Conor Sefkow

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About Me

My name is Conor Sefkow, and I'm currently a third-year student at UCLA studying mechanical engineering. I'm graduating in June 2023, and my GPA is 3.90.

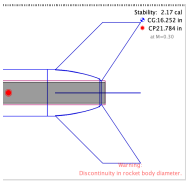
The projects I've listed here I believe are particularly relevant to me and hopefully help showcase the diversity of my experience—individual, small- and large-team projects across a range of disciplines and budgets—and, as a result, my ability to learn new skills and adapt to new environments quickly.

I hope this portfolio is a convenient guide to my recent activities outside of coursework; of course, I'm more than happy to talk in further detail about any of the projects I've listed here. Thank you for your consideration!

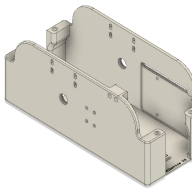
Contents

Bruin Racing: Since the start of my first year at UCLA, I've been very involved in Bruin Racing Baja, an on-campus student team that designs, manufactures, and competes off-road vehicles at Baja SAE events nationwide. I'm currently the lead engineer on the Panels, Composites, and Aerodynamics subteam.

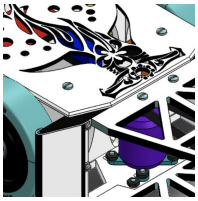
I'm also the Training Coordinator for the entire Bruin Racing organization (including our Formula SAE team and Supermileage gas and electric vehicles) which welcomed a record class of over 150 new members this fall. I led training programs in CAD (SOLIDWORKS), machining, composites, and electronics, and was the primary instructor for the former two.



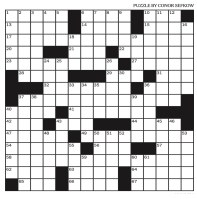
Rocket Project at UCLA: Also during my freshman year at UCLA, I enrolled in ENGR 96R, an elective course run by Rocket Project, UCLA's premier rocketry club. Working in a team with other students, we launched two rockets including one with payload to an apogee of 2,750 ft.



HiBotics: During the 2018-19 school year, I worked part-time at a local startup designing elevated robotic assistive devices (ERADs). My main accomplishments were complete redesigns of both the powertrain as well as the robot chassis.



ASME Combat Robotics: During the 2020-21 year, I joined the UCLA chapter of the American Society of Mechanical Engineers (ASME) and assisted in designing a 3 lb BattleBot.

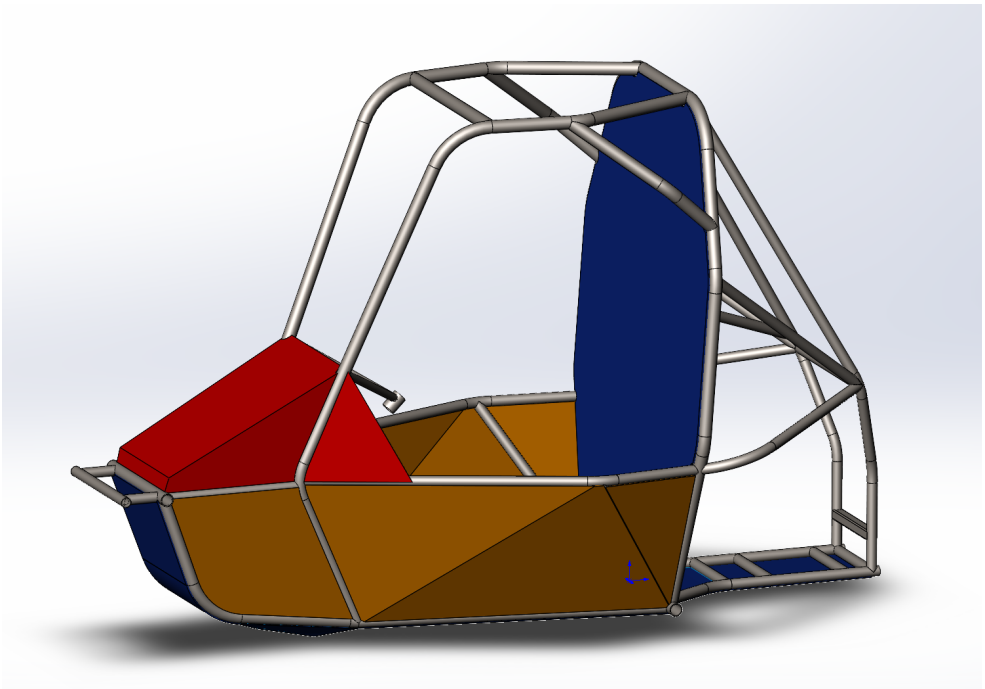


Bonus - Crossword: Since 2020, I've picked up the hobby of constructing crossword puzzles. I was published by the New York Times for the first time in October.

