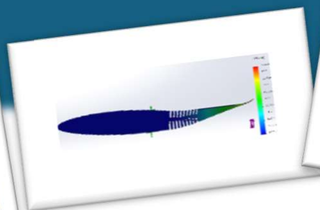
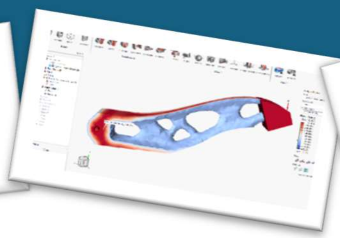
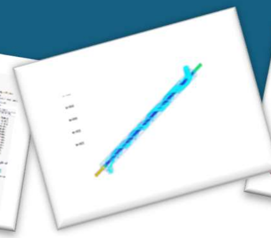
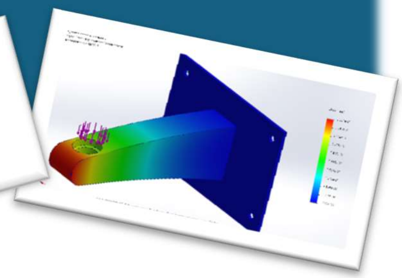
Raj Rathod

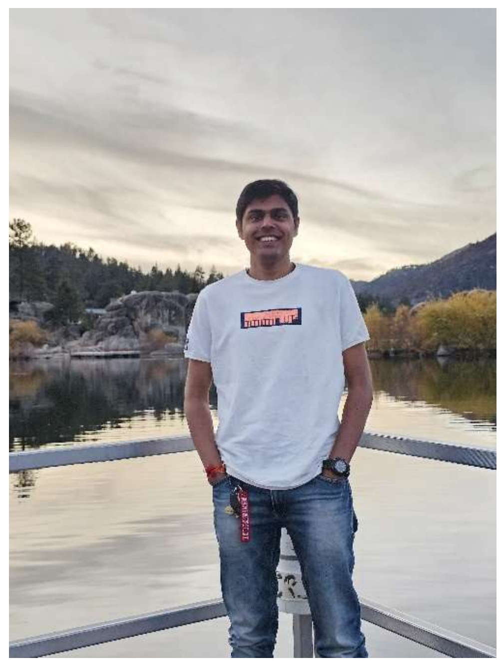








About Me:



Greetings! I recently graduated from California State University Long Beach, CSULB with a Master of Science Degree in Mechanical Engineering in May 2024. My time at CSULB has been a transforming experience, and I have had the opportunity to see the beauty of engineering from a variety of angles.

A deep passion for design and production drives both my academic and professional activities. These fields are beyond just areas of study for me; they are where my curiosity intersects with creativity. My main interests are mechanical design and additive manufacturing. They reflect the importance of our ability to envision, design, and bring to life the complex ideas that drive modern civilization.

At CSULB, I had the opportunity to participate in a variety of collaborative initiatives spanning multiple areas. These projects included mechanical design, modeling and simulation, product development, and project management. Each venture gave me with essential insights and firsthand experience, refueling my passion for developing significant solutions.

Contact Info

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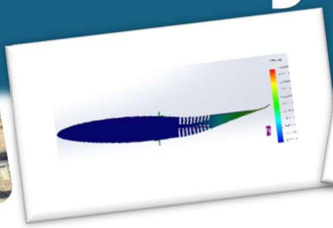
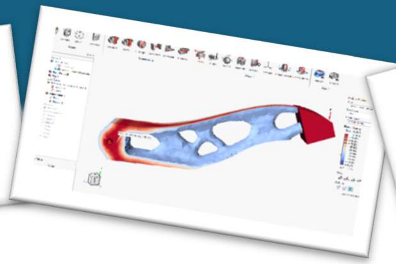
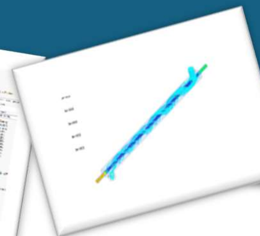
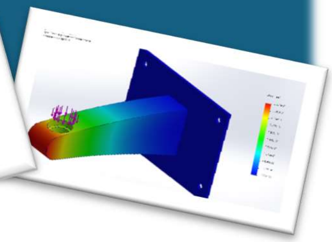





Liquid Rocket Static Fire Stand:

