Team #25619 NOVA PYRA

Engineering Portfolio

2024-2025

NOVA PYRA
FTC 25619

FIRST TECH CHALLENGE

INTO THE DEEP℠

PRESENTED BY RTX

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Mission Statement

Nova Pyra is dedicated to pushing the boundaries of innovation in robotics, fostering creativity, teamwork, and technical excellence. Together, we strive to ignite a passion for engineering and technology.

Team History

FTC 25619, Nova Pyra, was established in 2024 as the first FTC robotics team at Mandeville Junior High in six years. The name "Nova Pyra," meaning "New Fire," reflects the team's origin story - a rekindling of robotics in the school, inspired by the myth of Prometheus, who granted fire to humanity. Our team is composed of 7th-9th grade students from Mandeville Junior High and Mandeville High School, feeding directly into FRC 2992, SS Prometheus. As a rookie team, Nova Pyra is committed to innovation, teamwork, and embodying the spirit of gracious professionalism. Supported by adult mentors and SS Prometheus as well as dedicated sponsors, we embarked on this journey to explore, design, and build a competitive robot while fostering a love for STEM in our community.The 2024-2025 rookie season marks the beginning of Nova Pyra's legacy: a story of learning, growth, and the ignition of a passion for engineering and technology in the next generation.

Evee

Frank

Hailey

Julianne

Sam

Scarlett

Taylor

Viraaj

Wyatt

Victoria

Build | Outreach | CAD | Code

★ = Lead

Mr. Jonathan Holly

- MJH Teacher
- Co-Coach
- Previously coached 4 teams over 10 years between FLL, FRC & FTC

Mrs. Bordelon

- MJH Teacher
- Co-Coach
- New to robotics (Ready to learn!)

Mr. Ryan Harvey

- Professional software engineer
- Code & Controls Mentor
- 6 years of experience with FIRST, from FLL, & FRC

Mr. Brad Villemuer

- Senior Drafter at DDG
- CAD & Build Mentor
- 20 Years of prior experience with CAD

Mr. Matthew Gilbert

- Scientist
- Build & Manufacturing Mentor
- New to robotics

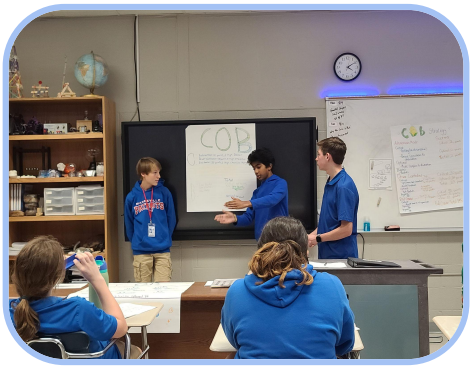
Meet the Team!

Later in the season, we were also approached by a gracious judge, Ms. Laura Meche of Turner Industries, who volunteered to help us reach our full potential by serving as a mentor.

Team Plan

STEP 1: Outreach Projects

- Spread awareness through active support of FTC and reaching out to communities, both technical and non technical.
- Work with local organizations and communities to design interactive projects that reach a wider audience.
- Create an innovative space where young engineers can actively interact with FTC members and gain insight and guidance.
- Assign resource management roles to team members.



STEP 2: Engineering and Design

- Work through the Trial and Error process and continue to innovate in order to create a robot that effectively automates and is able to be successfully controlled to perform specific tasks.
- Carefully read the instruction manual to create resourceful and effective solutions to scoring tasks in this year's FTC game.
- Create unique approaches to designing a fully functional robot.

STEP 3: Construct a Professional Reputation

- Collaborate with FRC2992 & FTC22032 in our shared workspace.
- Diligently focus on our tasks in each meeting., accomplish visible progress across all areas of competition preparation.
- Modeling the goals of FIRST at competition events as well as in our daily interactions with others.

Budget & Cost

Our team made budgeting and financial stability a critical step in our first year. We were able to come to conclusions about important financial decisions by carefully tracking incoming funds as well as expenses and by having necessary discussions about what FTC approved materials we would use.

Fundraising

Funds Received	Description		Funds in FTC Storefront	
$1,519.90	Central Office - Summer Training	Dean Kamen	$750	Rookie Grant
$252.48	Robotics Funds 2018 Rollover		-661.5	Rev FTC Starter Kit
$2,135.94	GTT	Dean Kamen		
$5,000	Deborah Rochelle Grant	Grant		
$500	Struction Solutions - Lopez	Woodie Flowers		
$750	DDG - Villemuer	Dean Kamen		
$275	Berend & Vera Vree			
$1,000	Student Fees			
$170	Intralox			
$50	Lago's Restaurant			

Expenses	Date	Description of Purchase
$608.98	15-May	GoBilda FTC Kit for Summer Training
$295.00	15-May	FTC Registration
$288.96	15-May	PITSCO - Rev Control & Communications Kit
$326.96	15-May	PITSCO - Rev Hub
$1,696.70	9-Sep	Rev Control & Comms Spares
$510.72	9-Sep	AndyMark Field Set
$1,139.91	19-Sep	GoBilda (Order #200052012) drivetrain strafer kit, odometry pods, intake kit, servo kit
$200.20	19-Sep	Rev Battery Charges
$296.71	9-Oct	GoBilda (Order #200056073)
$430.02	9-Oct	Rev Control Hub Backup & V-Groove Pulleys
$742.10	9-Oct	Amazon Order - Ms. Pat has invoice
$536.15	25-Oct	Misumi slides for intake and elevator
$245.31	22-Oct	Amazon Order - Ms. Pat has invoice
$127.08	21-Oct	McMasterCarr - Tools, screws & shafts
$175.00	6-Nov	Qualifiers
$238.70	29-Oct	Rev Order #177274
$492.84	25-Oct	GoBilda PO #200059221
$63.48	29-Oct	GoBilda Order #200060019
$83.87	6-Nov	GoBilda Order #200061647
$18.15	1-Nov	Amazon
$178	8-Nov	Home Depot Plywood
$65.91	11-Nov	GoBilda #200062617
$80.86	11-Nov	McMasterCarr - Tooling to tap M4 screw holes
$78.04	13-Nov	McMasterCarr - Fasteners (M4 Screws)
$48.53	18-Nov	Amazon - Servo extension cords & 1mm cord
$32.14	18-Nov	McMasterCarr - Countersink & Constant Force S
$98.92	2-Dec	McMasterCarr - Screws & Washers
$263.17	13-Dec	GoBilda - Climb Motor, Gears & Parts
$288		Team Shirts
$159.90	6-Jan	GoBilda Torque Servos
$141.67	15-Jan	Studica Servo Power Blocks & Wiring
$51.98	16-Jan	Amazon - Hatchbox 2kg PLA Filament
-$57.93	17-Jan	GoBilda Shipping Refund
$175	5-Feb	State Championship Registration Fee

Accomplishing our goals demands financial accountability. When fundraising, our team approached local business owners to introduce ourselves, describe FIRST robotics to them, & discuss what we could offer to the local STEM community.

Expenses

- Drivetrain Kit
- Motors & Servos
- Wires
- Metal Plates
- Miscellaneous Items Needed for Building
- Team Shirts & Hoodies
- Storage
- Pit
- And more!

Nova Pyra Sponsors:

DDG

NETCHEX

intralox

STRUCTION SOLUTIONS

Ryan and Katherine Harvey

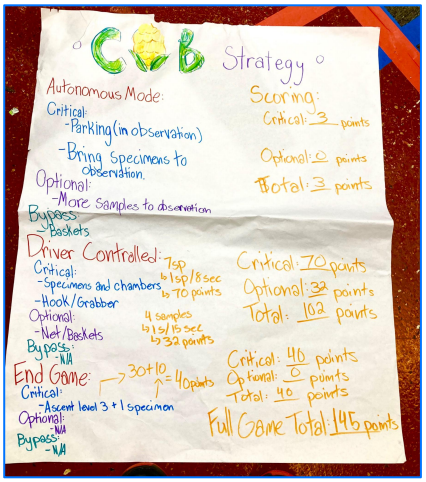
Susie and Ed Weideman

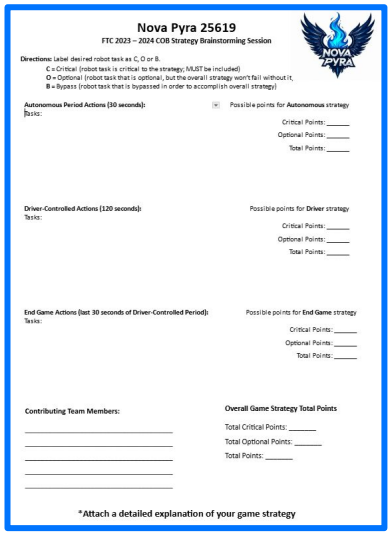
Ben and Vera Vree

Family Vree and Van Shank

Engineering & Design Plan

Our team used a planning technique called **C.O.B** (critical, optional bypass).





Critical:
- High Basket Scoring
- Continuous intake instead of a claw
- Low Climb
- Autonomous sequences

Optional:
- Low Basket Scoring
- High Climb
- Specimen Scoring

Bypass:
- Net Scoring

Focus - **critical** parts to be put on the robot, incorporated **optional** parts into later steps, **bypass** low point value elements.

AUTONOMOUS

1. Score preloaded specimen onto high bar. **(x1)**

2. Take specimens placed by human player and score onto high bar. **(x3) = 80 points**

TELEOP

1. Pick samples from field and score in high basket. **(As many times as possible)**

2. Pick samples from submersible and score in high basket. **(As many times as possible) = 64-89 points**

END GAME

1. Finish picking samples and scoring samples before 15 seconds.

2. Climb to low ascent. **= 23 points**

FINAL SCORE

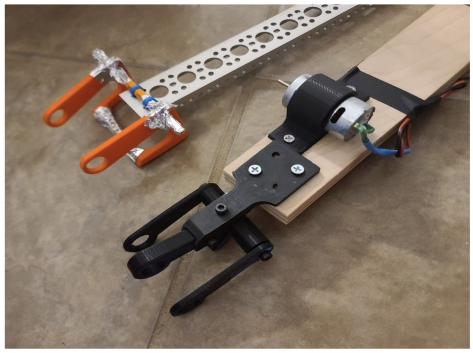
AUTO: 80 points
TELEOP: 64-89 points
END GAME: 23 points

FINAL SCORE: 167-192 points

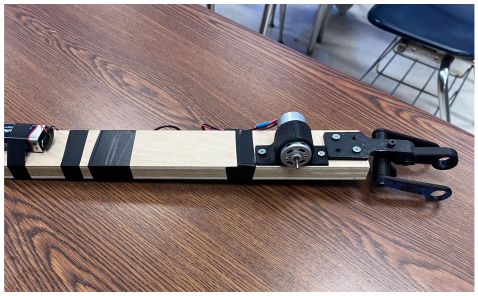
Early Iterations

After deciding on our focus during the game, the team started early ideas of intake.

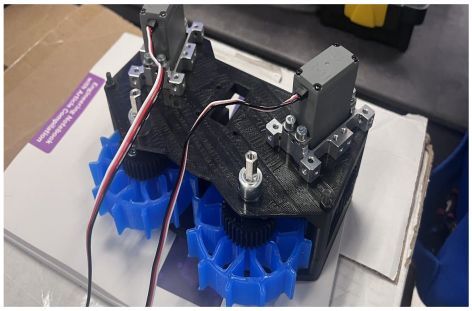
Prototypes



First Intake



Final Intake

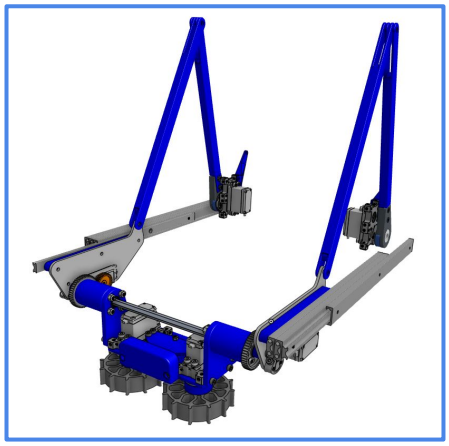


Engineering Design Process Overview

Our Four Main Systems

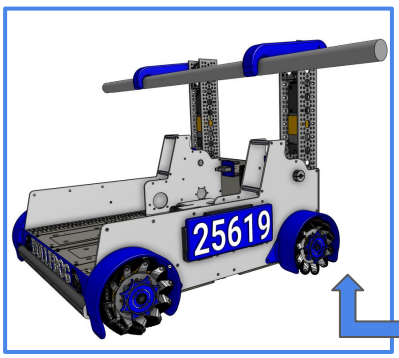
Intake

- First thoughts were on a claw, but soon switched to a continuous intake.
- Silicon wheels to intake the samples and specimens
- Many designs of the intake have been made and tested.



Depositor

- Nicknamed the "Grucket" for being a bucket that is able to grip onto the sample or specimen.
- Has a wrist used for rotating in order to score.
- Consists of:
  - Single discrete Servo
  - Color Sensor

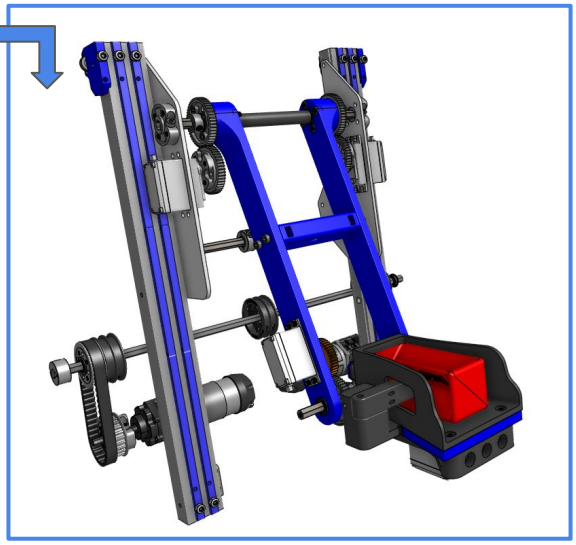


Climb

- PID control
- Consistent performance
- Specific location in End Game

Lift

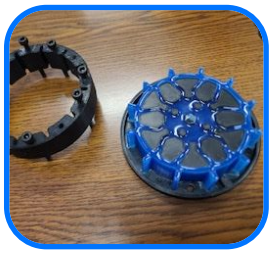
- Gets the depositor into scoring position
- Consists of:
  - Two motors
  - Position PID feedback loop
  - Encoder



Engineering Design Process Details

INTAKE

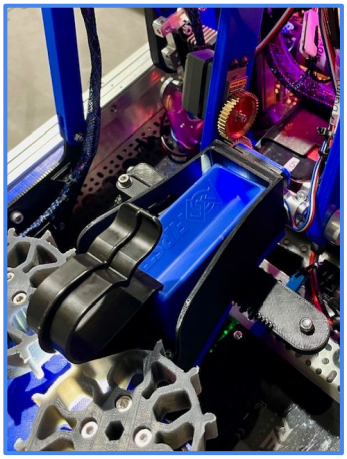
- Created custom intake wheels tailored specifically for this season's game pieces.
- Designed molds using OnShape CAD software.
- 3D-printed the molds.
- Cast the wheels using silicone rubber with Shore 15A hardness, achieving optimal balance between flexibility and grip.
- Iterative design process was key to refining the intake system.
  - Testing the wheel geometry
  - Modifying the mold design
  - Quickly producing new prototypes



DEPOSITOR

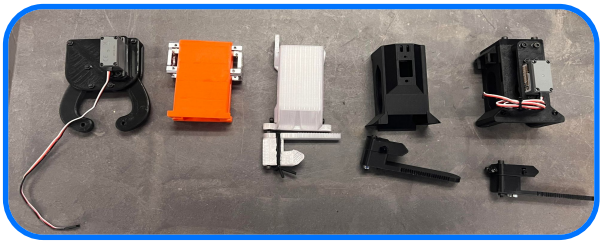
A unique feature of our robot is the "Grucket," named because it combines the functions of a gripper and bucket..

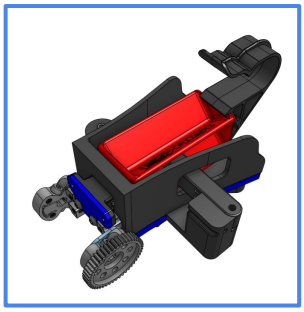
- Intake wheels drive the game piece into the Grucket's bucket
- Held in place by gripper mechanism
- Driven by a rack-and-pinion within the bucket



Final Design

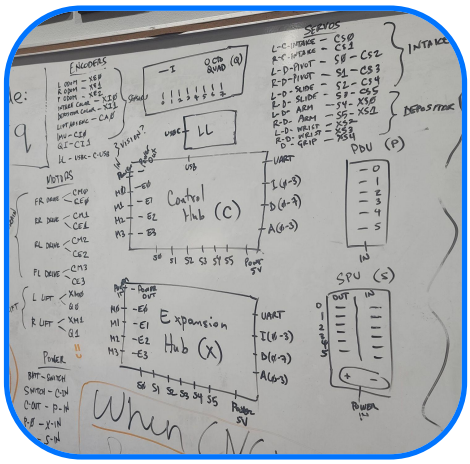
Grucket Iterations

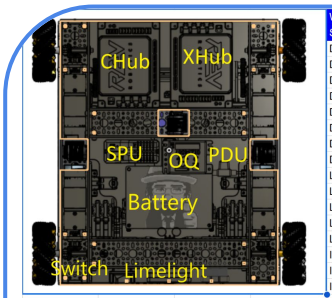




LIFT & CLIMB

- Using sensors and automation to ensure consistent scoring capabilities

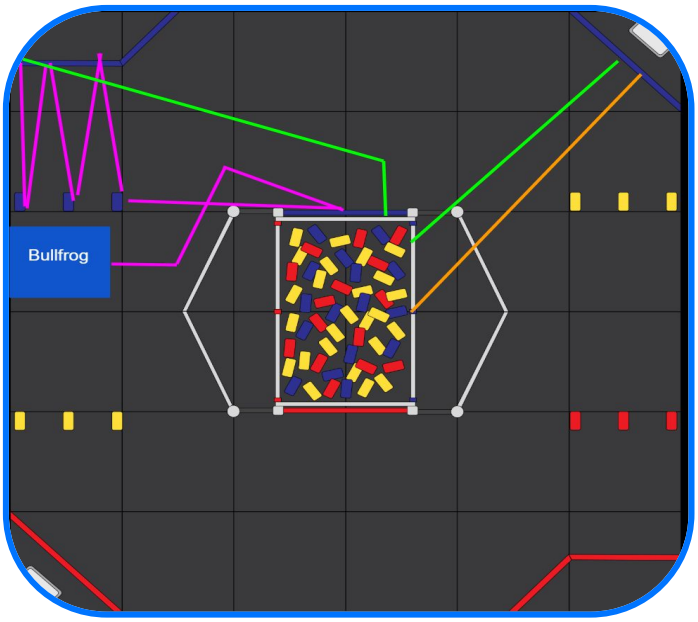




Wire Routes

Subsystem	Hardware Map Name	Connections			
Drivetrain		FR Drive	CHub M0		
Drivetrain		FR Drive	CHub E0		
Drivetrain		RR Drive	CHub M1		
Drivetrain		RR Drive	CHub E1		
Drivetrain		RL Drive	CHub M2		
Drivetrain		RL Drive	CHub E2		
Drivetrain		FL Drive	CHub M3		
Drivetrain		FL Drive	CHub E3		
Lift	lift_left	L Lift	XHub M0		
Lift		L Lift	OQ 0	OQ I	CHub I1
Lift	lift_right	R Lift	XHub M1		
Lift		R Lift	OQ 1	OQ I	CHub I1
Lift	lift_abs_enc	Lift Abs Enc	CHub A0		
Intake		L C Servo	CHub S0		
Intake		R C Servo	CHub S1		
Intake		Intake Color	XHub I0		
Intake		L D Pivot Servo	S0	CHub 2	
Intake		R D Pivot Servo	S1	CHub 3	
Intake		L D Slide Servo	S2	CHub 4	
Intake		R D Slide Servo	S3	CHub 5	
Depositor		L D Arm Servo	S4	XHub 0	
Depositor		R D Arm Servo	S5	XHub 1	
Depositor		L D Wrist Servo	XHub S2		
Depositor		R D Wrist Servo	XHub S3		
Depositor		D Grip	XHub S4		
Depositor		Depositor Color	XHub I1		
Sensors		IMU	CHub I0 (built-in, reserved port)		
Sensors		L Odom Pod	XHub E0		
Sensors		R Odom Pod	XHub E1		
Sensors		P Odom Pod	XHub E2		
Vision		Limelight	USB-C	CHub USB	

Strategy Development



Pre-Competition Analytics:

As a rookie team, we could not rely on prior experience. During this season, we have built upon our Qualifying Event experiences by collecting data on our work processes and robot performance in each round.