Bruin Racing (1/4)

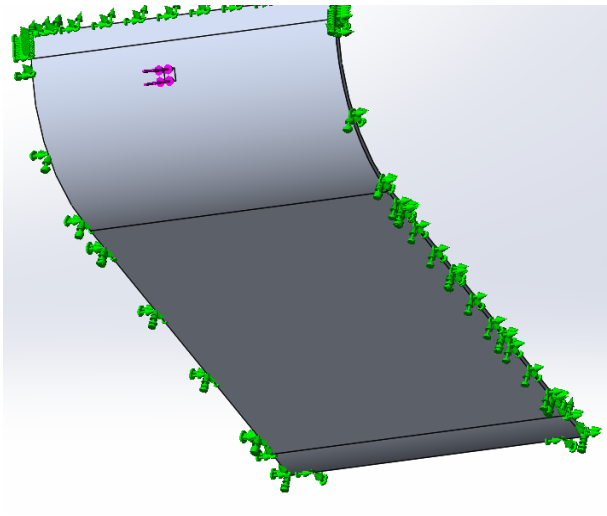
Above: Model 20 (“Sunset Car”) just after running for the first time in November 2021. My primary role on this car was manufacturing the aluminum and carbon fiber body panels. This car is 2WD and was intended to be completed by May 2020, but our garage was closed due to covid from March 2020 to September 2021.

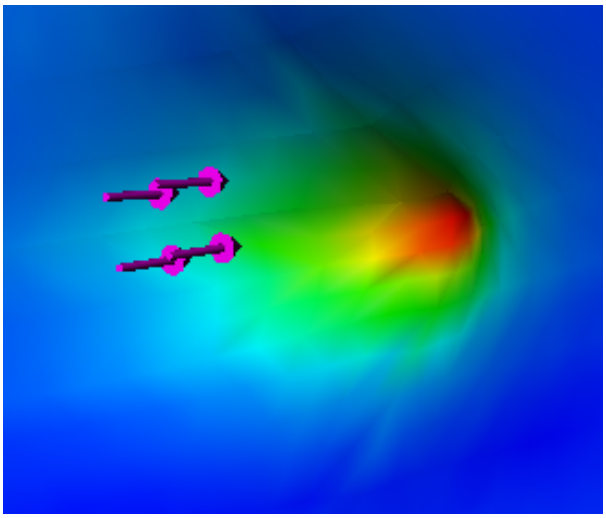
Bruin Racing (2/4)

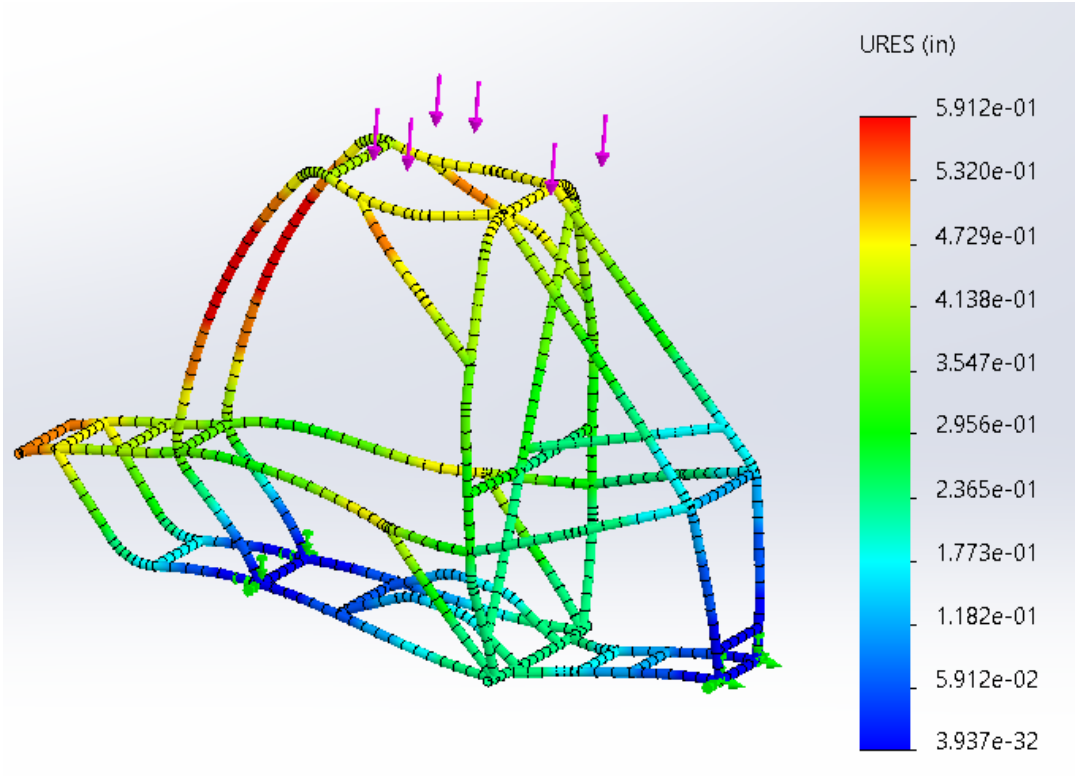


Above: Model 21, the car we're currently working on. This car is 4WD and will be raced at Tennessee Tech in May 2022. I'm the Panels, Composites, and Aerodynamics lead engineer for this car, and worked with our Chassis lead to reduce drag and minimize weight. All design work was done in SOLIDWORKS.