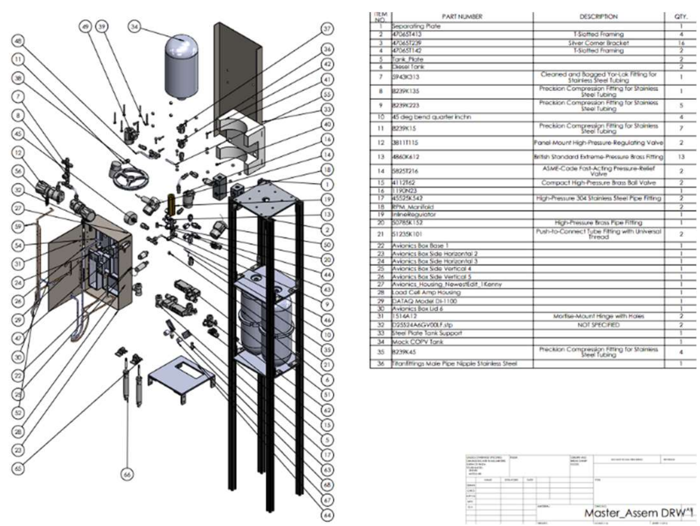
The project involved creating a liquid rocket engine and a modular static fire platform. The project made substantial use of technologies such as SolidWorks, Ansys, Fusion 360CAM, and Rocket Propulsion Analysis (RPA). In this team project, I learned about and had firsthand experience with several manufacturing processes, involving milling, turning, additive manufacturing, laser cutting, water jet cutting, composite lay-ups, and classic lathe machining.

The rocket engine was created with RPA software and built on a HAAS CNC milling machine. The nozzle and chamber were manufactured separately from a block of high carbon steel and welded together. I oversaw making combustion chamber.

A hot fire test was performed; however, the expected thrust values were not obtained. After in depth analysis of the hot fire, it was determined that the fuel and oxidizer ratio at the time of ignition was not achieved, resulting in the flamethrower.

SolidWorks software was used to create a comprehensive static fire test stand model. This project provided extensive experience in resource allocation and project planning, BOM, manufacturing, fluid mechanics, and fuel and oxidizer thermodynamics.

HOT STATIC FIRE



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Separating Plate		1
2	47065T413	T-Slotted Framing	4
3	47065T239	Silver Corner Bracket	16
4	47065T142	T-Slotted Framing	2
5	Tank_Plate		2
6	Diesel Tank		2
7	5943K313	Cleaned and Bagged Yor-Lok Fitting for Stainless Steel Tubing	1
8	8239K135	Precision Compression Fitting for Stainless Steel Tubing	1
9	8239K223	Precision Compression Fitting for Stainless Steel Tubing	5
10	45 deg bend quarter inchn		4
11	8239K15	Precision Compression Fitting for Stainless Steel Tubing	7
12	3811T115	Panel-Mount High-Pressure-Regulating Valve	2
13	4860K612	British Standard Extreme-Pressure Brass Fitting	13
14	5825T216	ASME-Code Fast-Acting Pressure-Relief Valve	2
15	4112T62	Compact High-Pressure Brass Ball Valve	2
16	1190N23		1
17	45525K342	High-Pressure 304 Stainless Steel Pipe Fitting	2
18	RPM_Manifold		2
19	InlineRegulator		1
20	50785K152	High-Pressure Brass Pipe Fitting	1
21	51235K101	Push-to-Connect Tube Fitting with Universal Thread	2
22	Avionics Box Base 1		1
23	Avionics Box Side Horizontal 2		1
24	Avionics Box Side Horizontal 3		1
25	Avionics Box Side Vertical 4		1
26	Avionics Box Side Vertical 5		1
27	Avionics_Housing_NewestEdit_1Kenny		1
28	Load Cell Amp Housing		1
29	DATAQ Model DI-1100		1
30	Avionics Box Lid 6		1
31	1514A12	Mortise-Mount Hinge with Holes	2
32	D25524A6GV00LF.stp	NOT SPECIFIED	2
33	Steel Plate Tank Support		1
34	Mock COPV Tank		1
35	8239K45	Precision Compression Fitting for Stainless Steel Tubing	4
36	TitanFittings Male Pipe Nipple Stainless Steel		1