Improvements after 1st Event:

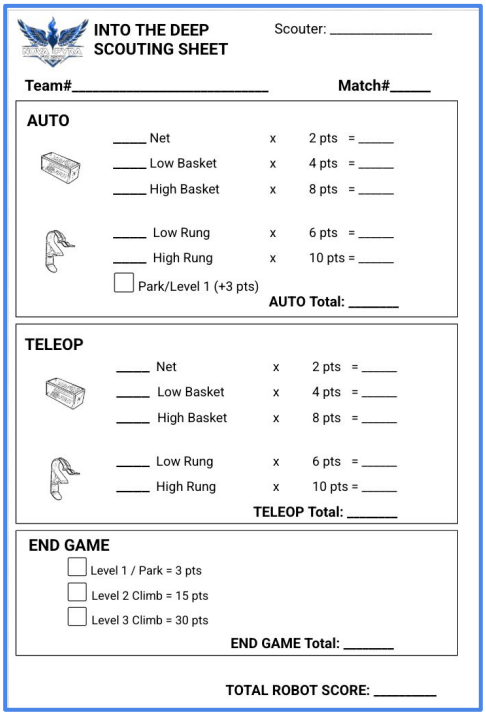
- Mechanical changes made to the Grucket
- Added mechanism to achieve level 2 ascent
- Programming changes to intake speed
- Adjusting slides

Improvements after 2nd Event:

- Additional upgrades made to Grucket
- Programming changes to speed, lift, and climb for smoother overall operation
- Improved driver controls for efficiency
- Autonomous component completed

Scouting:

Newly designed scoring sheets allow for accurate scouting information during competition events, with 4 team members at a time recording match play.



INTO THE DEEP
SCOUTING SHEET

Scouter: _____

Team#_____ Match#_____

AUTO

____ Net	x	2 pts	= ____
____ Low Basket	x	4 pts	= ____
____ High Basket	x	8 pts	= ____
____ Low Rung	x	6 pts	= ____
____ High Rung	x	10 pts	= ____

☐ Park/Level 1 (+3 pts)

AUTO Total: _____

TELEOP

____ Net	x	2 pts	= ____
____ Low Basket	x	4 pts	= ____
____ High Basket	x	8 pts	= ____
____ Low Rung	x	6 pts	= ____
____ High Rung	x	10 pts	= ____

TELEOP Total: _____

END GAME

☐ Level 1 / Park = 3 pts
☐ Level 2 Climb = 15 pts
☐ Level 3 Climb = 30 pts

END GAME Total: _____

TOTAL ROBOT SCORE: _____

Autonomous:

- Score pre-loaded specimen on high chamber
- Score 2-3 additional specimen on high chamber with human player assist

Tele-op:

- Immediate high basket score using final specimen from autonomous period if not previously achieved
- Repeatedly score samples in high basket quickly and efficiently
- Achieve level 2 climb in End Game

Outreach Summary

- Assisting & collaborating with other teams, specifically FTC Team EagleBots and FRC Team S.S. Prometheus - with whom we share a common workspace.
- Summer training sessions with adult and FRC mentors that taught us the basics of CAD, robot assembly, and programming, allowing us to be more prepared for our first season.
- Participation in the STEAM Night event hosted by Pontchartrain Elementary.
- Completing a mural in the Science Lab at Mandeville Junior High.
- Attending a Zoom meeting with FTC EagleBots hosted by Chapman Consulting.
- Canvassing local businesses to raise awareness of our team and secure fundraising.

FUTURE PLANS:

- Fundraising
  - Barnes and Noble Book Fair
  - Cane's Family Night
  - Carwash
- Community Engagement
  - Summer Camp/Workshop for younger students
  - Visits with local politicians and school board
  - Field Trips to sponsor businesses to learn about their use of robotics

Challenges & Solutions

As a rookie team, we have learned a lot from this build season. We learned more about team cooperation and what to expect for next year's season.

Mechanical Issues:

Our team has faced many problems, which led to the following solutions:

- Incorporating wire chokes to dull ESD
- Adding a sweeper arm to give our robot access to the submersible zone
- Remodeling our intake to allow us to score both samples and specimens

Programming Changes

From this season, our team learned that...

