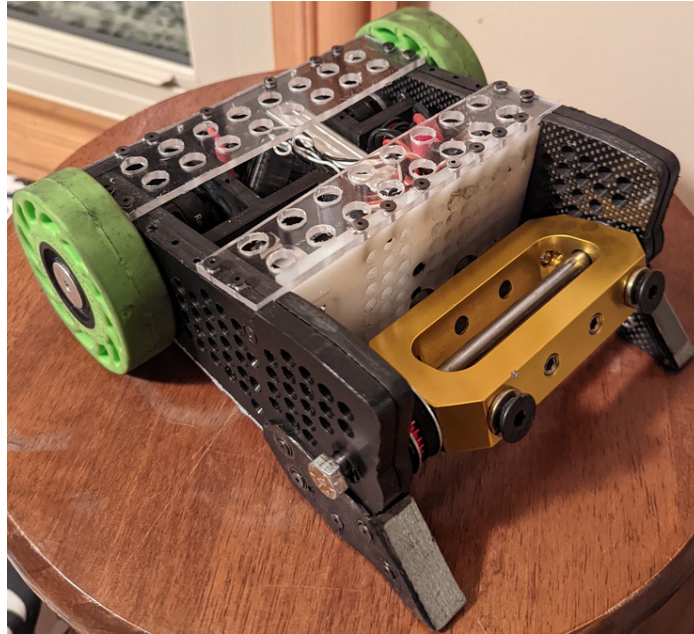


# SAAGAR ARYA

## COMBAT ROBOTS

OCTOBER 2019 - PRESENT



April 2022 - Present 3lb Drum Spinner V2

## SKILLS LEARNED/USED

3D Printing/Modelling

Ultimaker Cura

Arduino IDE

MOJO

Electrical Engineering

Material Science

CNC Software

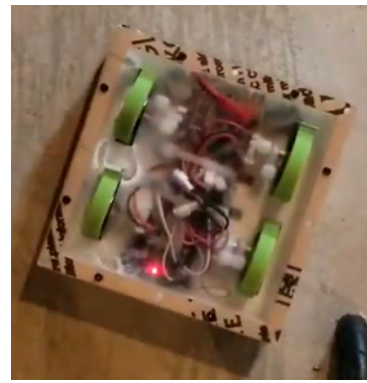
Glow Forge Software

## SUMMARY

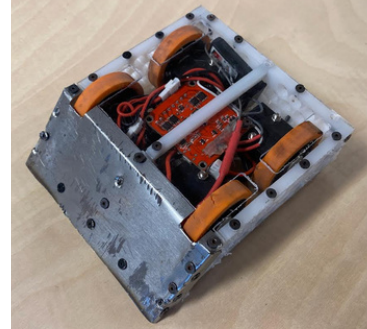
In 9th grade after transitioning to a new school, I joined the Robotics Club. The Club participates in the National Robotics Challenge (NRC) which happens once a year and consists of a variety of events. After reading the contest manual, I decided with a new friend Jim to begin working on combat robots. Combat Robots provided the unique challenge of creating an efficient yet durable robot under the weight limit of the division. This meant that ideas had to be creative which entailed a constant process of creating and revising. As such, the ideas we started with rarely ended up in the final version of the robot - from originally using zip ties to hold the motors to a custom motor case that screwed through the chassis, or the constant changing of motors of different RPMs and torques, to the size, capacity, and voltage of the battery.

Another aspect of this challenge was selecting the right materials. Considerations like weight, durability, strength, whether the material (ex. Polycarbonate, HDPE, UHMW, Steel, Aluminum, Composite 3D printing materials, Carbon Fiber...) crumpled or stayed rigid, and if we could even cut or form them at school were important. When we first started we often found ourselves asking whether we should include 3D-printed parts. 3D printing provided an easy way to make complex parts yet tended to be brittle and easy to cut through. As we continued to develop we learned how to avoid using 3D printing parts, dividing up complex components into simpler parts that could be milled easier forcing simpler designs with fewer points of failure. Oftentimes, we found ourselves watching fights of kits others bought online, yet the fun of the robot was in creating a unique design from scratch, not something just bought and assembled.

In my freshman year, although the NRC was canceled due to COVID, Jim and I continued to develop our robots and create new ones. By the time the competition came around my Sophomore year, the two robots Jim and I were competing for placing first and second in the 1lb division.



