Engineering Portfolio

Kyle Richardson

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SUMMARY

Enthusiastic and passionate senior in college working towards a Bachelor of Science in Mechanical Engineering at the University of Massachusetts Lowell. Highly motivated student with a strong background in computer-aided design software and additive manufacturing processes. Actively seeking a full-time position to further develop my technical skills and gain practical experience in the field. Strong problem-solving and communication skills; eager to contribute to a dynamic team environment.

EDUCATION

University of Massachusetts Lowell Expected August 2024

Francis College of Engineering; GPA:3.5

- Active member of the National Honors Society

Related Courses: Thermodynamics, Fluid Mechanics, Material Science, Mechanics of Materials, Manufacturing Laboratory, Computer-aided design, Kinematics of Mechanisms, Dynamics, Statics, Calculus III, Heat Transfer

SKILLS

Software: SOLIDWORKS core, 3DEXPERIENCE Platform, SOLIDWORKS Cloud Apps, MATLAB Programming, Cura Slicer, Bambu Studio, Camtasia Video Editing, Adobe Photoshop, Inkscape, HueForge, Microsoft Office

Engineering: FDM 3D Printing, Rapid Prototyping, Product Development, Parametric Design, 2D and 3D Manufacturing Documentation/Drawings, Material Testing, GD&T, Engineering Analysis and Optimization, Bill of Materials Management, Product Data/Lifecycle Management, Soldering, FPV Drone Construction

WORK EXPERIENCE

Dassault Systémes | Waltham Ma June – August 2023

SOLIDWORKS Product Management Intern

- Developed and presented a comprehensive software product proposal to the executive team
- Designed, modeled, and constructed a 3D-printable FPV drone from the ground up using xDesign
- Utilized the drone model as a valuable dataset for upcoming product demos, marketing initiatives, and software testing
- Enhanced software quality by identifying, documenting, and reporting numerous bugs, driving platform improvements
- Collaborated with the development team to address and rectify platform issues, ensuring a seamless user experience
- Navigated the multifaceted challenges of the drone project, from inception to flight within a tight 2-month timeframe
- Authored an in-depth blog post detailing the drone project's journey and the 3DEXPERIENCE platform's capabilities: https://blogs.solidworks.com/solidworksblog/2023/11/from-crash-and-burn-to-soaring-creating-a-drone-with-3d-creator.html

Dassault Systémes | Waltham Ma June – August 2022

SOLIDWORKS Product Management Intern

- Constructed a detailed technical product proposal for executive team
- Created numerous comprehensive mechanical designs for marketing and demo purposes
- Developed high quality CAD models to evaluate the performance of cloud apps within the 3DEXPERIENCE Platform
- Conducted data compatibility tests across various applications on the 3DEXPERIENCE Platform
- Coordinated with R&D Team to identify product issues and possible enhancements
- Generated images and videos depicting new product functionalities

Rideaway Adventures Summer Camp | Falmouth Ma June – August 2021

- Organized, lead, and implemented programs for 60+ weekly campers
- Coordinated daily camp activities including kayaking and paddleboarding for children ages 7-15
- Enforced rules and regulations to maintain discipline and ensure safety while also providing a fun educational experience

CERTIFICATIONS

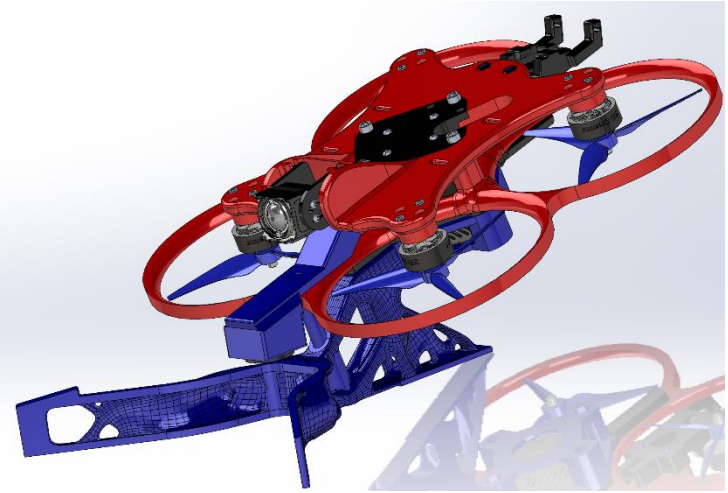
- Certified SOLIDWORKS Associate in Mechanical Design (CSWA) June 2022
- Certified SOLIDWORKS Professional in Mechanical Design (CSWP) August 2022
- Certified SOLIDWORKS Associate in Additive Manufacturing August 2022
- Certified 3DEXPERIENCE 3D Creator – Associate August 2022
- Certified 3DEXPERIENCE Collaborative Business Innovator – Associate August 2022
- Certified 3DEXPERIENCE Collaborative Industry Innovator – Associate August 2022