Bruin Racing (3/4)

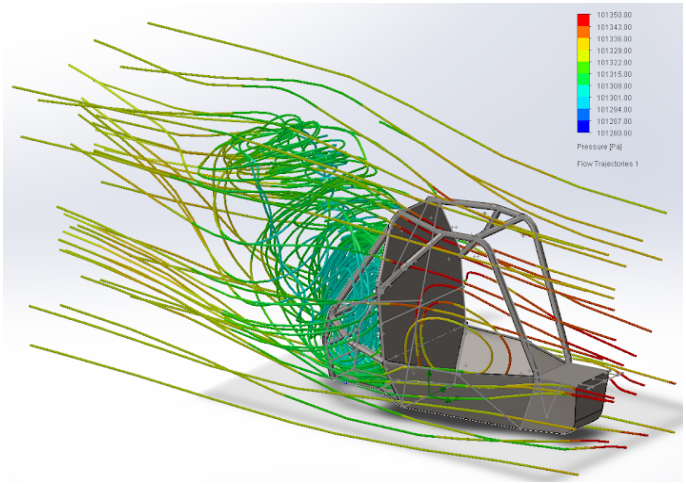


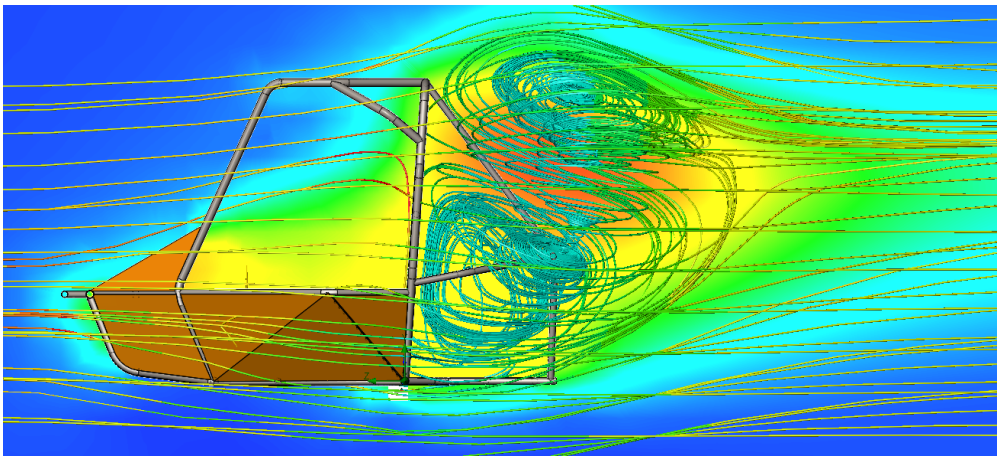




During the 2020-21 year, we conducted a more extensive finite element analysis of both our current and past chassis. This included puncture testing on body panels and load simulations on the chassis frame (above: roll-over test). I'm now helping to physically validate these results with strain gauges.

Bruin Racing (4/4)



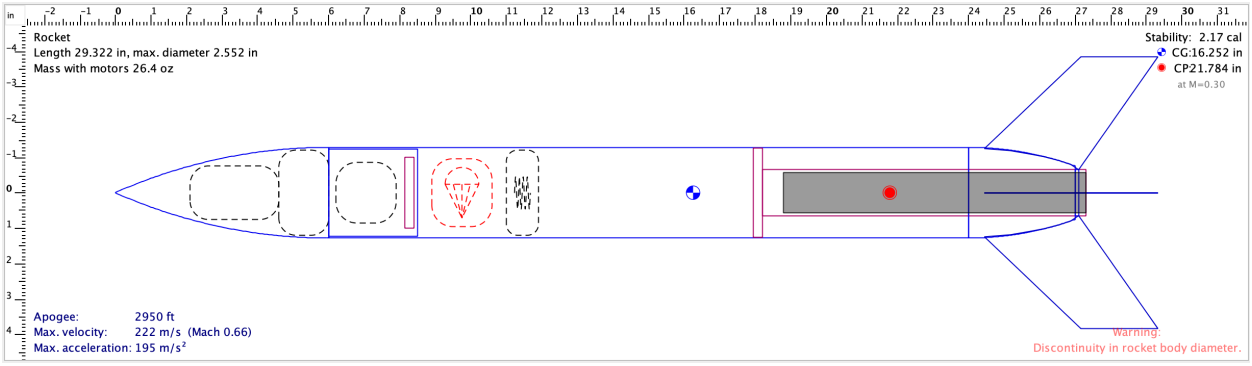


During the summer of 2021, I taught myself flow simulation in SOLIDWORKS, and did our first thorough aerodynamic analysis of the chassis. Above are visualizations of the aerodynamic profile of the chassis. The powertrain and wheels have been hidden to illustrate the negative effects the firewall (the large panel separating driver and engine) has at high speeds.