EXPLODED VIEW OF STAND ASSEMBLY

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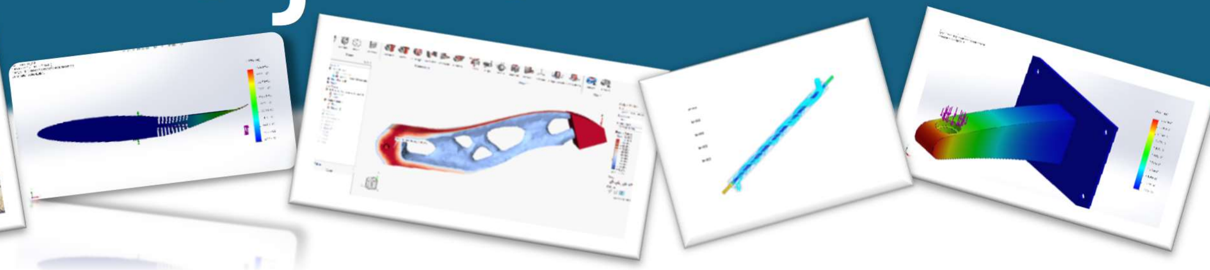
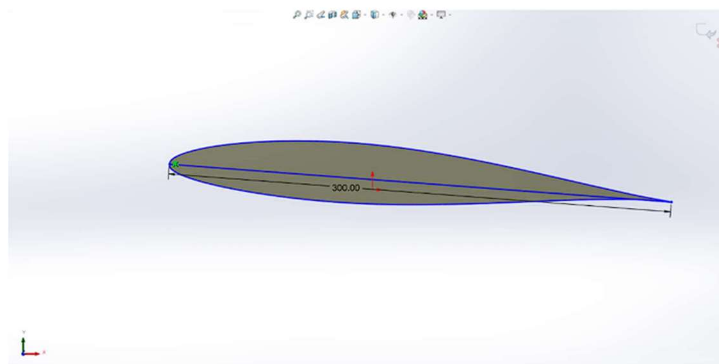


Design & Analysis of Morphing Wing:

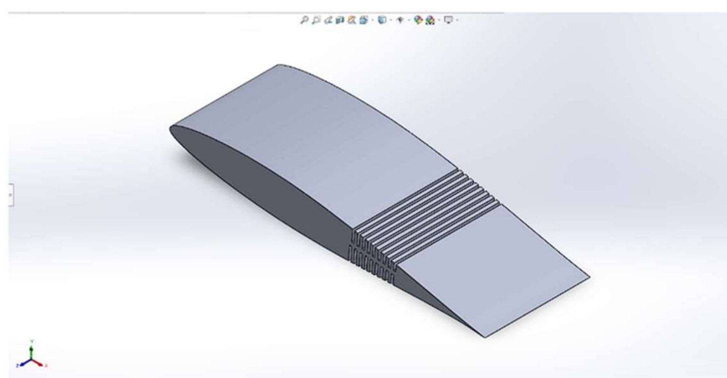
The project featured developing a simple model of a morphing wing using SolidWorks to model point forces on the tail end of the wing. Forces will be applied to pinch the wing downwards and upwards which replicates the morphing function. Using the software, we developed a visual model for the effects on the wing due to the forces.

The choice of the baseline airfoil is based on well-established designs with known aerodynamic characteristics. The airfoil geometry was imported from the available resources and was converted into a SolidWorks drawing which was then used to design a wing section and analysis was performed on the model by applying the load of 50 lbs. to the tail end of the wing.

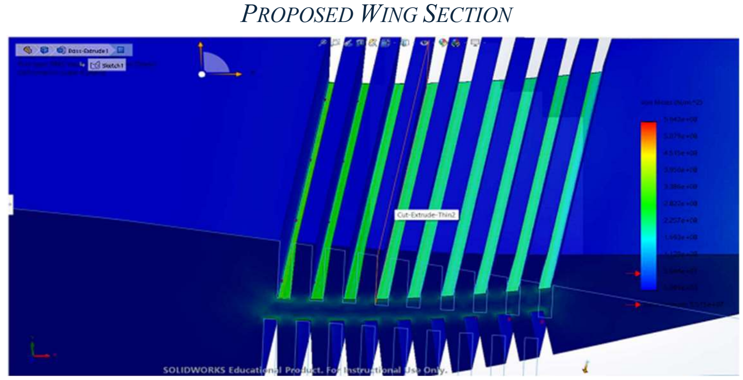
The results show that even at the high loading conditions of the wing at the tail end, the morphing feature does not fail. the von-mises stress acting at those edges is less than the maximum yield strength of material which is 6061 Aluminum alloy for this case thus, the purpose of this study was to determine the failure conditions for the morphing features of the wing.



