



AWS DEEPRACER STUDENT EDUCATOR PLAYBOOK (LABS)

OVERVIEW

This playbook provides the information and resources necessary for educators to execute an AWS DeepRacer Student (DRS) hands on lab for their students. Hands on labs consist of **virtual activations** (AWS DeepRacer Student League, Private Community Races, Live Virtual Racing) and **in person activations** with a physical track and AWS DeepRacer device.

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WHAT IS AWS DEEPRACER STUDENT

AWS DeepRacer Student is the world's first global autonomous racing league for students and educators, driven by machine learning (ML). High school and college-enrolled students around the globe can develop their ML skills in a fun, hands-on autonomous racing league. Students and educators can leverage 20 hours of ML educational content and 10 hours of monthly model training compute resources to up-level ML skills for free. Educators can use AWS DeepRacer Student to engage their students and turn theory into hands on learning by utilizing community races to create a private race to fit their learning outcomes.

GETTING STARTED

AWS DeepRacer Student is outside of the AWS console offering free account access with no credit card required. