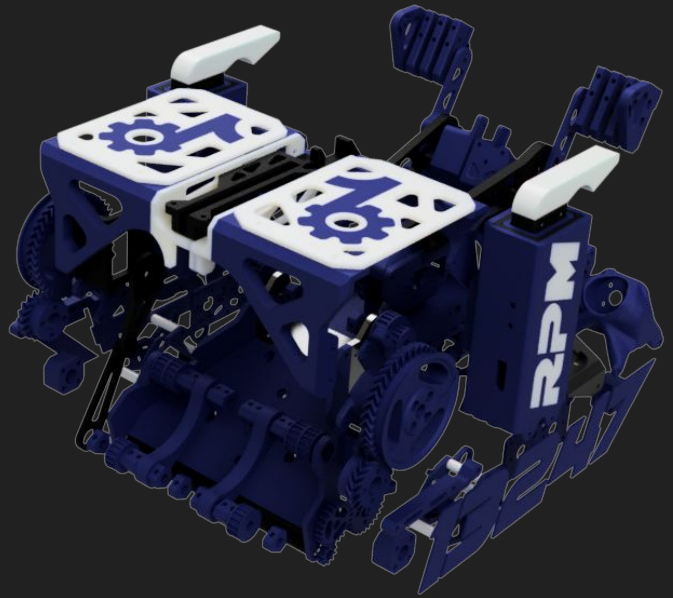
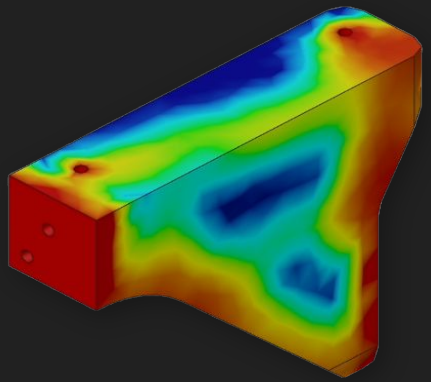
2023-2024 Season Robot

The challenge for this season included intaking and orienting different colored hexagon game pieces. This robot would passively intake the game pieces from the left side and outtake them / orient them on the right side.

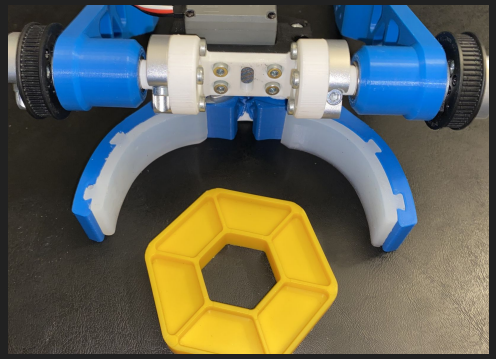


This image shows every 3D printed part on our robot this season. This robot ended with a total of 160 3D printed parts from multiple filaments like PLA, ABS, ASA, and TPU. Not seen on this image but can be seen on the other are the custom CNC cut aluminum plates used for structure in the frame of the robot

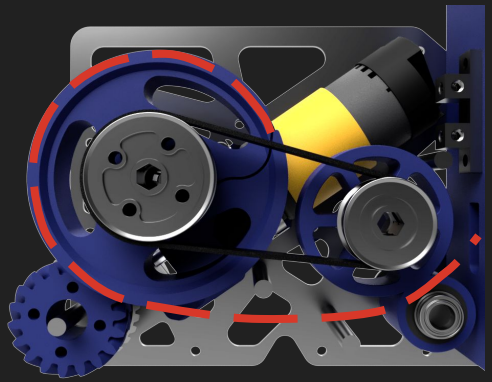
Challenges and Key Features



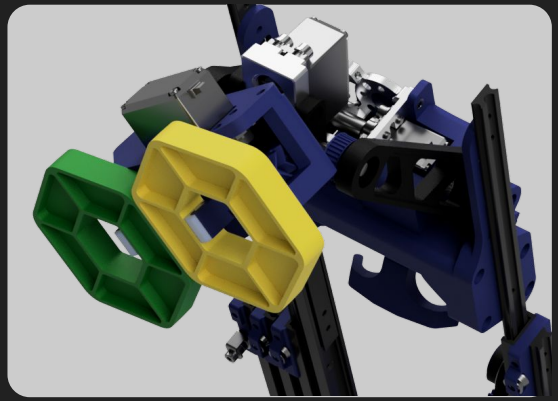
One issue with this robot was reducing weight, to solve this, we utilized topology optimization to find where to remove material without sacrificing structure.