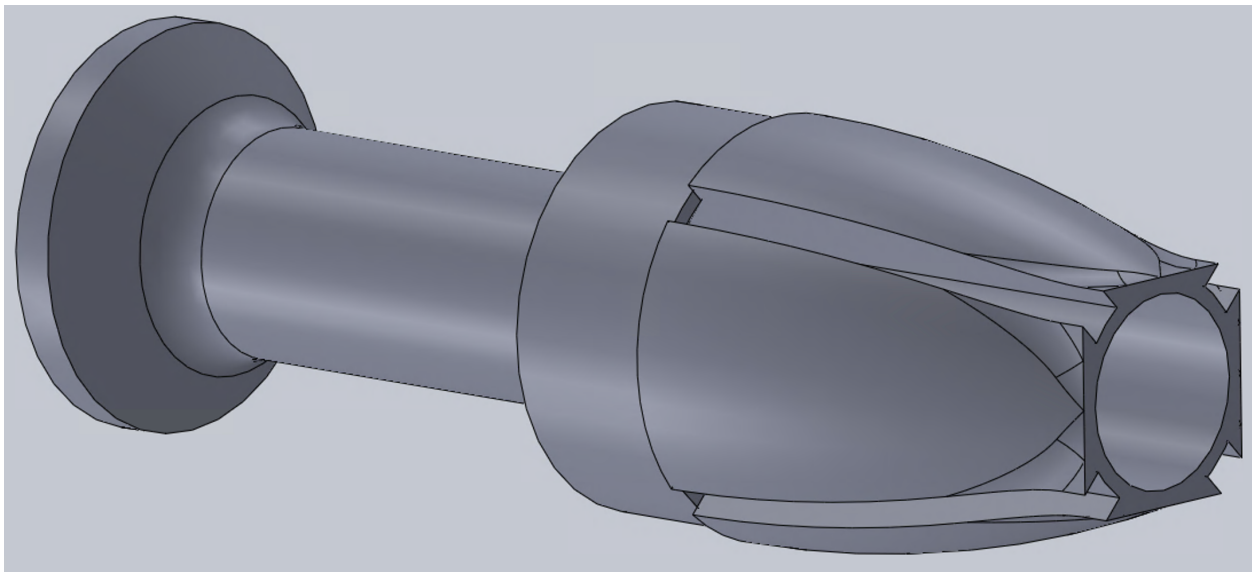
I found that past hood designs were too small to have a significant effect, and may have even slightly worsened performance. Learning from these simulations, I redesigned the hood to reduce the drag force on the chassis by 21%, increasing the top speed of the car by over 1 mph. (At least in theory—I'm currently working on learning ANSYS to validate and conduct more accurate simulations, and am looking into doing small-scale validation with 3D printed models in a wind tunnel.)

ENGR 96 - UCLA Rocket Project (1/2)

Objective: Design reusable H-class rocket to deliver a chicken egg to an apogee of 2,750+ ft. and return intact

