# Record Robotics

Belmont STEAM Alliance Corp.
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Thank you for your support of Record Robotics #6731 for the 2021-22 season! After the challenging all-virtual year in 2020-21, this year was both ambitious and successful on many levels for our team.

First, we created a separate 501(c)(3) organization, the Belmont STEAM Alliance Corporation, which now serves as the umbrella organization for Record Robotics. In our two previous seasons, we had been under the auspices of the UMass 4-H program, which, although helpful, also limited our ability to make independent decisions. Having our own non-profit organization this year has been tremendously helpful.

Also this season, with the help of our sponsors, we were able for the first time to rent a dedicated office space where the team could meet, design, build, and code our robot for the FIRST (For Inspiration and Recognition of Science and Technology) Rapid React challenge and competitions. A successful team fundraising campaign, as well as our Robotics students volunteering their time to clean, paint and organize the space, made this move possible. We love our new home!

Our focus this year was not just on FIRST and competitions. We also increased our outreach projects, both in the schools and for town events, and we sponsored and assisted two local FIRST Lego League teams. It's very important to our team that we build a supportive local community not only at the high-school level, but also for middle and elementary students, so that younger kids feel inspired about robotics and look forward to becoming future Record Robotics team members.

Last but certainly not least, we competed in two successful FIRST Robotics Competition events, which culminated in our team being selected for the top-seeded alliance at the second competition, and where we earned a second-place finish for the event and qualified for the District Championships.

In this annual report, you'll find the specifics of our operations and finances, as well as details about our current season. Please contact us if you would like any further information.

Sincerely,
The Record Robotics team

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*Pictured above: Record Robotics "mixing it up" at the WPI Central District Event, April 10, 2022*

Record Robotics is a student-led team that prioritizes the leadership and hands-on participation of all students. This season, our team members demonstrated endurance, excellent teamwork and problem-solving skills, and were thrilled to compete once again at in-person FIRST events.

The FIRST program inspires our students to pursue careers in STEM fields, with our ten graduating seniors choosing majors in engineering, computer science, and game design. In addition to this, our students develop important life skills like leadership, collaboration, time management, and decision making. We have seen our students gain in confidence this season and it is wonderful to witness their enthusiasm and passion for STEM.
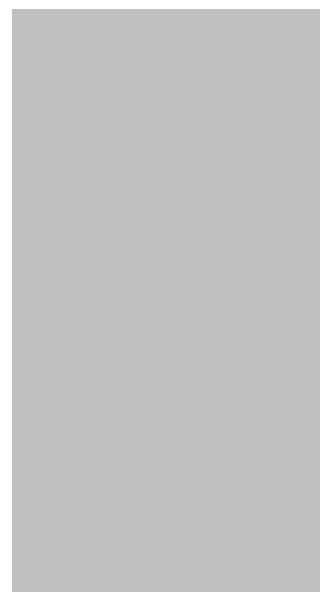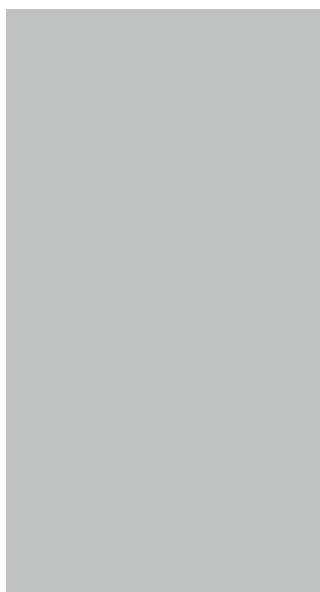
# The Creation of "Munchkin"
## The Design





The 2022 FRC challenge was to build and program a robot that can pick up balls, shoot them into hoops positioned at two different heights, and at the end of the game, be able to lift itself up and traverse a series of monkey bars.



