Project Portfolio

Anthony D. Vu

Table of Contents

About Me

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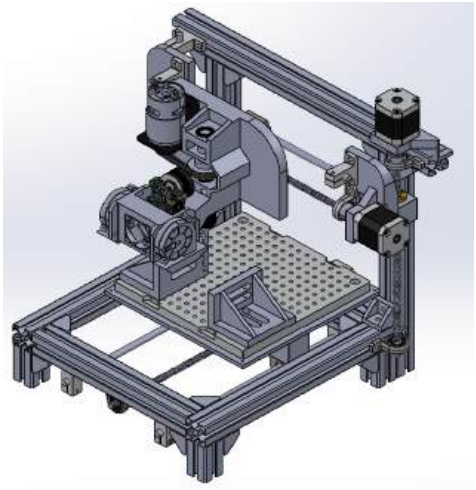
I’m a recent Mechanical Engineering graduate from Cal Poly Pomona with a passion for mechanical design, CAD modeling, and structural systems. I thrive in hands-on, project-based environments where I can bring ideas to life through solid engineering principles and creative problem-solving. My academic journey has been shaped by multidisciplinary team projects, from reverse engineering to building hybrid manufacturing systems, all of which have strengthened my skills in SolidWorks, technical communication, and collaborative design. I'm currently seeking opportunities where I can grow as a design engineer, contribute to innovative projects, and apply my mechanical knowledge to real-world challenges.

Mini Maker Mill

Objective: Design and develop a hybrid manufacturing system capable of CNC milling and 3D printing using a dual-head machine on a single axis. Provide users with a compact and affordable fabrication solution by combining additive and subtractive manufacturing processes in one platform.

Outcomes & Contributions

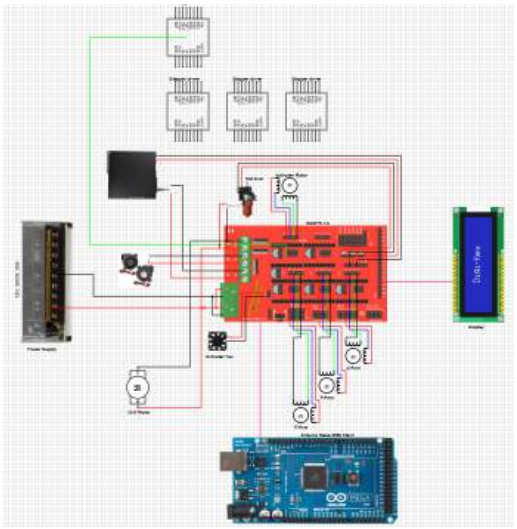
- Designed the dual-head assembly using SolidWorks, incorporating a CNC spindle and a 3D printer hotend.
- Contributed to the design and layout of the machine frame and axis system.
- Conducted FEA simulations in SolidWorks to test the structural integrity of 3D printed parts.
- Participated in subsystem integration and testing of both milling and printing heads.



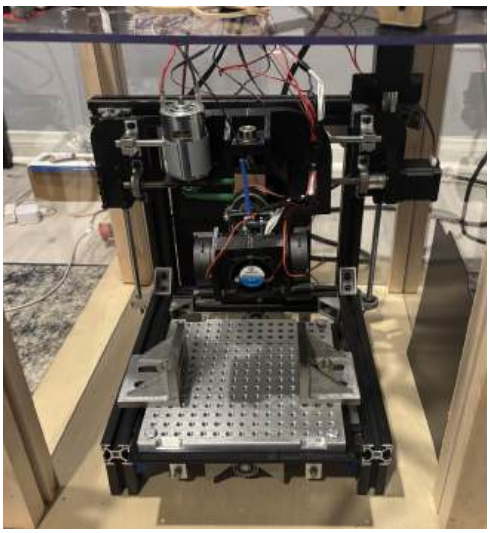
CAD Model Assembly

Technical Details & Skills

- CAD modeling and assembly in SolidWorks
- Structural frame design and motion system layout
- G-code processing and Arduino integration
- Problem-solving in multi-functional machine development



Electrical Schematic



Physical Assembly

Results

The final prototype successfully demonstrated rotational switching between heads and basic motion control. The device met spatial footprint constraints and mechanical strength requirements. The project served as a strong starting point for continued development, particularly in advancing firmware and multi-head control systems. The final presentation and report were highly rated by faculty and peers, validating the project's innovation and engineering rigor.