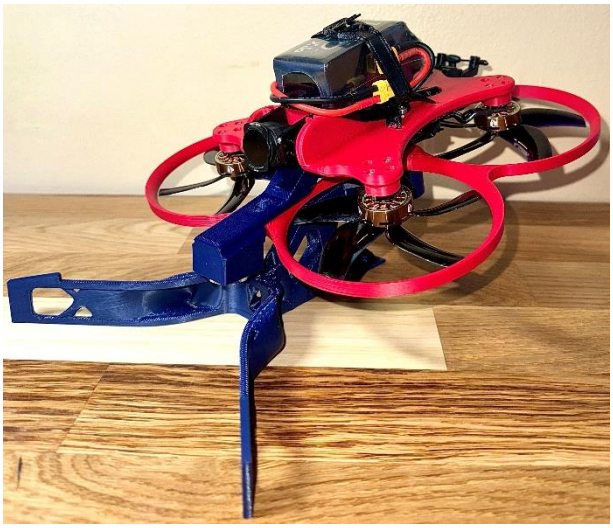
ACTIVITIES & INTERESTS

Umass Lowell Intramurals (basketball, softball, volleyball), hiking, skiing, fishing, skateboarding, Building and flying FPV drones

ASME EFX Drone Design Competition

Project Date: January–March 2024





Project Overview:

- **Innovative Drone Design:** Designed and 3D printed a custom First-Person View (FPV) drone for the national ASME EFX cargo drone racing competition, utilizing an iterative design process for optimal performance in payload pick-up and racing
- **Senior Capstone Project:** Developed this drone as part of my senior capstone design project, setting a precedent as the first team from UMass Lowell to enter the national ASME EFX cargo drone racing competition

Key Achievements:

- **Leveraged Prior Experience:** Capitalized on comprehensive knowledge from a previous end-to-end 3D-printed FPV drone project, fast-tracking the research phase and excelling in design execution by incorporating learned principles such as ease of assembly, repairability, and minimal hardware reliance, significantly streamlining the development of this drone design
- **Project Leadership:** Led the design and production phases, drawing on experience from a prior drone project to streamline development and mentor teammates new to drone technology and 3D printing

Technical Skills Developed:

- **Advanced Additive Manufacturing:** Prioritized 3D printing to minimize reliance on physical hardware, enhancing the drone's ease of manufacture, assembly, and repair while adhering to competition rules on additive manufactured parts.
- **Electromagnetic Payload Integration:** Engineered an innovative solution for payload handling by incorporating an electromagnet system into the drone design, enabling effective pick-up and drop-off during the race.
- **Advanced Optimization Techniques:** Utilized Altair Inspire software’s topology optimization features to enhance our drone design, creating geometries finely balanced for strength and weight while ensuring compatibility with a FDM 3D printing machine