In the original design, the robot would intake the game pieces with a claw. This ended up being too slow which drove our decision to switch to a passive noodle-based intake



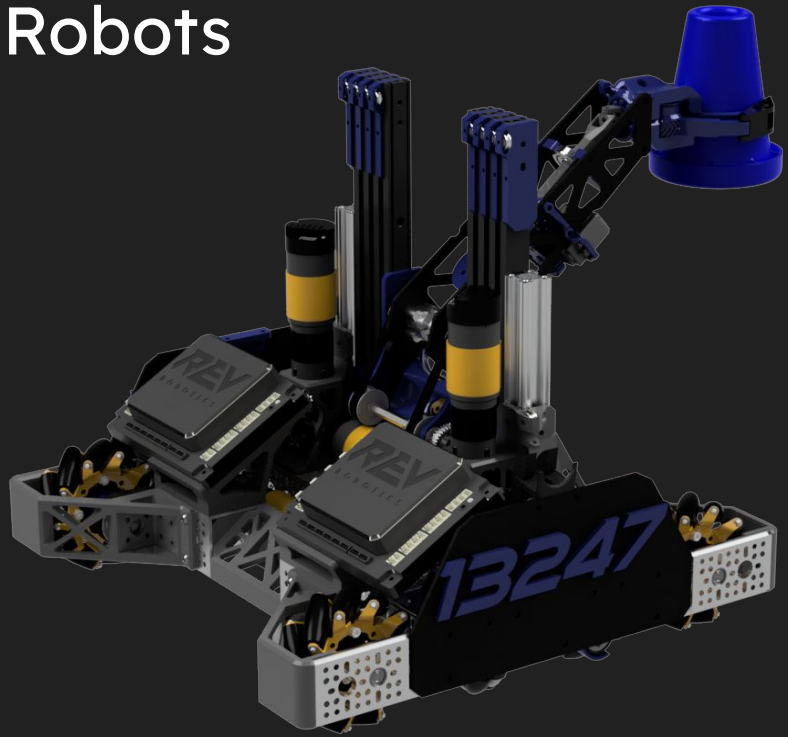
At the end of the match the robot could score points by climbing a bar 2 ft off of the ground. To do this, our robot used a spool and winch system to push telescoping 3D printed slides to the height



The outtake of the robot grabbed the game pieces by the middle and could rotate 300 degrees for any type of orientation necessary.

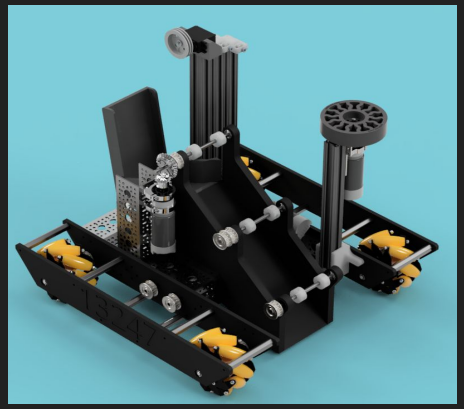
2021-22 and 2022-23 Season Robots

The challenge for this season included picking up and placing blocks and balls at various heights. This design could intake game pieces from either side and outtake them through the middle.

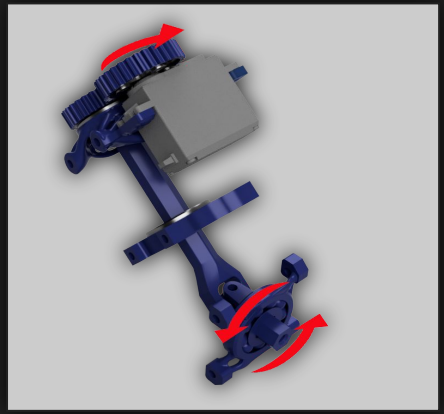


This season's challenge involved stacking cones on tall junction poles in different places through the field. The main arm for this design swung through the middle and allowed us to score cones from either side of our robot.

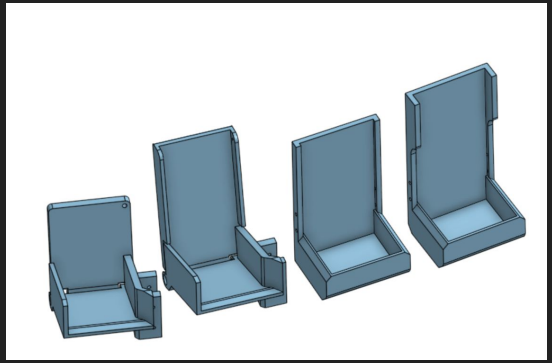
Challenges and Key Features



In this challenge, we completely changed the design of our initial robot as seen here. The main concept was similar overall



One challenge with this robot was scoring on both sides of the bot. Our solution was a 3D printed universal joint system embedded into our swinging arm to rotate the claw for scoring on both sides.