- Running on test code and simpler code forced our drivers to operate the robot manually.
- Programming mechanisms have become more efficient by gaining proficiency in coding.

Outreach Limitations

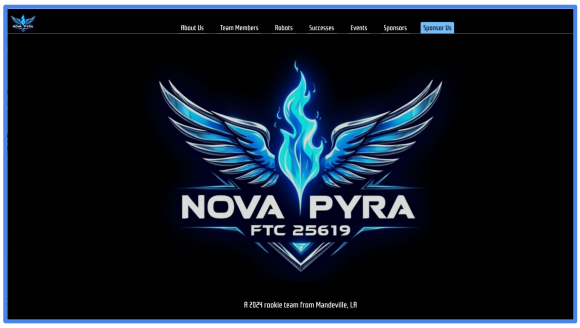
The challenges of limited time during the build season and inexperience greatly limited our ability to achieve our true potential with regards to outreach.

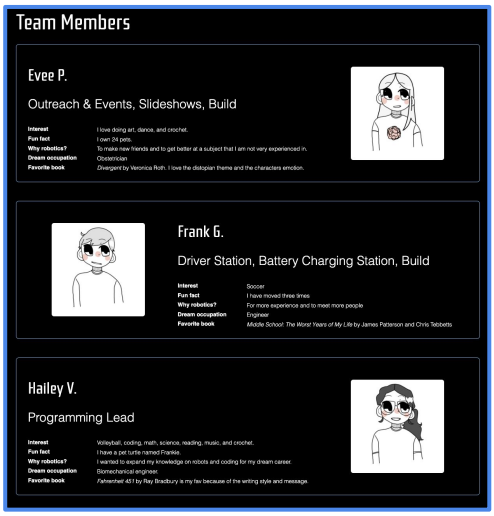
- We have several activities planned for this spring and summer including a workshop for younger students, visits with community leaders, fundraising events to provide a foundation for next season, and networking sessions with STEM professionals.

Team Relations

Communications

Our team has created a website with the help of mentor, Ryan Harvey. Novapyra.org allows community members and the general public to see our robot, learn more about FIRST robotics, view upcoming events, meet team members/ mentors/sponsors, and even donate to or sponsor the team!





We have also established a presence on social media, using Facebook, Instagram, and YouTube to document achievements, market our team, and share highlights of our season.

Team Connections

Our team has formed strong bonds with those who share our workshop, FTC 22032 Eaglebots & FRC 2992 S.S. Prometheus. Through constant collaboration with them, our team was able to grow our capabilities and learn new techniques.

CORE VALUES

Discovery:

We discover something new with every prototype and idea. Our rookie team is always finding new information and changing with it. From test running with communication from other teams to test running with "Trust the Process" ideas, our team is constantly evolving and discovering new and imaginative designs.

Innovation:

Our team works hard to demonstrate the persistence and creativity needed to innovate in FIRST. The Grucket came to life after much trial and error. The creative minds of our team worked diligently to tweak several iterations and solve the problems of earlier versions by combining our ideas. Finding a fun and jazzy name was icing on the cake!

Impact:

We apply our knowledge to make a positive impact on our community. As a rookie team, it's hard to focus with climbing the ladder of success in competition while helping our community at the same time, but we still manage! Our team has planned fun activities with the local community stores and schools for times closer to summer so we can give our entire focus and motivation to them!

Inclusion & Teamwork:

Every member is hands-on in multiple aspects of building and in competition prep. As seen on our "Meet the Team" page, our group is well-rounded and always takes a helping hand not only to the teams that we share a shop with, but also at a smaller level within our own group. Giving each other rides, staying later with build sessions, or different groups, like code and build, combining their unique intelligence are all examples of the teamwork that makes our team and robot what it is.

Fun:

Every part of our robot is something that our team worked really hard on and had fun while doing! Memories are created anywhere Nova Pyra goes - inside jokes, funny nicknames, and crazy robot ideas make this team someplace where anyone can find a home.

BULLFROG

Nova Pyra's Bullfrog truly exemplifies the spirit of form and function in design. 3D printing our components allowed us the flexibility to continually modify the design of independent parts and improve functionality with each iteration. The robot you see today is sleek, efficient, and performs consistently.