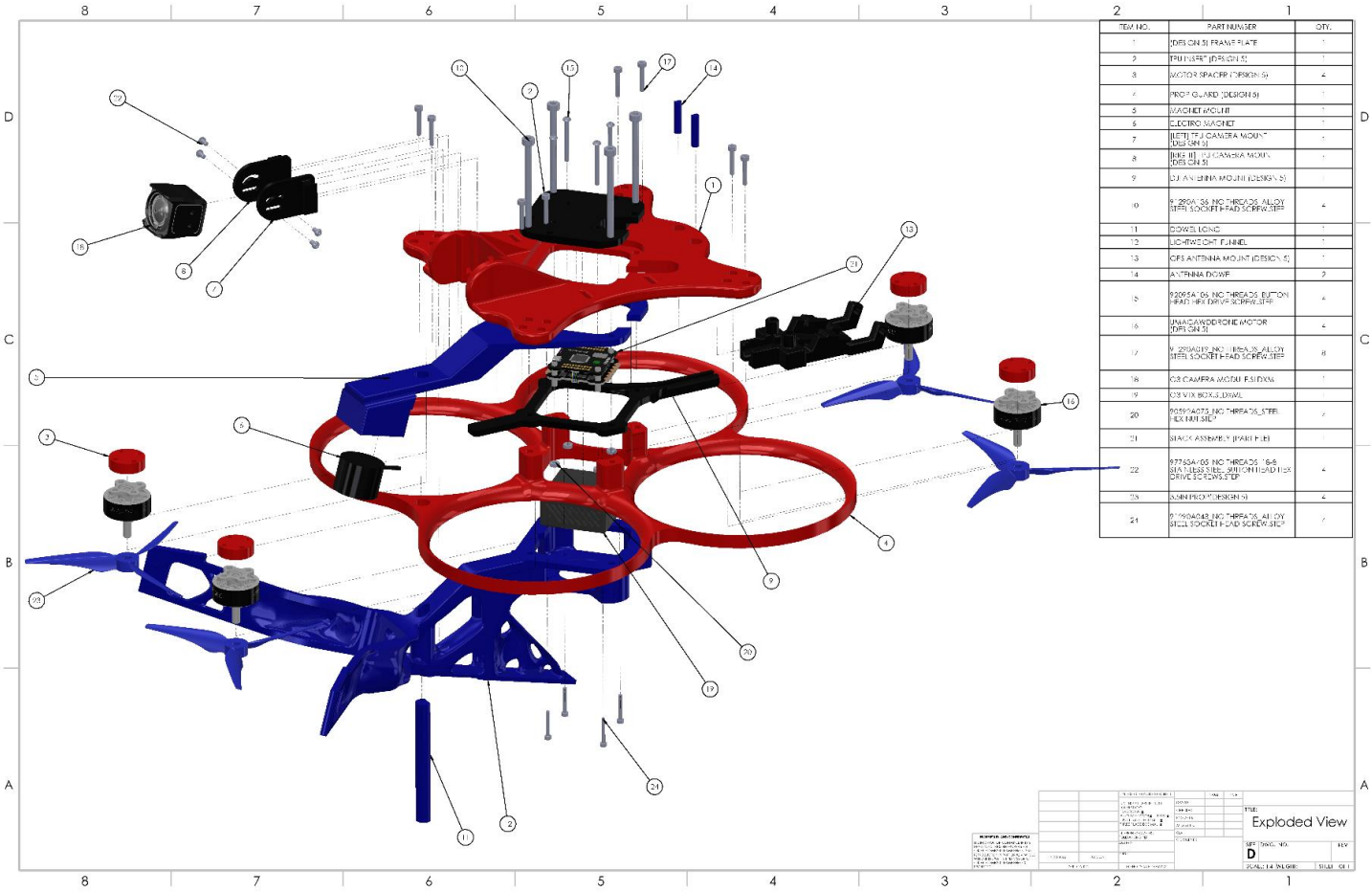
Project Outcomes:

- **Passion for Innovation:** Embraced the opportunity to design a new drone from the ground up with enthusiasm, applying lessons from past experiences to significantly refine the model—demonstrating personal growth as an engineer, an eagerness for continuous improvement, and a commitment to leveraging past insights for advanced efficiency and optimization.
- **Tight Timeline Execution:** Managed a rigorous two-month schedule to conceptualize, design, fabricate, and document the drone build process, resulting in the on-time submission of a detailed design report one month before the competition.
- **Leadership and Mentorship:** Demonstrated leadership and provided mentorship within the team, guiding group members with little to no experience in drones and 3D printing through the learning curve. By effectively communicating complex concepts and delegating tasks, I showcased crucial engineering skills beyond the technical realm, emphasizing the importance of teamwork and collaboration in achieving project success

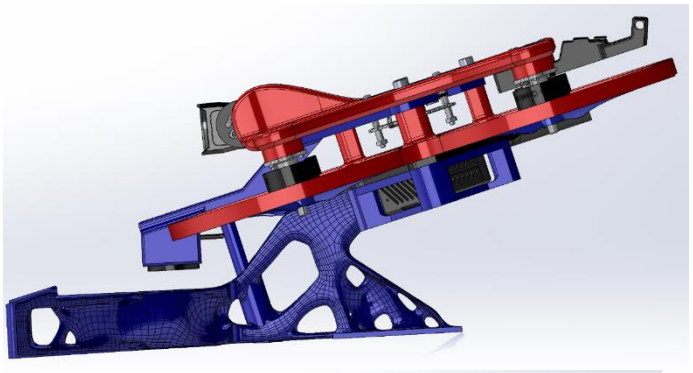
Competition Design Report:

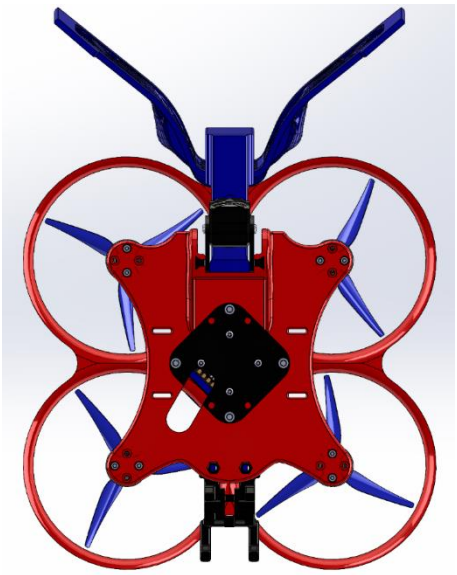
For a comprehensive insight into our project, the detailed design report submitted to the ASME EFX drone racing competition is available for review here: [ASME EFX Design Report]

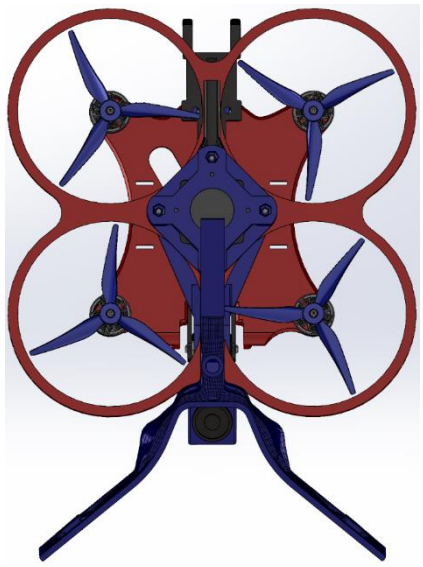
Additional Images of this Drone Project:

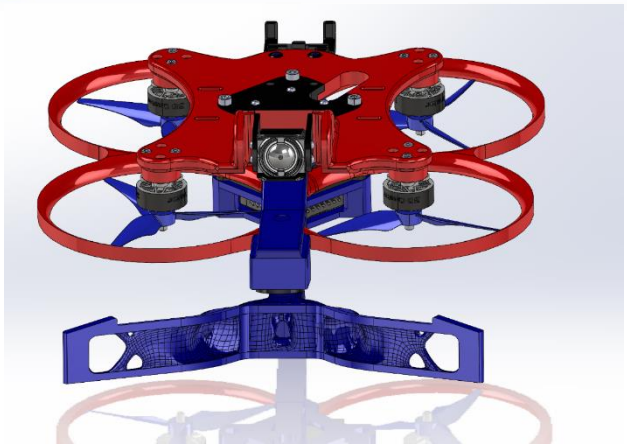


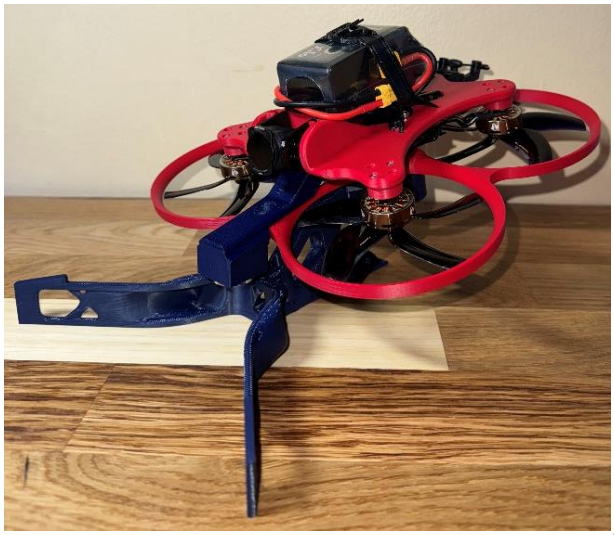
Full CAD Assembly Exploded View











Visual comparison between the detailed CAD model and the final assembled drone in its physical form.