NACA AEROFOIL 63212 IMPORTED GEOMETRY



PROPOSED WING SECTION



MORPHED SECTION ANALYSIS SUCCESS

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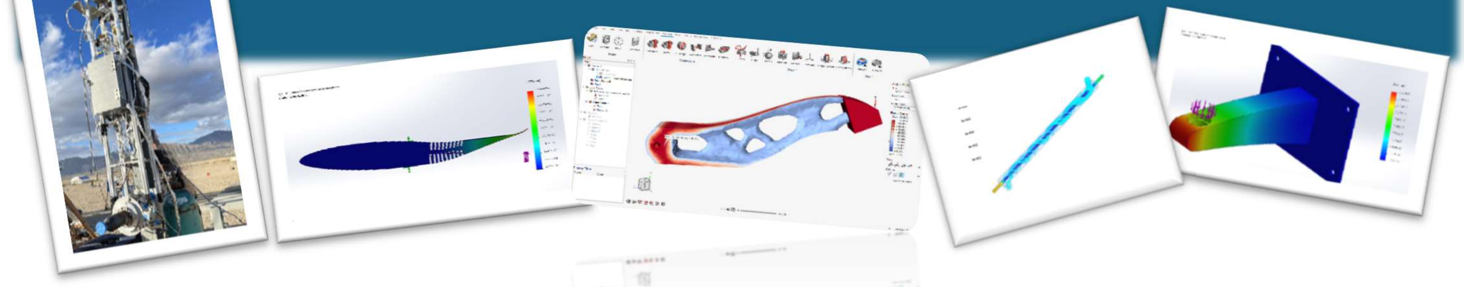


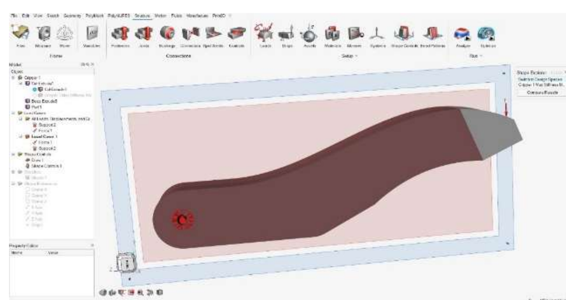
Topology optimization of Robotic Arm:

The project's goal was to optimize the topology of a robotic arm and make it more manufacturable so that it could be made using additive manufacturing methods.

ROBOTIC ARM

To streamline the process of modeling and optimization we removed the non-essential servo motors, leading to an updated SolidWorks CAD model that included base three arms and gripper.

I oversaw optimizing the end effector f robotic arm. The gripper geometry was simplified to emphasized bulkiness, laying the groundwork for topology optimization followed by increasing manufacturability.



END EFFECTOR ANALYSIS SETUP

The analysis was carried out by applying 20 N load calculated with respect to lifting an object with 2Kg mass and was originally calculated as 19.62 N but rounded up to 20N. The various load setups depending on the orientation of the arm and the positioning of object were taken into consideration.

FINAL POLYNURBS RENDERED END EFFECTOR

Altair Inspire software was used to carryout topology optimization. The results showed successful reduction in mass of around 70% with optimum strength too weight ratio criteria.

