

Student name: Adars Payyakyil

Academic level/academic standing: High School Student

I worked on the programming team of the MIRV internship, working primarily on the rover side of programming. Over the summer, I worked on several programming skills, including strengthening my debugging skills, programming neural networks and using ROS (robot operating system). During the start of the summer, I began developing the neural networks that would be used by the MIRV rover. In June I developed code to implement a neural network that detected free space and lane lines in a road to help MIRV to determine where to place pi lits. In addition to lane line detection, I developed a custom neural network to detect pi lits to assist MIRV in pick up operations. To do so, I created a dataset of hundreds of pictures of pi lits and used Pytorch to train a neural network to recognize a pi lit in a camera frame. In addition, I used the depth capabilities of our stereo cameras to determine an accurate depth and angle to both pi lits, and different points on a lane line. During July I programmed routines for the rover to pick up pi lits using PID loops, as well as writing code to chain together multiple commands (for example, an autonomous path followed by a pi lit placement or pickup). During this internship I was able to gain a considerable amount of technical knowledge, but also improved my communication and debugging skills. These skills are invaluable in my future as look towards college and my career.

Student name: Ahmad Jalal

Academic level/academic standing: High School Student

Throughout this summer's MIRV project, I worked on the mechanical sub team. I learned to make G-code and run it on our CNC mills while improving my manual machine skill as well. Post-processing was a large part of my work. Post-processing consisted of deburring, sandblasting, and powder coating the parts after they were CNC machined. Along with machining, I did a lot of design and assembly work on both, the garage and the rover. My work on the garage mainly consisted of the over-center linkage found in the garage locking mechanism. Creating an over-center linkage to work with the purpose in mind was significantly more difficult than I anticipated. I found a final successful design by going through multiple iterations and prototypes. Through this process, I was able to improve my skills in CAD, CAM, and machining.

Student name: Ben Mick

Academic level/academic standing: High School Student

I spent most of my time working with the user interface, creating buttons and different pages. Some of the pages I worked on were the Home Page, Status Page, and the Rover Operation Page. On the Status Page, I used a GridView() to show different subsystems and their health. On the Operation Page, I set the Layout using SixedTextBox(), then filled it in with buttons and joysticks. Over the summer I have learned to use Flutter/dart to program. I learned to use a good work ethic and to communicate well with peers. I am grateful for this wonderful opportunity, and I hope to work on more in the future.

Student name: Chun-che Lo

Academic level/academic standing: College Student- Electrical Engineering

I was a mechanical intern for the MIRV project. Overall, my internship experience was wonderful this Summer. It was fun to work on a hard engineering challenge with the team of interns. Most of my time was spent in designing the intake, conveyor, and garage. Between the subsystems, each had their own complexities when it came to packaging. The biggest thing for me this summer was just to work through the problems each mechanism had and creating the most reliable functioning mechanism we could and learn I did.

Student name: Hailey Holman

Academic level/academic standing: High School Student

Throughout the summer, I have been able to elevate my current skills and learn new ones. I was given the opportunity to do my own electrical placement, design, and wiring of this robot. I learned that antennas had certain constraints on where they could be placed because of how they send signals. I was able to work with components there were familiar to me, like the power distribution panel and TalonSRXs. This allowed me to optimize my space with the knowledge I already had about these. The new primary skill I learned this summer was how to program. I haven't done a lot of programming in the past, so this opportunity let me widen my ability as an engineer. I learned the language Dart and the Flutter framework to create the app for this project. I excelled in this new area because of the support around me. I had the chance to develop an app that I could be proud of, and I could see where my hard work paid off.

Student name: Jerry Lu

Academic level/academic standing: High School Student

This summer I worked on the mechanical sub team. I started by helping design the chassis sheet metal parts. I also helped prototype and design the conveyor mechanism. I machined the plates on the prototype rover and the production rover with a Haas VF 2. I also worked on the garage CAD and went to the Ford Dealership to take measurements of the spare tire bay. I also worked with billet and machined tube blocks for MIRV and the garage. I bent a lot of the sheet metal parts and learned how to bend plates correctly. Overall, I learned how to machine parts more efficiently as a team and how to CAD more quickly.

Student name: Johnny Lu

Academic level/academic standing: High School Student

I worked as part of the mechanical sub team on the MIRV project. At the beginning of the summer, I worked on designing the chassis for our prototype rover. I then manufactured the tubes of the prototype rover on our Tree CNC machine. Next, I helped in designing the first iteration of the intake that never got built since we concluded that the intake was not going to work as well as we hoped. I tested many prototypes of the intake and conveyor by cutting them out of wood on the laser cutter. I also finalized the design of the chassis and manufactured all the tubes on the professional version of MIRV. Finally, I worked on many iterations of the garage/deployment system for MIRV. I went to the Ford dealership to take measurements from the trucks several times since there were difficulties in finding the exact model of the truck. I integrated gussets to attach to the garage tubes and manufactured all the garage tubes as well. Overall, my summer experience was good. This was my first experience working in a professional setting and it definitely prepared me better for the future. Sometimes the week felt long and I wanted a break since I was not used to working full-time weeks. But other than that I definitely improved my CAD and manufacturing skills over the summer from working at this internship.