Our build season started as fully remote due to COVID concerns. At that time, we formed groups that could meet online to brainstorm ideas and prototype different parts of the robot, and then create rough CAD models. After about four weeks, we formed small pods of four students and two mentors, each one responsible for a different robot component, and began meeting in-person to build the sections of the robot. In mid-February, the team resumed integration meetings to piece the parts of the robot together and finalize our design.

*On this page: student using drill press (top left), band saw (top right), and power drill (bottom) to build robot parts*

# The Creation of "Munchkin"

## The Build

Since Record Robotics does not have access to custom machinery, one of our team's challenges is to find creative solutions to our problems. For example, we needed an internal gear of two feet in diameter to operate our lift, so our engineers created one by screwing individual bike chain links to a piece of wood in an arc. In addition to this, the team came up with a solution to move the ball up into our shooter using servo motors to push it into place.

Throughout the season, our business division has been dedicating their time to restoring the team's online presence through social media including Instagram and Facebook, as well as completely redesigning the website. To see more images and team content, visit recordrobotics.org or @recordrobotics on Instagram and Facebook.

*On this page: students working on Munchkin the robot over February break*

# The Creation of "Munchkin"
## Programming
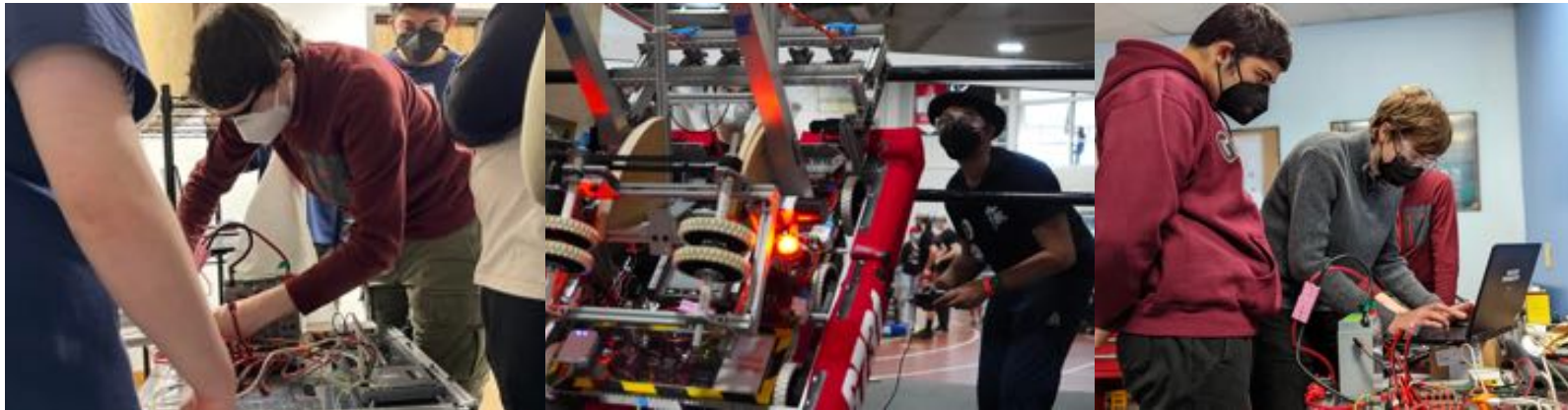


Programming is vitally intrinsic to the success of the robot. The programming team creates the brain of the robot; the code they write enables the robot to run. Our programmers are also the main drivers of Munchkin in competition, and train other members of the team in driving the robot.



```java
 * Rotate lift towards target
 */
@Override
public void initialize() {
    // Calculate direction
    double dx = _target - _rotator.getPosition();
    _direction = dx > 0 ? Direction.FORWARD : Direction.BACKWARD;

    _rotator.rotate(_speed * _direction.value());
}
```

This year, our programmers had to work hard in a short span of time to ensure that our robot had a functional control scheme. They also automated some non-required elements for the competition, including the lift sequence. The programming division is continuing to focus on rewriting the code from this season and prior seasons, using resources like Github to develop a more organized and readable format.