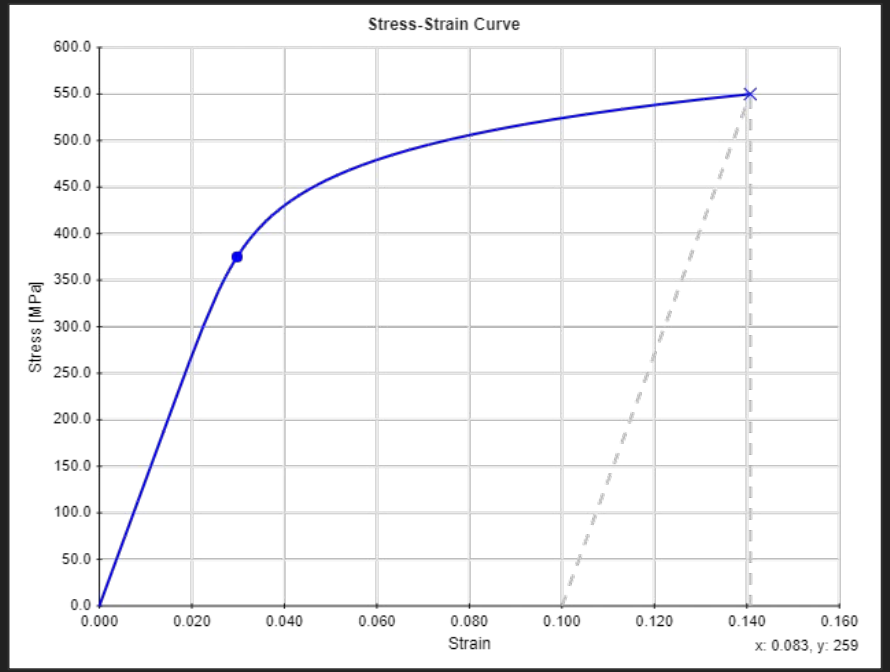


This robot also was where our team involved our first ever 3D printed part to our bot. It was this bucket used to score game pieces.

This claw used in this challenge used a 4 bar system to wrap around the game piece and secure it. The black TPU ends to the claw helped increase success in controlling game pieces.

Tensile Test Machine (2024)

This project was made because of my curiosity in materials science and the limits of 3D printing. By spinning the dial on the right, a lead screw would pull on a load cell and then on a sample 3D printed part. With the reading of the load cell and measuring the distance the sample part deformed, a stress-strain curve was made.



The curve above is a fit to a data set from the machine. The linear part of the curve represents the sample's elastic deformation and the leveled off part of the curve represents the sample's plastic deformation.

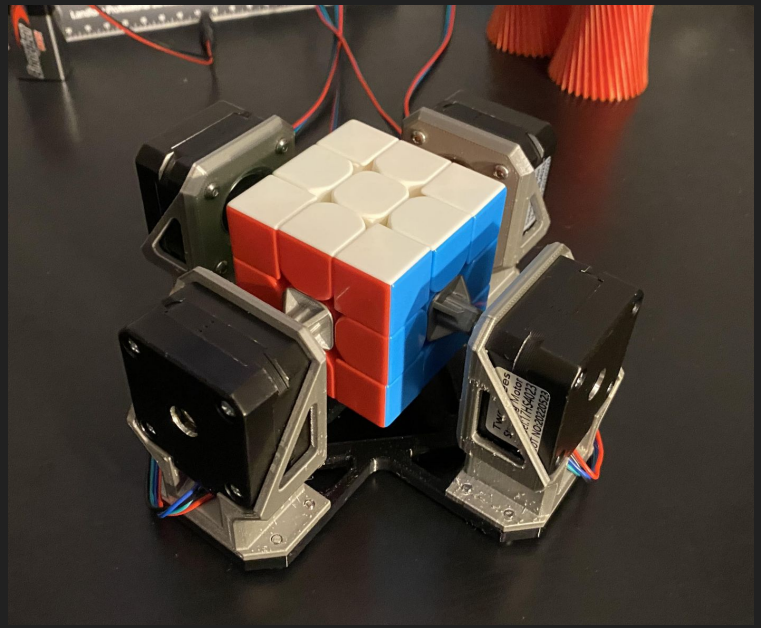
Clock (2023)

Starting with a simple escapement prototype, I challenged myself to make a working clock last year. The setup for all the gearing can be seen below and the clock was powered by a coiled up steel torsion spring.

Despite the prototype escapement working, the clock doesn't actually accurately tell time. The imprecision in the 3D printed gears and the friction built up between all of the connections between the gears causes the clock to often run fast or slow.

Rubik’s Cube Solver (2022 and Now)

One of my first personal projects was this rubik’s cube solver which used 4 stepper motors and an arduino to control sides of a face to a rubik’s cube. This design worked, but the colors of the faces when mixed up needed to be manually given to the arduino.



I am currently revisiting this project and I have designed a new solution which will use a color sensor to identify the colors of each face without manual input.