Student name: Luke Staudacher:

Academic level/academic standing: College Student Computer Engineering

I was responsible for building out pathing, Odometry, the State manager/Scheduling, Pi-Lit controls, and helped Plan, Design, and Implement various electrical components. Working on this project allowed me to have hands-on experience working with skills I learned inside the classroom, such as developing a math model for the desired behavior and then translating that into runnable code, like in the pure pursuit algorithm. This Project also allowed me to learn from industry professionals about things like Extended Kalman filters, GPS performance/behavior, and ROS. This Project also helped me grow soft skills like leadership and interpersonal skills. Being a college intern, I was able to help lead some of the high school interns. I grew my interpersonal skills on this project when the team had differing solutions to a problem and had to justify and defend my solutions, then work with team members to decide the best action forward. At the end of this project I feel more prepared to go into the workforce and am grateful for the opportunity provided by VTTI and Neaera Consulting.

Student name: Paul Mick

Academic level/academic standing: High School Student

I worked on the rover code development team over the summer. The main parts of the codebase that I worked on included the CAN-bus motor control of the drive-train and intake, rover status collection and logging, and interfacing with the SQLite database. Working with the CAN-bus control code was my first time writing code in C++ and I learned quite a lot from doing so. I built out the status logging module which receives data on feeds from many different nodes and outputs a JSON string status message that is logged and sent to the cloud. I also created a custom API to easily and scalable interface with an SQLite database to store and retrieve Pi-Lit locations, the garage location, and the number of Pi-Lits currently stored on either side of the magazine. Overall, I learned a lot of new skills working on the MIRV project this summer.

Student name: Tyler Booth

Academic level/academic standing: High School Student

This summer I worked as part of the mechanical team on the MIRV internship. I've spent the summer strengthening my skills in prototyping, CAD design, CNC sequencing, and more efficient machining practices and broadened my view on sheet metal parts. I started the summer by designing the chassis for MIRV. I learned very quickly that we had a large inflow of parts that needed to be made and I was in charge of the CNC sequencing for the parts. Using Fusion 360, I was able to develop manufacturing templates for each part that streamlined the process of CAMing a part significantly. During June, I spent a large portion of the month designing and iterating on the first version of the garage for MIRV. This required us to go to the Ford dealership to gather dimensions, and during that time I was able to build a strong relationship with one of the salesmen there which helped because we had to go back several times to gather and confirm certain dimensions due to different truck versions. I also worked on developing and testing prototype versions of the conveyer and intake handoff. Over the summer, I learned the importance of communication and cooperation in the professional work environment. I know I have gathered skills here that I will carry with me to other job opportunities and throughout my professional career after college.

Student name: Yasin Khadbai

Academic level/academic standing: High School Student

The Summer Internship at Neaera Consulting this summer was one I will cherish for years to come. The work done by the entire team in designing the MIRV was much fun as it was a learning experience. During the internship, we continued to build on the core values of First: Discovery, Innovation, Impact, Inclusion, Teamwork and Fun. Tony & Debbie often tell us that the work you do should not just motivate but excite you to come back each day. This internship did that and much more. Besides getting up each day excited to return to work, I learnt to celebrate my achievements. The internship also taught me that in a formal work environment, design modification and change requests are a real thing and as a professional you need to be amenable to these. Among other things, the best memory of this internship was designing the conveyer which included multiple design changes and iterations. I also got more exposure to CAD and machining. While machining the axles for the robot, I found that making a few minor modifications to my approach allowed me to machine faster and more efficiently. I also got better at CAD and am hoping to obtain certification later this year. Special shout-out to John, Michael and Chun-che all of whom patiently guided me throughout the internship when I was struggling. As an aspiring engineer, the work I did during the internship strengthened my resolve of putting to use the skills I learnt for the benefit of mankind. The work we accomplished during the internship and the practical applications of the MIRV gave me an immense sense of purpose and responsibility. I look forward to continued contribution.

Student name: Zoya Khan

Academic level/academic standing: High School Student

My experience on the Mirv project was primarily focused on app development, where I was responsible for helping create the M app to control the rover and its garage using the Dart language and Google flutter. This summer experience with Neaera Consulting was very fulfilling. Starting with no code experience, I was given the opportunity to learn and code many components, from just simple widgets to creating the garage operation page that used observables, switch cases, and other elements I learned this summer.