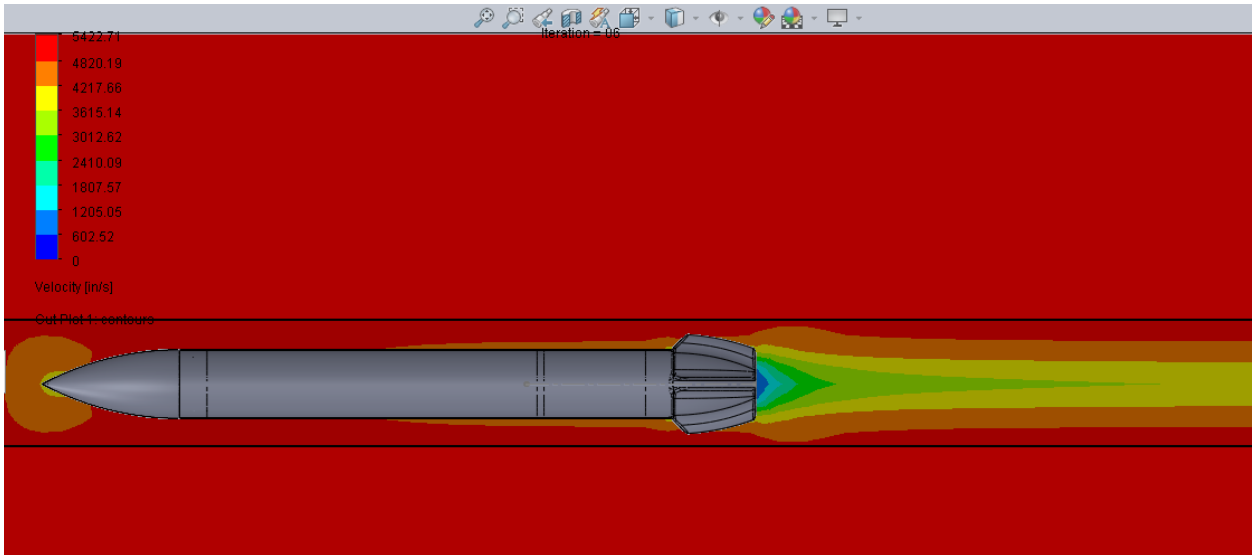


Above: OpenRocket model of the final design. My primary role was designing the tail of the rocket.

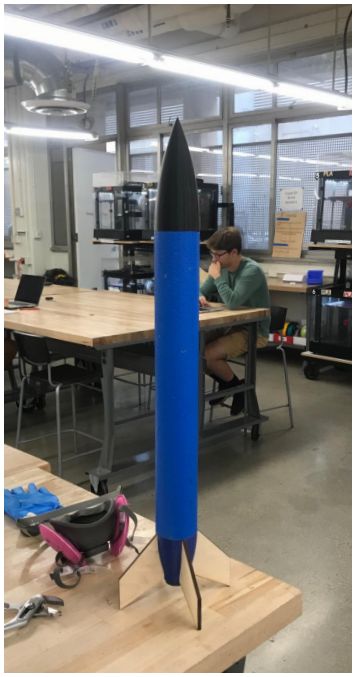


Above: CAD (SOLIDWORKS) model of the tail—I incorporated the motor mount, fin mounts, and aerodynamic boattail all in one 3D-printed piece. The entire assembly could be held in place with only one retaining ring. Although the rocket failed due to improper attachment of the nose cone, the tail and fins survived crash-landing with minimal damage.

ENGR 96 - UCLA Rocket Project (2/2)



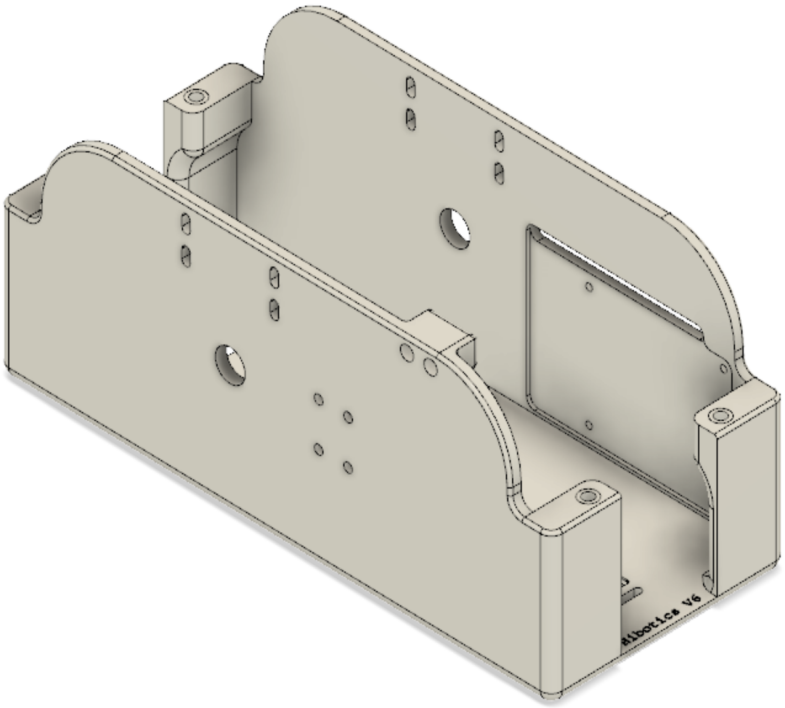
Above: CFD simulation of drag profile. This particular simulation was conducted on an earlier version of the tail that had the fins protrude out more; the design was eventually changed for improved aerodynamics and to reduce the likelihood of fins breaking during flight or landing.



Above: Manufactured rocket (body tube is carbon fiber; nose and boattail are 3D-printed PLA; fins are birch wood).