SOLIDWORKS Drone Project

Project Date: June 16th– August 25th, 2023

Project Overview:

- **End-to-End Development:** Managed the complete design and development of a custom FPV (first-Person View) drone, transitioning from conceptual design to real-world flight within a tight 2-month deadline
- **Internship Project:** Undertook this comprehensive drone project during my second summer internship with the SOLIDWORKS Product Management team, modeling it in xDesign, their cloud CAD solution, contributing a complex native data set used for marking and product demonstration purposes

Key Achievements:

- **Fast Learning:** Went from knowing little about drones to designing, building, and flying my own custom FPV drone in just two months, showcasing quick learning for a complex, multifaceted project
- **Creative Design and Problem-Solving:** Utilized FDM 3D printing to create an intricate frame design, went through various design iterations and overcame numerous challenges, proving resilience, creativity, and real-world engineering skills
- **Efficient Project Management:** Delivered a fully functional drone model under tight deadlines, balancing a steep learning curve with effective time management and dedication to quality

Technical Skills Developed:

- **Efficient CAD Modeling:** Leveraged the advantages of a single modeling environment for streamlined, top-down assembly approach, crucial for managing the drone's large complex assembly design
- **Design, Testing, and Iteration:** Utilized 3D printing for rapid prototyping and numerous design iterations - especially the custom toroidal propellers - through the flexible single modeling environment, leading to successful outcomes after multiple iterations
- **Soldering Skills:** Entered the project with no prior soldering experience; quickly learned and applied soldering techniques essential for assembling the drone's electrical components, ensuring secure and efficient connections vital for the drone's performance

Challenges:

- **Navigating the Learning Curve:** Tackled a steep learning curve that involved extensive research into drone fundamentals, components consideration and compatibility, forming a comprehensive bill of materials essential for the subsequent design phase
- **Initial Frame Design:** Overcame the absence of physical components by extensively researching and sourcing design drawings for each part, ensuring the drone frame design was accurate and functional
- **Balancing Design and Assembly:** Managed a demanding schedule between detailed CAD modeling – including every minor component like fasteners, electrical hardware, wiring – and the physical assembly of the drone, showcasing effective multitasking and precision
- **Learning Flight Control:** Dedicated numerous hours to training in drone simulations, preparing for the real-world challenge of controlling a FPV drone, persisting despite several setbacks from crashes and broken components, a journey which highlights resilience and the ongoing commitment to skill development

Project Outcomes/Lessons Learned:

- **Successful Project Completion:** Achieved the significant milestone of getting the drone airborne before the internship's conclusion, a feat showcased to the CEO of SOLIDWORKS, highlighting the project's success
- **Comprehensive Engineering Process:** Managed a complete end-to-end engineering design process for the first time, handling everything from initial research to final testing, understanding the intricacies involved in bringing a complex project to fruition
- **Emphasis on Design Intent:** Learned the importance of detailed design intent, focusing on manufacturability and ease of assembly in design, understanding the importance of creating models that translate efficiently from screen to reality
- **Streamlined Assembly and Hardware:** Realized the benefits of designing for simplified assembly and incorporating uniform hardware, making both construction and part replacement more efficient while optimizing cost and resource management

Videos of Drone:

- If you are curious to see a more in-depth dive into the CAD model and the actual engineering behind the drone frame itself, check out this short video which walks through the entire design process for this drone: Drone Design Video

- Short video showing a successful takeoff: Drone Flying

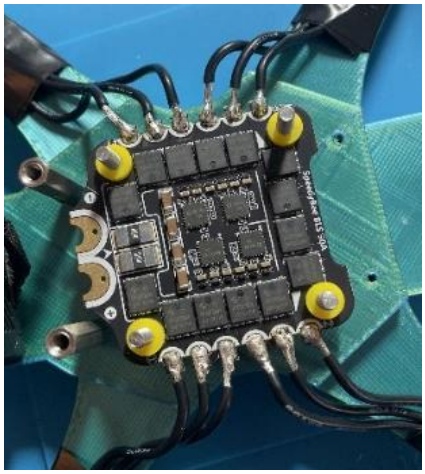
Additional Drone Images:

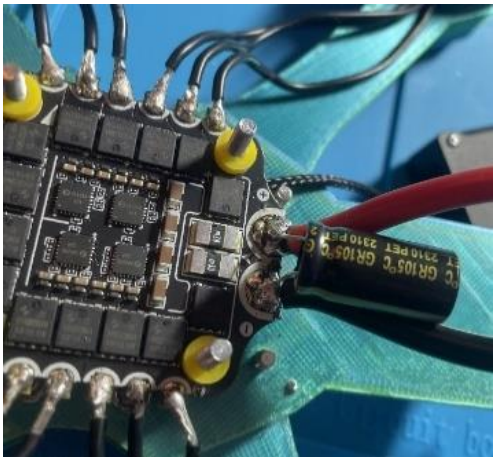
Images of the Drones frame design in CAD and how it translated to the real world with 3D Prinitng.