*On this page: student members of the programming division working on Munchkin's electronics board and testing the robot*

# Competitions
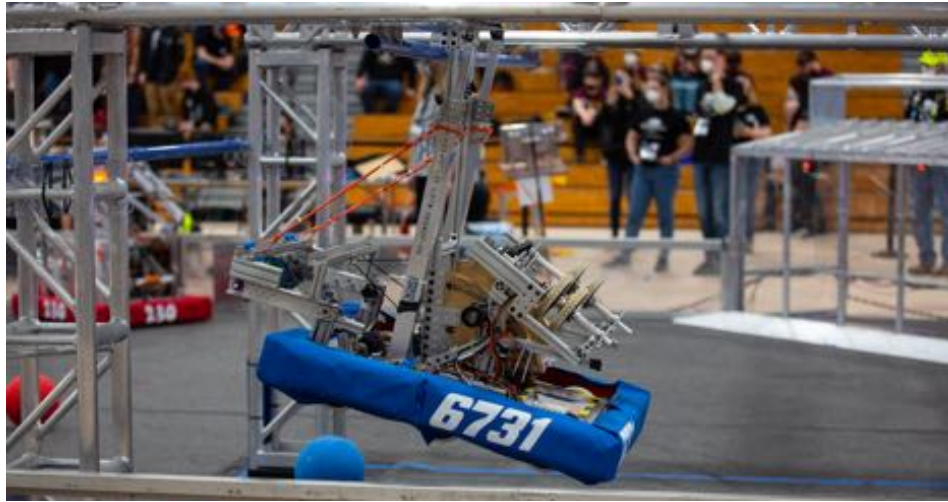
*Pictured above: "Munchkin" completing the traversal climb at the Shrewsbury Central District Event*

Our team was very excited for the first tournament this year. It was a relatively new experience for almost everyone, because we hadn't gone to any competitions since 2020. While the robot didn't run as smoothly as we had hoped, our months of hard work did pay off as Munchkin completed all the required tasks, and even reached the top bar on the climb!



*Pictured above: Record Robotics members celebrating after being selected to the top alliance*

On April 9th, Record Robotics attended the FRC tournament at WPI, and it was a massive success! Munchkin pulled off one spectacular play after another and landed us in the top alliance for the finals of the competition. Our success at WPI was a direct result of the many hours the team spent working on the robot during the two weeks between tournaments. We were very proud of Munchkin's transformation from a semi-functional robot after the Shrewsbury competition to a real competitor at WPI.

# Community Events

### UNICEF Family Fun Night



The UNICEF club at Belmont High School asked our team to demonstrate our robot for families with young children. The event was wildly successful with kids lining up to interact with Munchkin.

### Burbank STEM Night



One of our local elementary schools asked us to attend their STEM night, to show the next generation of robotics kids what it's like to be part of Record Robotics!

### Town Day



We demonstrated our 2019 and 2022 robots at two consecutive Belmont Town Days, and talked to families about FIRST robotics and our team. It was a popular outdoor outreach event, particularly for young children who loved interacting with our students and the robot.

### Alumni STEM Panel



In collaboration with Belmont High School, we arranged for Record Robotics alumni currently in college to to answer questions from students and families about college life and their decision to major in a STEM field. This was a successful, first-of-its-kind event in Belmont and we hope to make this an annual tradition.

# FLL Teams
## FIRST Lego League

This was the first season that Record Robotics mentors and students formally assisted and sponsored local FIRST Lego League teams. The two teams we worked with were both all-girl rookie teams! One team of sixth graders met privately at a team members' house, and competed in the Shrewsbury Qualifier on December 4th, 2021.



The other team, composed of seventh and eighth graders, met at the Belmont STEAM Alliance office, where they used a dedicated FLL room within the space. They chose not to compete in a qualifying event, opting instead to enjoy solving several of the robotics challenges without competitive pressure.