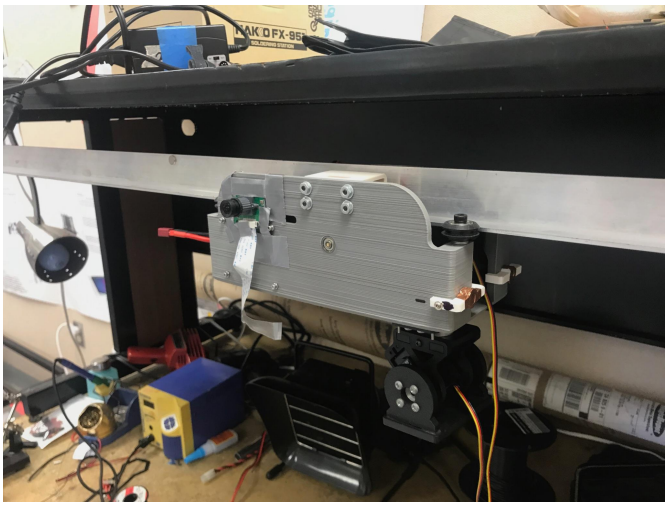
HiBotics (1/2)

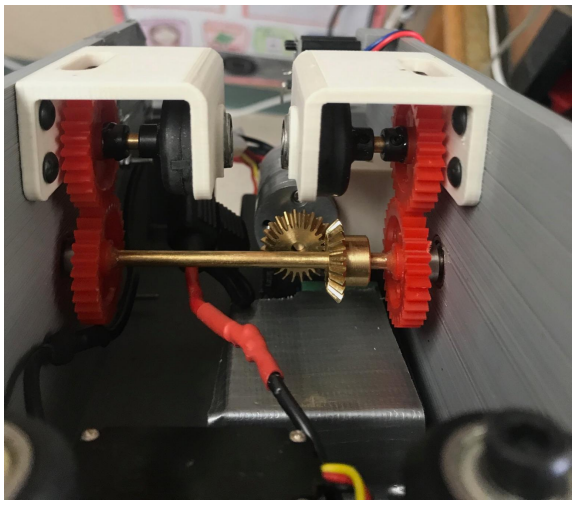
Objective: I worked part-time during the school year to help design a track-mounted monorail elevated robotic assistive device (ERAD).



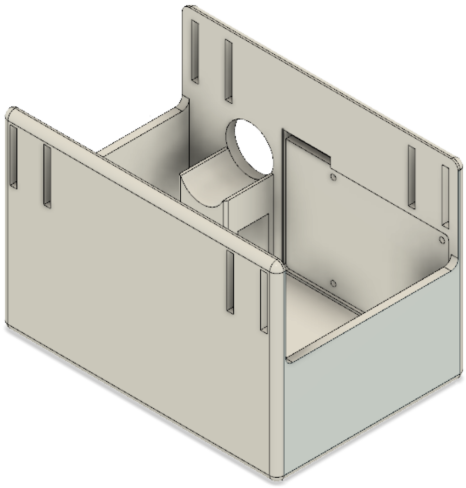
Above: Version 6.0 of the robot chassis, the first that I led the design of. Previous versions had been machined or made from bent sheet metal, which was both time-consuming and expensive for prototyping. 3D-printing the chassis offered far faster and cheaper prototyping at a minimal cost to quality. I primarily worked in Fusion 360.

HiBotics (2/2)





Above: V6.0 prototype on a test track. The wheels (black) are powered by the driveshaft and rode on top of the track. The slotted wheels in the corner kept the robot centered horizontally.

