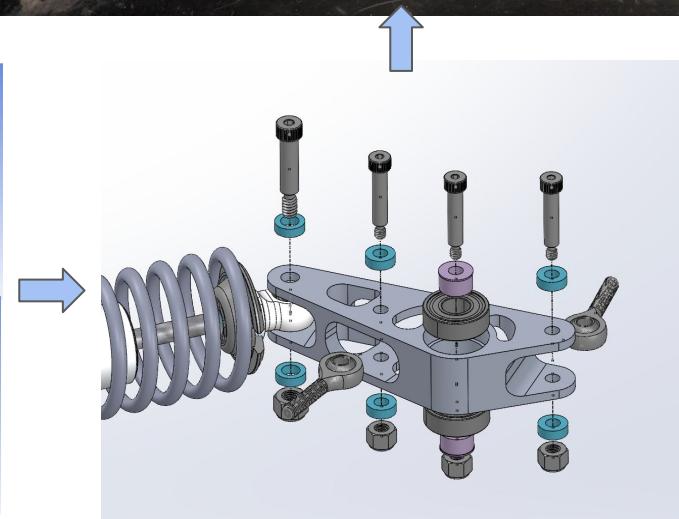
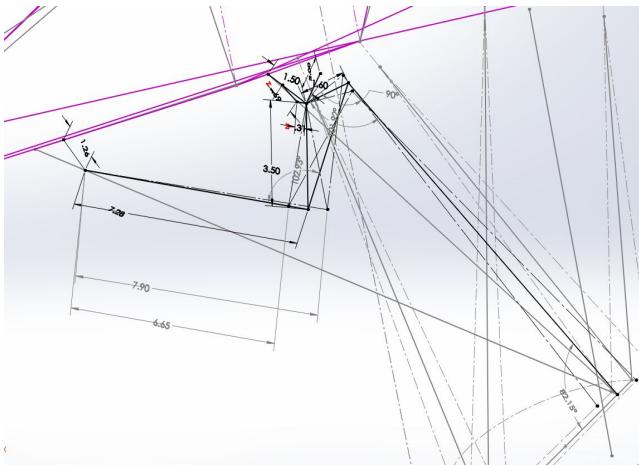
Adjustable anti-roll bar blade I designed, validated, and manufactured



UCONN Formula SAE Car Suspension Rocker

This is a suspension component for the 2020 car that links the pull rod, damper, and roll bar to control the vertical travel of the wheel. The particular geometry of how these parts interact hugely affects the suspension effectiveness.

While this may seem like a project strictly defined by engineering requirements that is not quite the whole story. Through this optimization it became clear that the features that looked most natural and flowed into each other best were also the strongest. In this, way the beauty of the design came to be on its own. The trick was to merge a beautiful, strong design within our limitations of manufacturing and complexity.

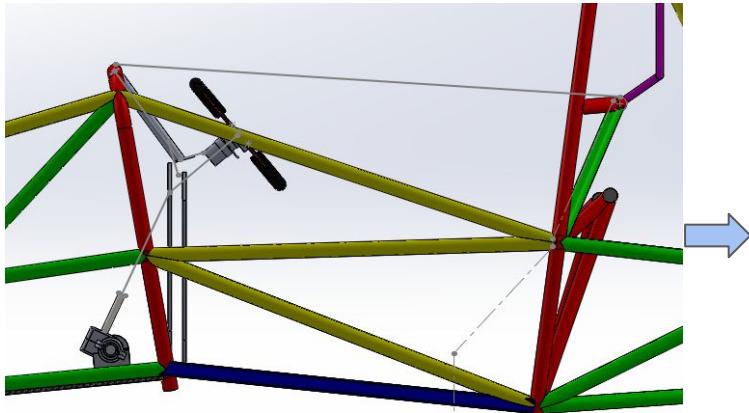


UCONN Formula SAE Car Steering Redesign

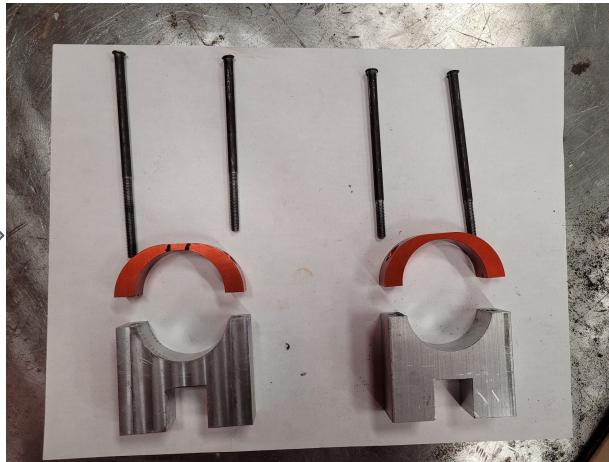
After the formerly designed steering system for the 2021 car failed for a multitude of reasons I jumped into designing and implementing a new system in a fast paced 2 week process. This included completely redesigning the steering wheel position and column geometry to better suit the driver and then designing, manufacturing, and troubleshooting all of the parts between the upright and the steering wheel. The timeline for this project pushed my design and machining skills like no other.



New steering geometry in chassis model



Newly machined rack mounts with custom hardware



ME Undergraduate Research

I am currently working with Professor Julian Norato to model anisotropic lattice structures after they are optimized. I work to make them manufacturable within the limitations of the machines that will be used to create the prototypes.