# How It Started



*On this page: the teams also participated in Burbank STEM Night at the Mary Lee Burbank Elementary School on April 27, 2022.*

*" I was inspired to start my own robotics team when I saw all the cool things my brother's high school team was doing. While I was a part of the Fierce Falcons, I learned what it was like to be a part of a team, how to build and code a LEGO robot, and that if I come across a problem, I can always overcome it. I liked problem solving with my friends and programming the robot we made. I absolutely enjoyed robotics and it was a fun experience for me."*

- Fierce Falcons team member

# Media
Newspaper Appearances, Social Media, and Local News Interview


*Record Robotics mentioned in Belmont Citizen Herald*

Record Robotics made an appearance in the local newspaper, Belmont Citizen Herald, after our alliance ranked second at the Central District Event at WPI in April 2022. The page shows images of the team with Munchkin, the robot on the traversal climb, and several team members working on the robot at the competition.

For social media, we knew that build season would be busy, so we created a media plan to retain our online presence on Instagram and Facebook. This allowed our members, many of whom participate in both business and engineering, to split their time effectively.
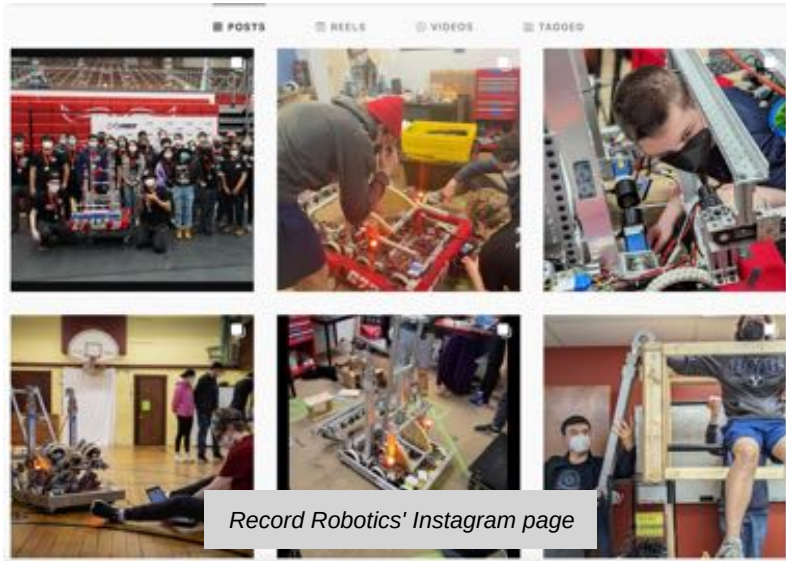

*Record Robotics' Instagram page*


*Belmont Media Center Building*

In April 2022, the Belmont Media Center interviewed Record Robotics' business co-leads. We gave a tour of the new office space while discussing the competition season and plans for the off-season, including several community outreach events. The interview will be available on belmontmedia.org.

# Finances
## Financial Plan and Budget Management


*Students preparing for door-to-door fundraiser in November 2021*

**Financial Plan**

The team supports its activities via corporate sponsorships, STEM grants and individual contributions. As part of our fundraising initiatives, we organized a door-to-door campaign where students helped raise awareness of FIRST & STEM activities in our community. Our students also designed and wrote personal fundraising pages which they sent out to family and friends over the winter holidays, asking for donations to help fund the building of our 2022 robot.

**Budget Management**

Our team treasurer reports weekly to our core mentors and student captains during leadership meetings. Our shared Google Drive contains a finances folder with our budget, a list of major sponsors, and details of our quarterly income and expenses. Sponsorship and grant proposals are written and tracked by our business division, which includes a group of nine students and two adult mentors. Our purchasing system allows team members to request approval for necessary items, and the treasurer completes and tracks all purchases. Financial operations are overseen by the treasurer and the president of Belmont STEAM Alliance Corp.