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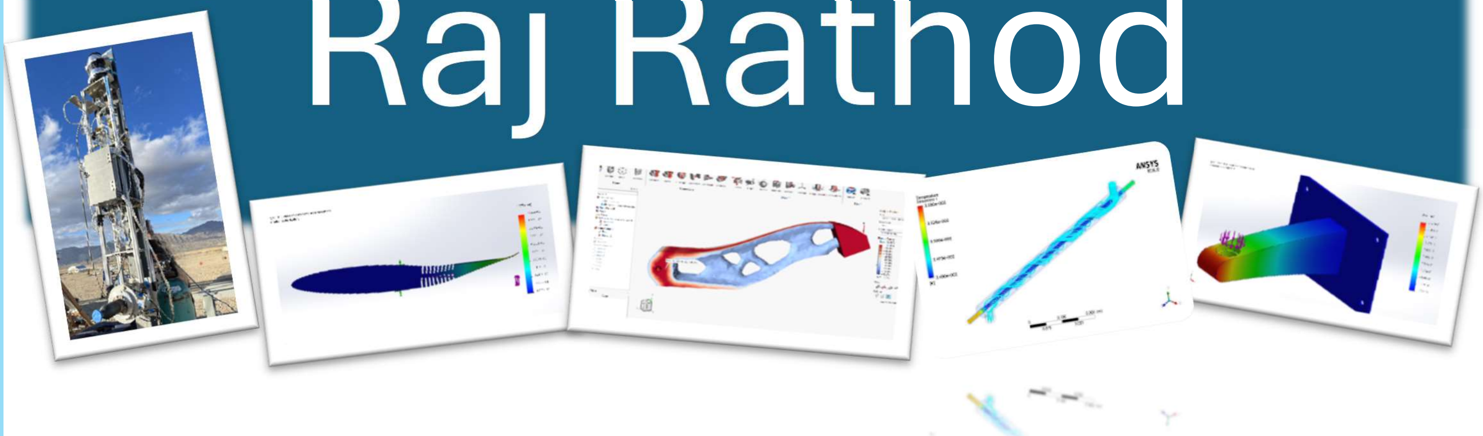


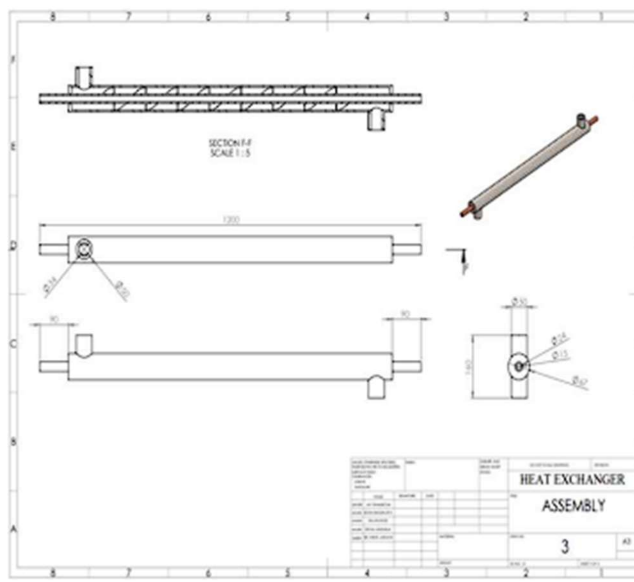
Effect of Process Parameters in Pipe-in-pipe Heat Exchanger:

A new design for a concentric pipe heat exchanger was proposed. The design includes the addition of fins to the heat exchanger's inner pipe, which increased the heat transfer area and effectiveness.

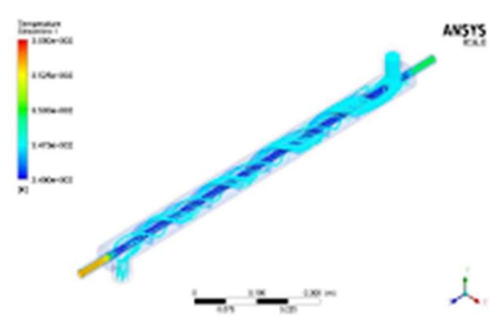
The heat exchanger module was designed in SolidWorks, and the analysis was performed using SolidWorks and Ansys software.

I responsible for analyzing the performance of the heat exchanger module design. The project's goal was to create a design that could be fabricated and utilized as a test rig to conduct tests. The purpose was to analyze the performance of the heat exchanger using digital tools.

Ansys Fluent was used to analyze the fluid flow and thermal properties of the proposed design. The results showed a 20% increase in total efficiency, resulting in more effective resource utilization.