Additional images of the final assembled drone

Additional Drone Images:

Images of the ESC (Electronic Speed Controller) after soldering the motor wire, battery leads, and the capacitor

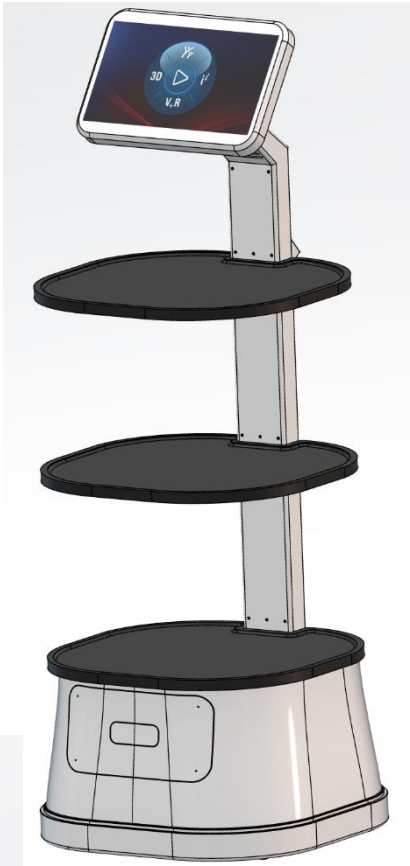




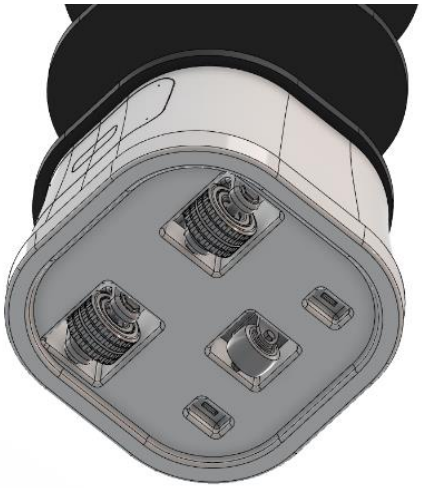
Images of some of the heat set inserts needed for the build

Images of two different frame iterations laid out on a single build plate on my FDM 3D printer

Restaurant Server Robot Model: (August 2022)



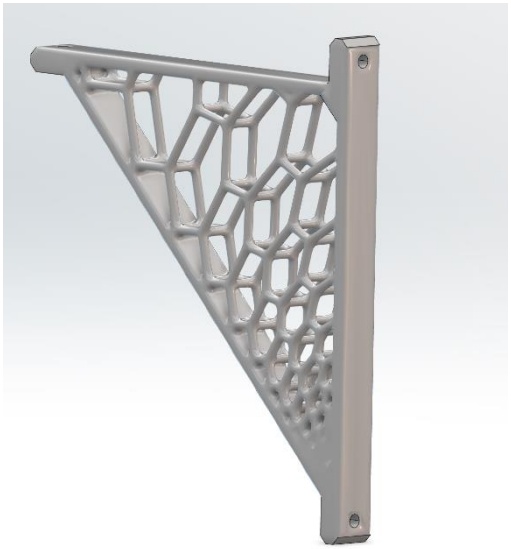
- **Internship Contribution:** Developed this intricate CAD model in xDesign, SOLIDWORKS' cloud-based solution, during my first summer internship, providing valuable experiences in real-world design and corporate project demands
- **Role in Demo Video:** The model was central to a product proposal demo video presented to the Dassault executive team, serving as a tangible example for a potential future software offering
- **Detail-Oriented Design:** The model was created with a high level of detail to ensure it accurately represented the envisioned product, reflecting my commitment to deliver high quality CAD designs
- **Learning Experience:** This project was one of my initial experiences in creating assemblies in a single modeling environment, showing me the immense capabilities and efficiencies of this approach in CAD modeling



Additional CAD Designs and 3D Printing Projects

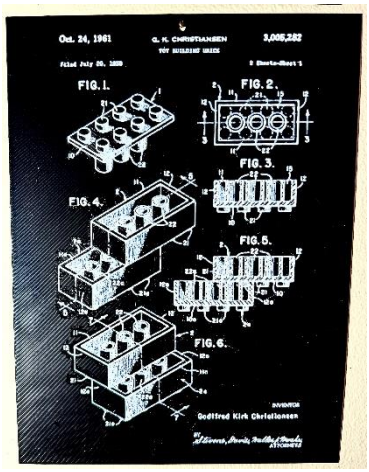
Shelf Brackets: (August 2023)