*Pictured above: marketing members writing to sponsors during pre-season*

# Finances
Donations
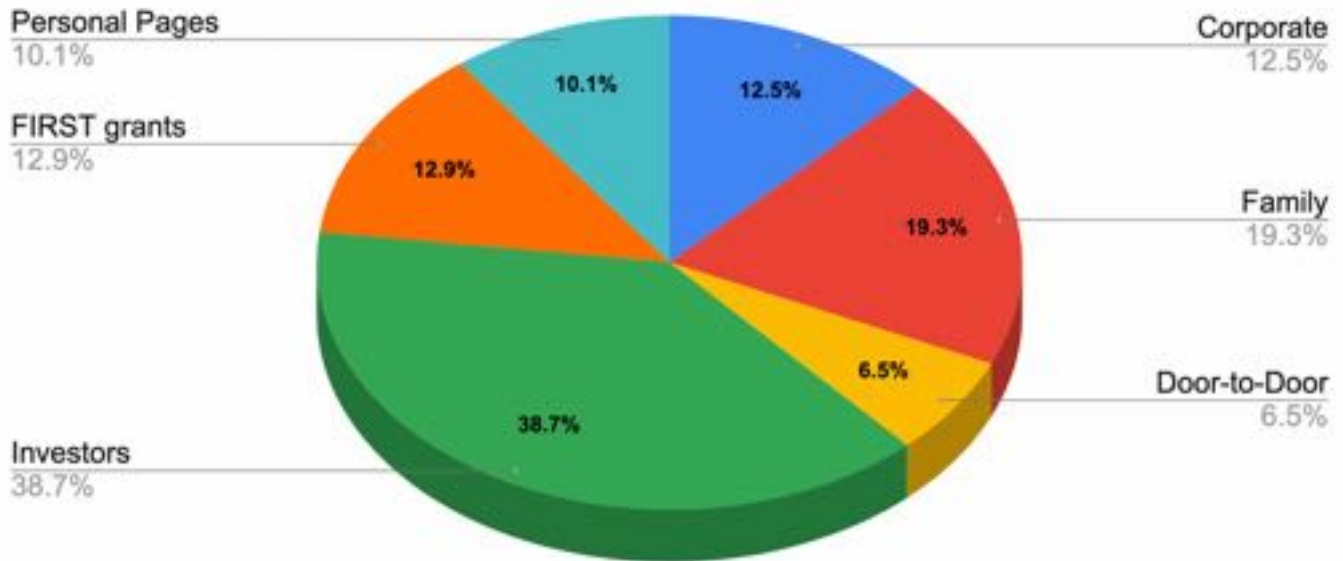


**Income July 1, 2021 - May 31, 2022**

Our team relies heavily on the donations of our members' families and individual supporters of STEM activities in the community. This year, during our annual door-to-door fundraising campaign, our students met two Belmont residents who were particularly interested in hearing about our team, and made generous $5000 donations from their donor-advised funds. Another parent of the team made a $5000 donation, bringing our total donations of "individual investors" to $22,500. The students' personal fundraising pages were a great success and raised almost $6000. Each student customized their text and photos on the page and then shared it with friends or family via email or social media. While we did not reach our corporate fundraising goal this season, we did receive a repeat donation from Motional, and formed relationships with three other local businesses that donated $500 each.
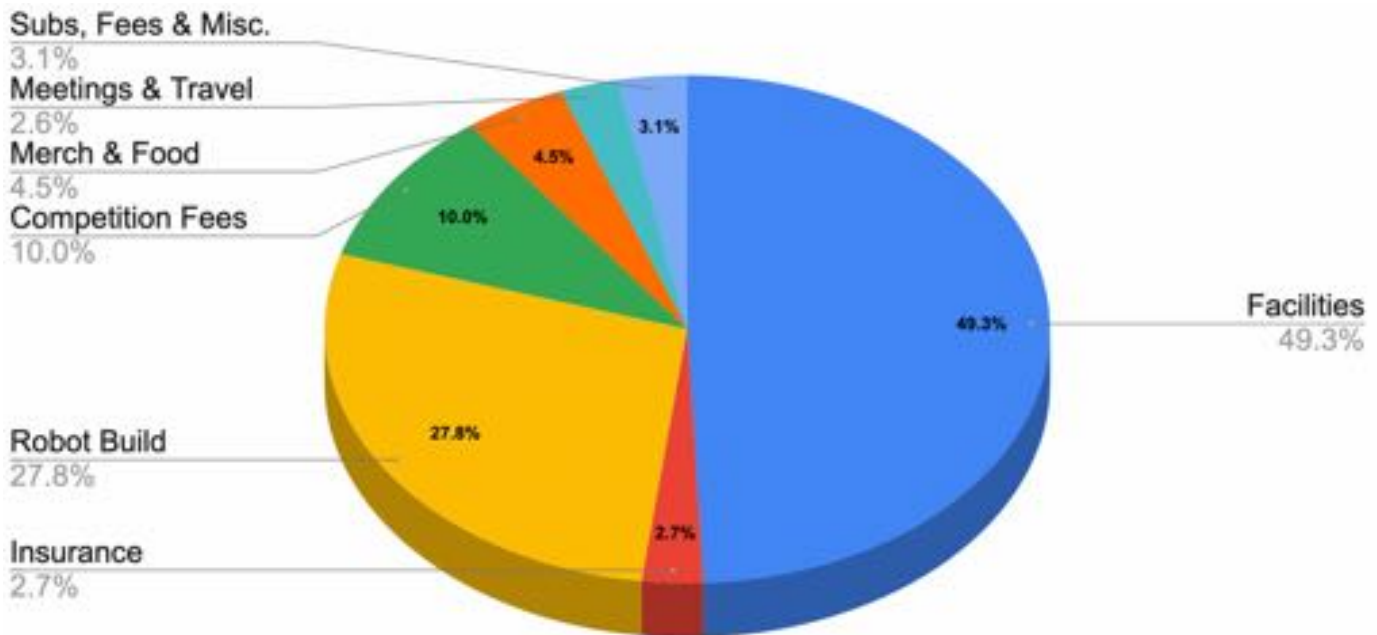
| DONATIONS | |
|---|---|
| Corporate | $7,244 |
| Family | $11,201 |
| Door-to-door | $3,790 |
| Investors | $22,500 |
| FIRST grants | $7,500 |
| Personal pages | $5,897 |
| TOTAL | $58,132 |



*Pictured above: Record Robotics member inside Motional car at Robotics Block Party in 2021*

Subs, Fees & Misc.