Bolt Cutter Reverse Engineering

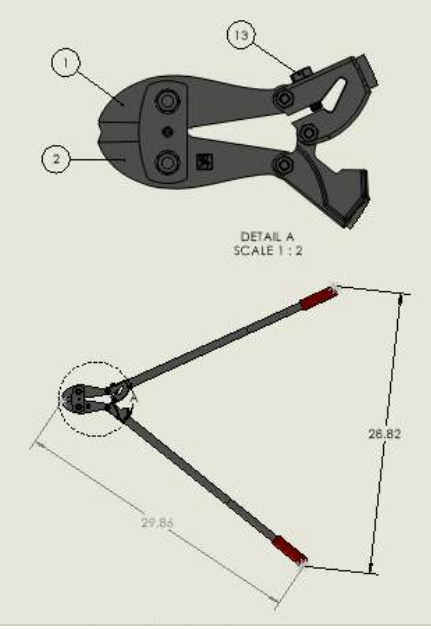
Objectives: Disassemble and analyze a mechanical tool to reverse engineer it into a CAD model and drawing package. Gain insight into part relationships, mechanisms, and manufacturability.

Outcomes & Contributions

- Disassembled bolt cutters and documented all parts with Calipers, rulers, and other measuring tools.
- Created detailed CAD models of each component using SolidWorks.
- Generated an assembly model and a full set of engineering drawings.
- Analyzed material selections for each part.
- Performed hand-calculated static analysis for each part

Technical Details & Skills

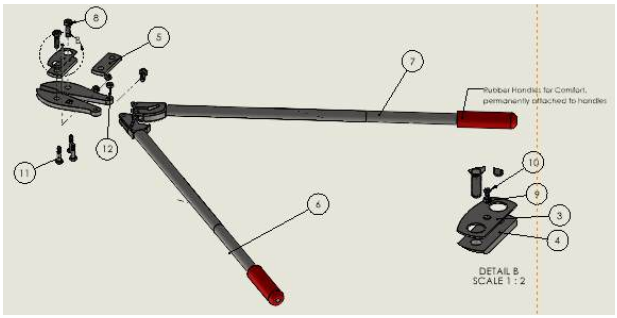
- Reverse engineering methodology
- Mechanical linkage understanding and 2D sketch replication
- SolidWorks part modeling and mechanical assembly
- Technical drawing development and dimensioning



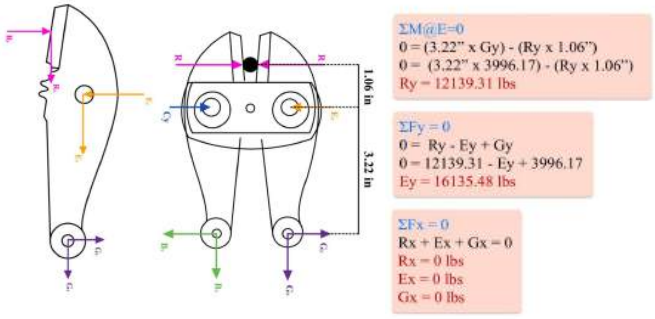
CAD Assembly Drawing

Results

The completed CAD model accurately represented the bolt cutters' operation, including their compound leverage mechanism. The report provided a clear understanding of the reverse engineering process and detailed insights into the tool's design and functionality. The project reinforced key concepts in mechanical design and assembly alignment.



CAD Assembly Drawing (Exploded View)



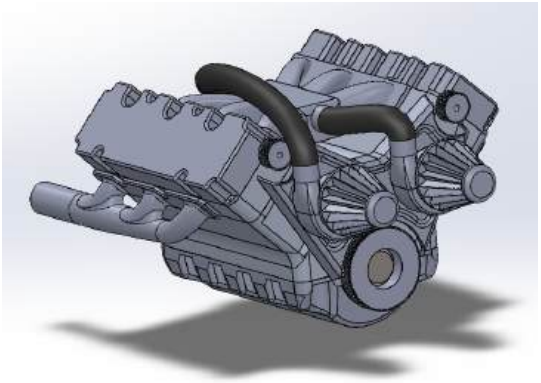
Static Analysis of Bolt Cutter Jaws

3D Modeled V6 Engine

Objective: To acquire working knowledge of a V6 engine by researching the functional roles and typical materials used for each major component.