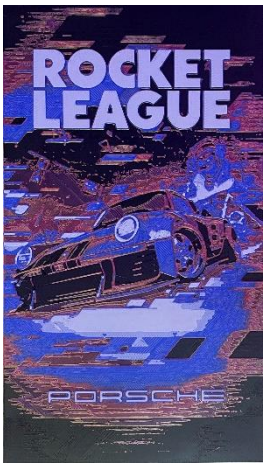
- **Practical Problem-Solving:** Designed and 3D printed personalized shelf brackets for an effective display solution, combining functionality with aesthetics to showcase a collection of 3D printed models
- **Design Software Proficiency:** Crafted initial shelf bracket geometry using xDesign and refined the design with an intricate honeycomb lattice using the Lattice Designer app on the 3D EXPERIENCE Platform
- **Product Testing and Analysis:** Tested new software capabilities and the manufacturability of complex geometries during my SolidWorks internship, showcasing the practical application of cutting-edge CAD tools
- **Additive Manufacturing Proficiency:** Tailored lattice design for FDM 3D printing, optimizing the balance between structural integrity and material efficiency for practical use



Innovative 3D Printing with HueForge: (October 2023)

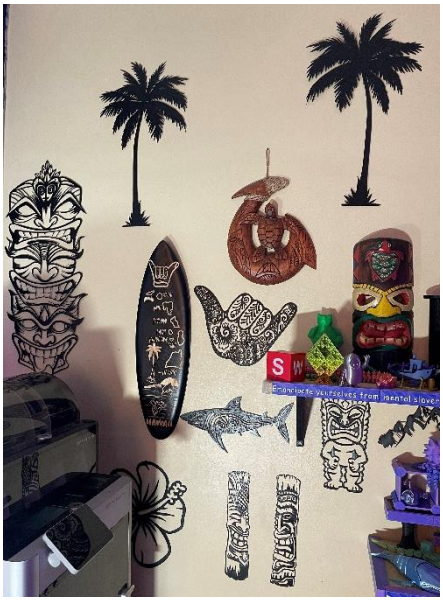
- **Software Utilization:** Utilized HueForge for advanced color 3D printing, showcasing a broad skill set in innovative software applications to create detailed wall art
- **Cutting-Edge Adaptation:** Embraced HueForge's print time efficiencies and color blending to produce vibrant, artistically inspired 3D prints, demonstrating an up-to-date knowledge of industry advancements
- **Artistic Innovation:** Crafted unique 3D wall art with HueForge, illustrating the ability to merge modern printing technologies with personal creative pursuits

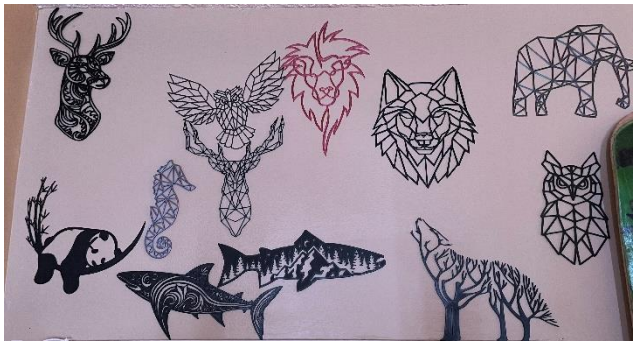




Integrating Art and Engineering: (September 2023)

- **Inkscape Workflow:** Demonstrated expertise in using Inkscape for tracing and converting images into DXF files, followed by manipulating these designs in SOLIDWORKS which could then be exported as an STL file for 3D Printing
- **Real-World Application:** Applied problem-solving skills and software integration knowledge to real world scenarios, exemplifying the ability to learn and adapt various software tools for achieving desired outcomes in various projects





Custom 3D Printed Desk Stands: (January 2024)

- **Innovative Design Integration:** Leveraged different software tools such as SOLIDWORKS and Inkscape for precise CAD modeling and vector graphic design, resulting in personalized 3D printed stands with detailed logos
- **Advanced Manufacturing Techniques:** Utilized Fused Deposition Modeling (FDM) with a multi-material printing system to achieve realistic logo representation
- **Design for Manufacturability:** Recognized and addressed the limitations inherent to FDM technology, particularly in producing minute details, by optimizing the model design for efficient printing without compromising on the fine details
- **Software Optimization:** Tailored slicing software settings to match the capabilities of a 0.4mm nozzle by varying extrusion widths where smaller details were needed, demonstrating a deep understanding of equipment capabilities and software tuning
- **Functional Aesthetics:** Designed desk stands that balance personalized aesthetics with practicality, serving as both a stylish office accessory and thoughtful, custom gifts

Custom PC Build: (June 2022)

Comprehensive Research and Component Selection: Conducted extensive research to understand the intricacies of computer hardware, including the functionality of each component and compatibility issues. This thorough investigation guided the informed selection of parts, ensuring a balanced and efficient system tailored to specific needs like gaming, CAD modeling, and video editing.