August 2019 - August 2020  
1lb Ram Robot



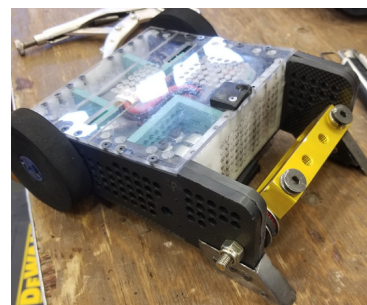
November 2019 - April 2022  
1lb Ramp Robot



November 2019 - April 2021  
1lb Horizontal Spinner



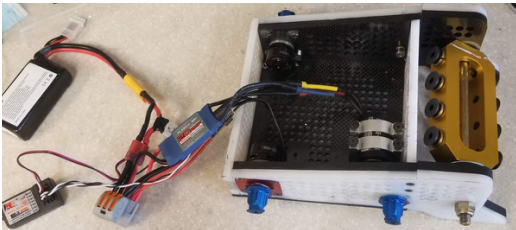
August 2021 - February 2022  
3lb Ramp Robot



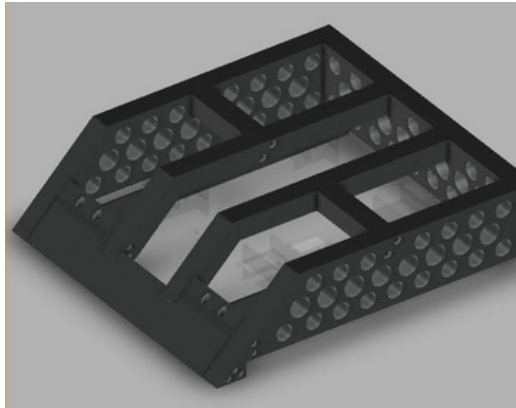
February 2022 - April 2022  
3lb Drum Spinner V1



Over the summer after my Sophomore year, we worked on creating a new robot, scaled to be a 3 lb combat robot, and competed in our first professional competition in Harrisburg Pennsylvania. Although we lost all four of our fights, we learned from the experience, and took inspiration from other robots which led to a complete redesign of our robots. We changed our motors and their electronic speed controllers, the battery, and the materials we made it out of. Additionally, we added a 350-gram aluminum bar which spun at roughly 3500 RPM. Entering this additional robot in the NRC we claimed first and second in the 3lb division and 3rd place in the 1lb division. In our next professional competition at Sandusky, OH, a few months later, we came 3rd out of 20 for our 3lb robot and 5th out of 16 for our 1lb robot.



First Attempt of a Belt Driven Weapon



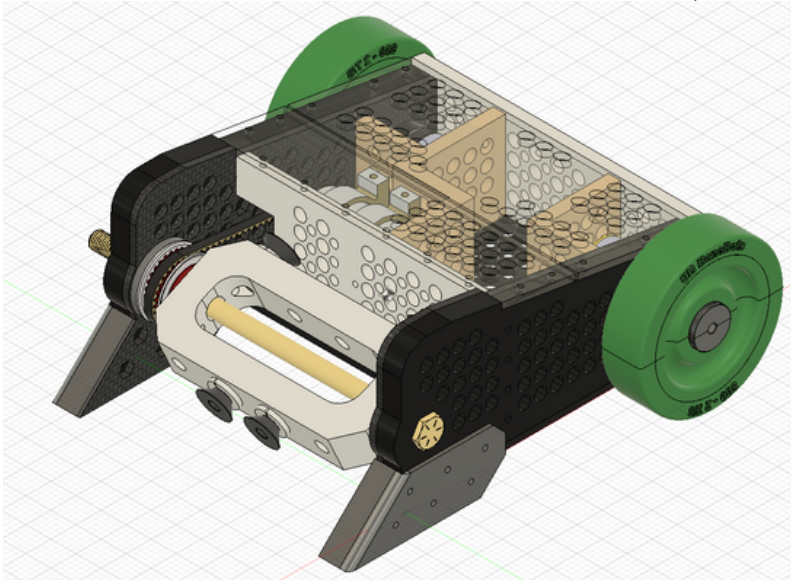
3D Rendering of 1lb Ramp Robot



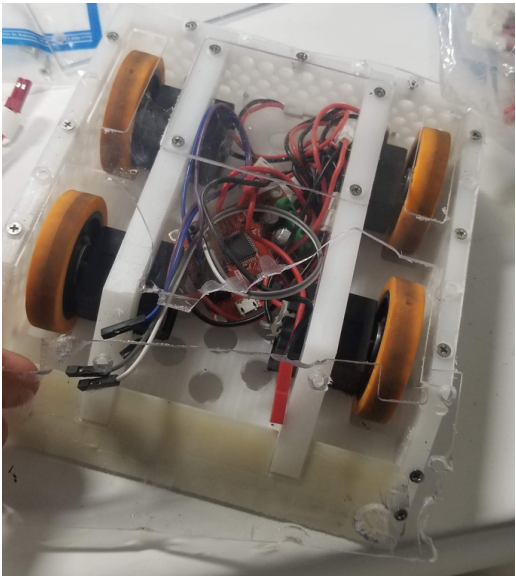
First Draft of 1lb Spinner.



Final Version of 1lb Spinner



3lb Drum Spinner 3D Model



First Professional Event (2021) Post Fight Damage Pictures



Jim(Left) Me(Right) After Placing 3rd and 5th in a Professional Competition



3lb Ramp Robot & 1lb Robot & 1lb Spare Chassis Before First Professional Competition



First Attempts of Mating a Brushless Motor and Gear Box