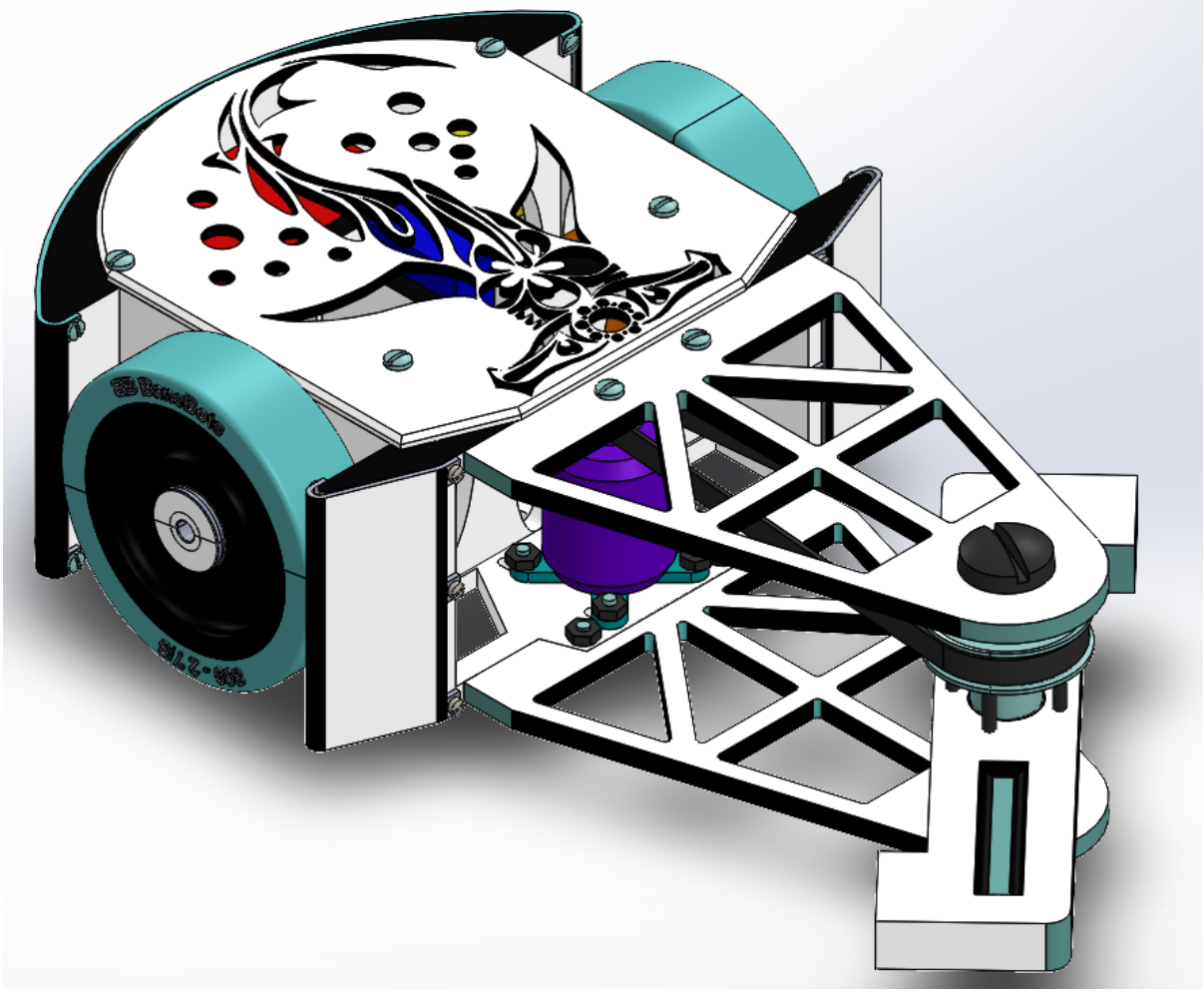


In 2019, I led another redesign of the robot that eliminated the drivetrain and gears (chassis above). Instead, the motor was mounted sideways with a single wheel directly attached to it, and four slotted wheels on the corners kept the robot centered on the track. This chassis was smaller, more enclosed, and had fewer moving parts and modes of failure.

A softer drive wheel and a small amount of interference between the drive wheel and the plane of the slotted wheels applied a constant pressure so that the drive wheel easily powered the robot with much less friction and noise. The wheels were also easily tunable in both the vertical and horizontal directions.

ASME - Combat Robotics

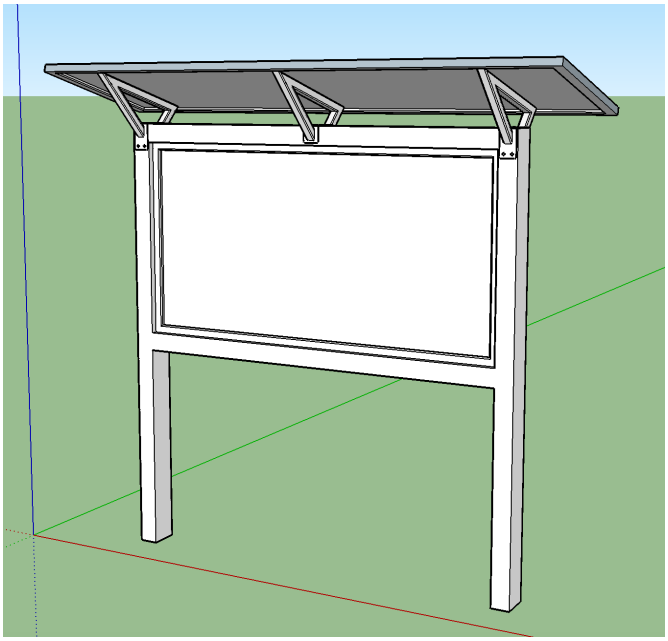
Objective: Design remote-controlled 3-lb BattleBot for competition



Above: CAD (SOLIDWORKS) model of final design. My primary role was designing the chassis frame, and compartmentalizing the interior to fit all of our components while still being able to withstand attacks of all types—spinning blades, hammers, flips and falls, etc. Unfortunately, due to covid, we were unable to actually manufacture or compete with it. As we were on a strict cost and weight budget, the most significant lessons I learned from this project were how to research and work with off-the-shelf components.

While I didn't know much FEA at the time, if I were to re-do this design, I would like to further decrease weight and increase strength by using a program like Altair Inspire to do topology optimization.

Eagle Scout Project - Bulletin Board



Above: For my Eagle Scout project, I designed and constructed a freestanding bulletin board for my high school. I taught myself SketchUp (a free CAD software) specifically for this project.