Hands-On Assembly and Technical Proficiency: Successfully assembled a custom desktop PC from scratch, demonstrating hands-on technical proficiency. This process involved meticulous assembly of hardware components, showcasing an ability to follow complex technical instructions and an understanding of the physical architecture of computing systems.

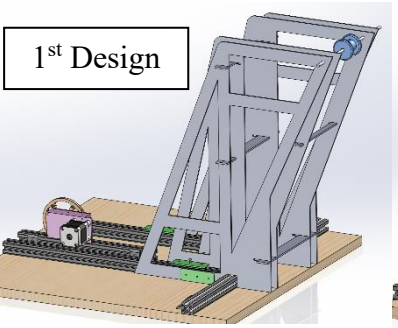
Software Setup and Problem-Solving: Overcame challenges in software installation and configuration, a previously unfamiliar territory. This phase required learning new software-related skills, demonstrating adaptability and problem-solving abilities, crucial for tackling diverse engineering challenges.

Practical Application and Continuous Learning: The completed PC serves as a personal workstation for various applications, from entertainment to academic and professional tasks like CAD and video editing. This project exemplifies the practical application of theoretical knowledge and underscores the importance of continuous learning and skill development in engineering.

Crane Project: (April 2022)

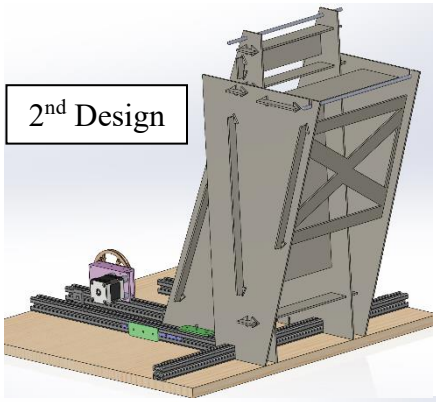
- **Collaborative Design:** Constructed a static crane as a group project using SOLIDWORKS for the CAD design, with the objective of achieving maximum load-bearing capacity from cardboard material
- **Iterative Design Process:** Implemented a two-phase design process; the initial design was subjected to a load test, revealing the need for enhanced lateral stability in the crane structure
- **Problem-Solving and Innovation:** Leveraged insights from the initial test to reinforce the crane's frame, resulting in a robust second iteration that significantly improved structural integrity
- **Structural Integrity Analysis:** Demonstrated exceptional problem-solving skills by iterating on the original design and addressing failure points through strategic reinforcements, contributing to a successful outcome
- **Competitive Design Achievement:** Achieved a notable engineering feat by constructing a crane capable of holding approximately 55 pounds, outperforming all other class projects with the second-highest load-bearing capacity at below 30 pounds
- **Material Strength Optimization:** Surpassed material limitations by engineering a crane whose cardboard structure withstood more strain than the metal linear rods utilized for the weight-bearing mechanism, which bent under the load
- **Sustainable Engineering Practice:** Showcased proficiency in material utilization and structural analysis, leading to a cost-effective and efficient design solution that emphasized sustainability and innovation

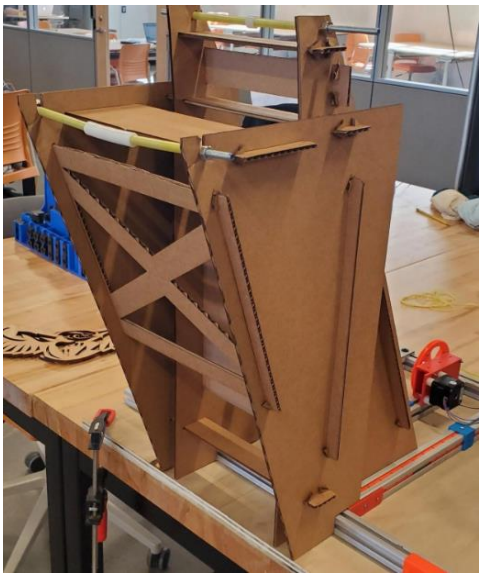
1st Design



Images showing the difference between the two design iterations

2nd Design





This is an image of the final assembled model after the weight testing was completed. The deformation of the front metal rod can be seen here.