Outcomes & Contributions

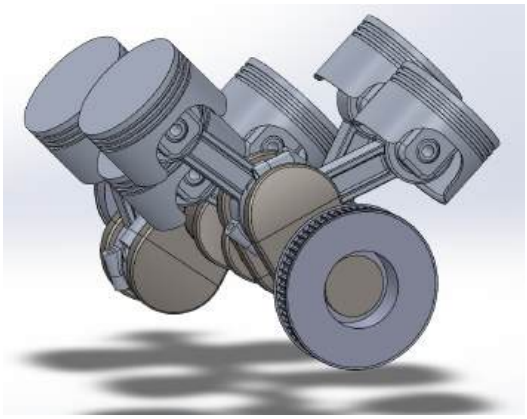
- Developed a general understanding of how each engine part contributes to internal combustion and mechanical motion
- Conducted independent research on common industry materials for over 15 components
- Compiled a clear, organized report linking each component to its function and typical material
- Improved skills in technical documentation and engineering research.



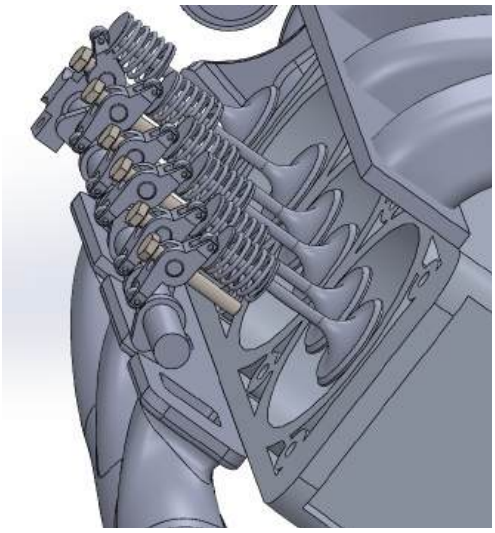
CAD Model Assembly (Isometric View)

Technical Details & Skills

- Built a full 3D model of a V6 engine in SolidWorks based on a tutorial without detailed specifications of engine type or geometry.
- Researched the function, purpose, and commonly used materials for major parts such as pistons, crankshaft, valves, and exhaust manifold.
- Focused on the proper use of material for its intended function and gained an in depth understanding of the functionality of an engine



CAD Model of Piston Mechanism Assembly



CAD Model of Cam Shaft & Valves

Results

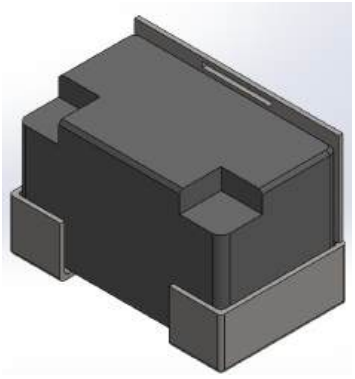
Created a simple reference guide with their commonly used materials. For instance, forged aluminum is often used for pistons due to its lightweight properties, and cast iron is frequently used for exhaust manifolds for its durability. This project provided foundational knowledge of component function.

Mini Chopper Motorcycle

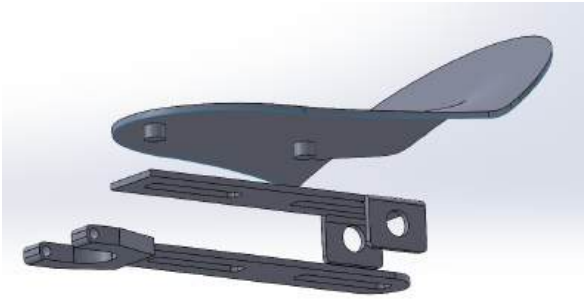
Objective: Design and fabricate key mechanical subsystems for a miniature chopper motorcycle, focusing on ergonomic seat design, load-bearing functionality, and battery housing integration. The project emphasized structural performance, manufacturability, and rider comfort through iterative design.