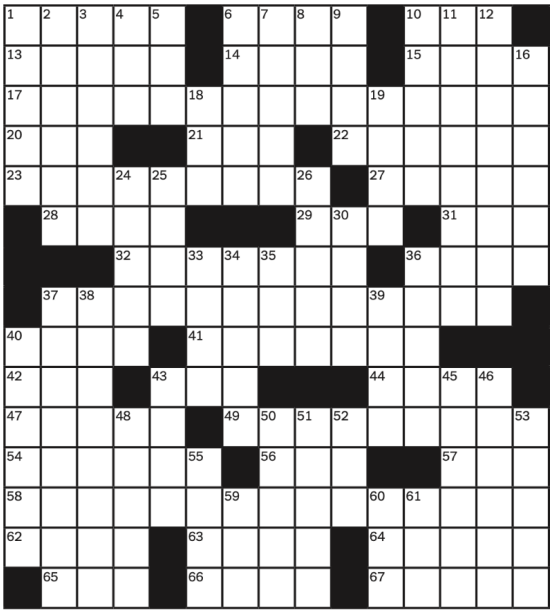
While I've since done much more technically impressive things, I like to include this project because of the attention to detail I invested in it: I thoroughly researched every part that went into it, quite literally down to the smallest nut, catalogued every drawing throughout the process, and compiled all my work into a comprehensive, easy-to-read binder for presentation. I've since done my best in every project to continue creating concise, complete documentation.

Bonus: New York Times Crossword

Since summer 2020, I've been constructing crossword puzzles as a hobby. I recently had one published in the New York Times on Tuesday, Oct. 12, 2021 (below). Interestingly, I found the construction process to be much more similar to an engineering problem than one might imagine.

Crossword | Edited by Will Shortz

PUZZLE BY CONOR SEFKOW



10/12/21

ACROSS

1 Dip for chips
6 Epitome of redness
10 ___ Jima (1945 battle site)
13 The first one was sent in 1971
14 Shape for an eyebrow or rainbow
15 Captivated
17 Game that has only a single round
20 Officeholders
21 Bay Area airport code
22 Not get take-out
23 Single item seemingly always found at the bottom of a McDonald's bag
27 Sales at concerts or games, informally
28 Region traveled by 63-Across
29 Nile biter
31 "Kill Bill" actress Lucy
32 One of more than 115 on a table
36 Dinghy or dory
37 Portmanteau coinage describing this puzzle's theme
40 Club charges
41 Like some aprons or reputations
42 Info for an airport limo driver
43 NaOH, familiarly
44 Cartoon collectibles
47 Hot drink at a ski resort
49 Entrance divided in half horizontally
54 Counter-Strike or League of Legends
56 "Thanks, but I'm good"
57 Regret
58 Board game played on a big hexagram
62 Map with elevation lines, in brief
63 Explorer Marco
64 Informal goodbye
65 For each
66 Old dagger
67 Tip of a shoelace

DOWN

1 Font flourish
2 Egyptian king of the gods: Var.
3 Scottish girls
4 "___ boom bah!"
5 "Float like a butterfly, sting like a bee" boxer
6 Canada's oldest national park
7 Cause for a correction
8 Prefix with tourism
9 A bad joke might go over with one
10 "Goodnight, ___" (classic song)
11 Decisive defeat
12 Professional you might need to see?
16 Drill sergeant's shout
18 Volcanic pollutant
19 Rock's ___ Bizkit
24 Nobelist Bohr with a 32-Across named for him
25 San Diego's state, informally
26 One-named Greek New Age musician
30 Obsessive fan, in slang
33 Etail site for handmade goods
34 Doled (out)
35 Most common answer in New York Times crosswords (more than 6% of all puzzles)
36 ___ one's time (waited)
37 Where model workers can be found?
38 Weapon in the original Clue
39 Support for a PC
40 Pick up on
43 U-shaped stringed instrument
45 World's largest cosmetics company
46 Listing in a footnote
48 Name on a building wing, perhaps
50 "I give!"
51 Lake on 25-Down's border
52 Revolutionary Guevara
53 Button at a bowling alley
55 768 of them make a gal.
59 Long, long time
60 Many an I.R.S. employee
61 Container with a pump

ANSWER TO PREVIOUS PUZZLE

C	O	N	C	H		S	A	M		C	L	O	U	T
A	K	I	R	A		T	I	O		H	E	N	N	A
T	A	K	E	I	T	O	R	L	E	A	V	E	I	T
E	Y	E	D	R	O	P		E	N	L	I	S	T	
				T	O	G	A		G	E	N			
L	O	V	E	I	T	O	R	H	A	T	E	I	T	
A	N	I	S	E			T	A	G	S		C	U	E
L	E	D	E		T	A	B	L	E		B	A	L	M
A	P	E		N	O	N	O			F	A	R	S	I
	M	O	V	E	I	T	O	R	L	O	S	E	I	T
			O	W	L		K	E	E	L				
	B	O	W	S	E	R		D	A	D	B	O	D	S
M	A	K	E	I	T	O	R	B	R	E	A	K	I	T
E	A	R	L	E		W	O	O		R	H	I	N	E
G	L	A	S	S		S	E	X		S	T	E	E	P