3.1%

Meetings & Travel
2.6%

Merch & Food
4.5%

Competition Fees
10.0%

Robot Build
27.8%

Insurance
2.7%

Facilities
49.3%

**Expenses July 1, 2021 - May 31, 2022**

The cost of facilities—rent for our workspace and utilities—made up almost half of our expenses ($26,610). We spent $14,994 on parts, tools, and equipment to build and program our 2022 FRC robot. Unlike previous years, we were able to afford items like Falcon 500 motors, new laptops for more team members to learn CAD, and a more extensive variety of materials, which enabled us to be more creative in our problem solving, and experiment with a new style of drive base for next season. Our next biggest expense of $5400 was the cost of FRC Competition fees. Other main expenses included team merchandise (T-shirts, pins, and gifts for graduating seniors and sponsors), food (we provide dinners during long build sessions and competition days), meetings (e.g. attending the "Students for STEM Advocacy" conference in Washington, DC), and insurance.

| EXPENSES | |
|---|---:|
| Facilities | $26,610 |
| Insurance | $1,465 |
| Robot Build | $14,994 |
| Competition Fees | $5,400 |
| Merch & Food | $2,442 |
| Meetings & Travel | $1,396 |
| Subscriptions, Fees, & Misc. | $1,672 |
| TOTAL | $53,979 |

*Pictured above: Record Robotics' team mascot
"Frunkus," which incorporates the team logo and is
featured on our merchandise and promotional materials*