Outcomes & Contributions

- Designed and prototyped a seat pan fitted to the frame's main bracket within an 8×10-inch constraint
- Modeled and validated geometry in SolidWorks using 3D-printed ABS prototypes
- Developed a spring hinge to reduce seat deflection and improve comfort
- Designed a battery mount for stable and accessible integration with the frame



Battery Mount Assembly



Seat Pan & Spring Hinge Assembly

Finished Product

Technical Details & Skills

- SolidWorks modeling, assembly design, and fabrication documentation
- Rapid prototyping using 3D printing for geometry verification and fit testing
- Collaboration in a multidisciplinary team environment for concept testing and manufacturing readiness

Results

The final assembly achieved structural integrity and ergonomic balance through iterative refinement. The spring hinge effectively absorbed dynamic loads, and the seat pan met comfort and dimensional goals. The battery mount successfully completed the electrical subsystem housing, contributing to overall system functionality. The project demonstrated practical integration of 3D design, fabrication, and mechanical testing within a small-scale motorcycle platform.

Doppler Project

Objectives: Conduct a lab experiment to demonstrate and analyze the Doppler Effect using controlled sound wave experiments and computational methods.

Outcomes & Contributions

- Set up an experiment setup involving a revolving sound source via a speaker and a stationary microphone.
- Designed and 3D printed housing for sensors, then produced detailed drawings using SolidWorks
- Collected and analyzed frequency shift data to quantify the Doppler Effect.
- Developed and utilized an Arduino code using IDE to control the motor, microphone, and speaker.
- Documented findings in a formal lab presentation.

CAD Model Rev A

Technical Details & Skills

- Basic acoustic theory and wave behavior
- Experimental setup design and execution
- Data collection and frequency analysis
- Technical communication via PowerPoint and written reporting

Physical Assembly

CAD Model Rev B

Results

The demonstration effectively showcased the real-world application of the Doppler Effect and was well-received by peers and instructors. The slide deck supported the live demonstration with visuals and theoretical background, reinforcing comprehension of the phenomenon.

Design of Industrial Barbeque Grill

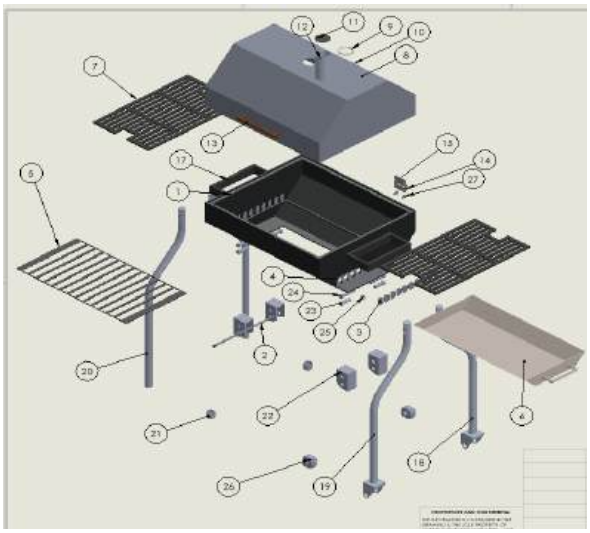
Objectives: Design a robust, mobile grill system tailored for large outdoor gatherings and commercial-scale cooking. The project focused on meeting specified requirements such as weight limits, portability, and modular design, while ensuring functional and practical features.

Outcomes & Contributions

- Designed key grill components, including the base frame, grill racks, and side attachments.
- Created detailed SolidWorks models and associated technical drawings that can facilitate commercializing prototyping.
- Presented Preliminary Design Review to faculty and peers and received outstanding review

Technical Details & Skills

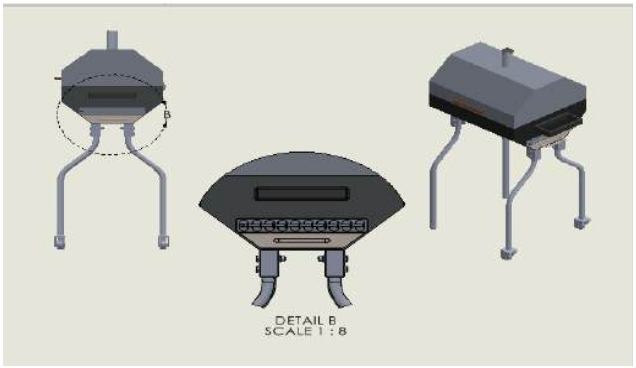
- Mechanical CAD modeling and drawing generation using SolidWorks
- Engineering documentation and technical presentation