Assembly drawing



Fluid Flow Analysis

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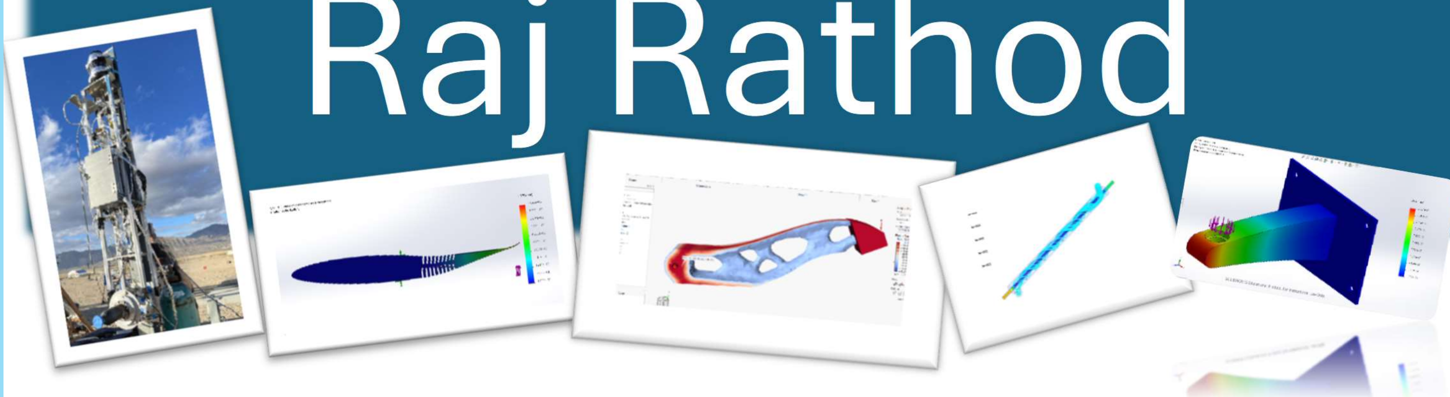
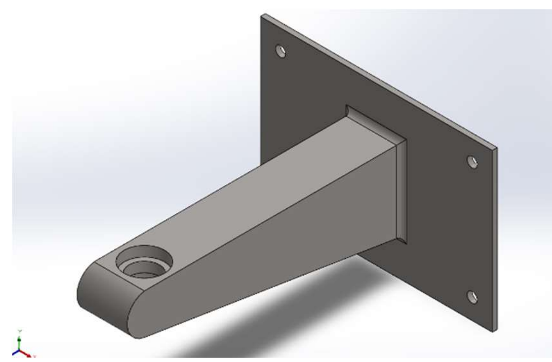


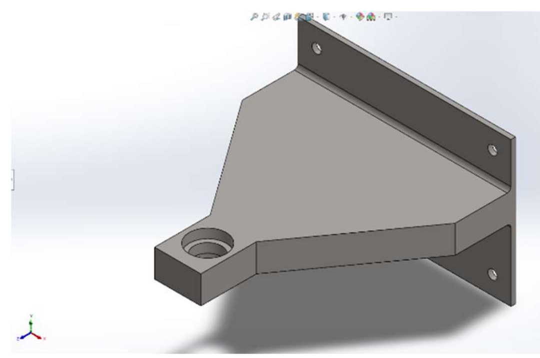
Design & Analysis of Antenna Bracket

This project was focused to improve communication system reliability, I designed and analyzed antenna brackets in SolidWorks. Starting from the provided geometric drawings and a 3D bisection view, I adhered to defined constraints to initiate the design process.



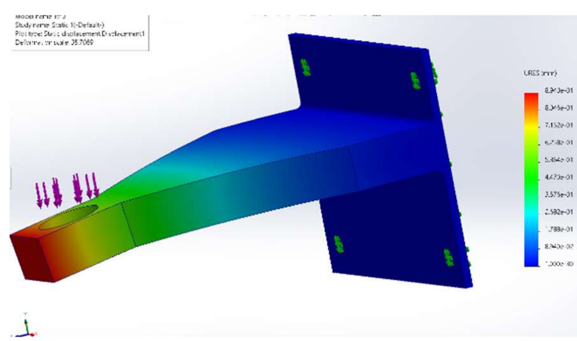
INITIAL DESIGN

Multiple design iterations were carried out with the goal of improving the brackets' performance while keeping manufacturability in mind. This procedure was aided using topology optimization algorithms in SolidWorks, which guided material distribution and geometry to improve structural integrity while reducing superfluous mass.



FINAL DESIGN

The analysis resulted in a strong final design that can sustain loads up to 20KN in either direction without substantial failure or deformation. Impressively, the design was modified to require only two setups on a CNC milling machine for production, demonstrating its efficiency and applicability.



MAX. DISPLACEMENT

This work honed my design thinking skills and expanded my understanding of designing for manufacturing (DFM), highlighting the delicate balance between design, analysis, and manufacturing in engineering projects.