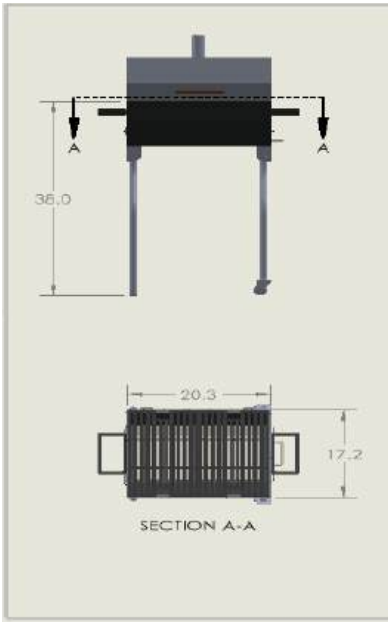
CAD Model Assembly (Exploded View)

Results

The final design package included complete SolidWorks assemblies, detailed part drawings, and a bill of materials. While a physical prototype was not constructed, the grill design was well-received for its practicality, mobility features, and attention to structural detail. The project demonstrated a clear understanding of mechanical design and human factor, and product development workflows.



CAD Model Assembly

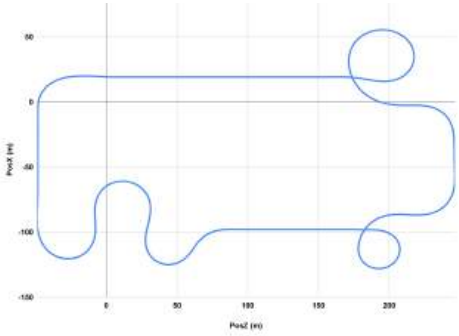


Roller Coaster Design

Objectives: To design an immersive, Minecraft-themed roller coaster incorporating mechanical safety, environmental effects, and interactive VR screens. The ride aimed to meet ASTM amusement safety standards while delivering a thrilling and memorable user experience.

Outcomes & Contributions

- Created a full ride layout with realistic biome transitions, a dynamic storyline, and portal based ride sequences.
- Performed calculations on ride forces, braking distances, and deflection under loading conditions.
- Contributed to mechanical subsystem development including chain-lift drive, anti-rollback mechanisms, and emergency brakes.

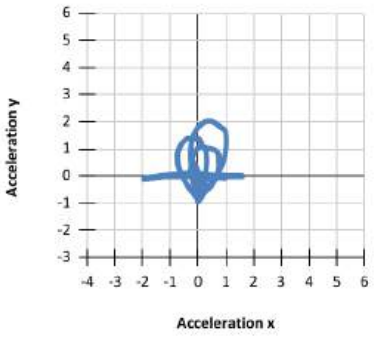


Track Layout

- Participated in VR and environmental effect integration to enhance user immersion.
- Presented project during conceptual, intermediate, and final design reviews

Technical Details & Skills

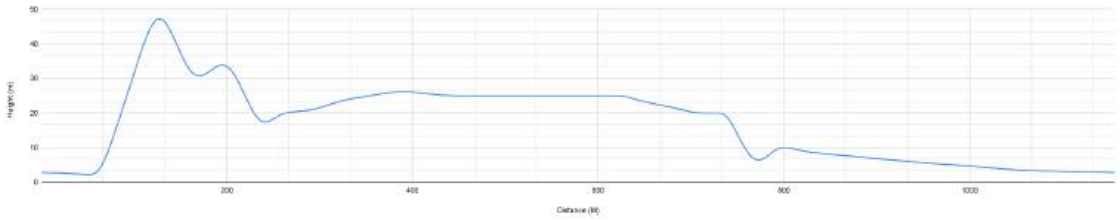
- Applied design criteria from ASTM F2291 to ensure structural and rider safety.
- Modeled ride dynamics and structural stresses using analytical equations and simulation principles.
- Developed restraint systems using patent references and FOS calculations.
- Conducted buckling and fatigue checks for support columns using Euler-Johnson methodology.
- Designed emergency braking zones and overhang clearance with envelope analysis.



Acceleration Safety Charts (X vs Y)

Results

Delivered a comprehensive engineering plan for a 1.75-minute ride spanning 1156.5 meters with four trains. Validated mechanical systems (chain lift, support structure, restraints, braking) against worst-case loads. The project merged storytelling, VR integration, and mechanical safety into a professional grade concept suitable for theme park applications.



Elevation Chart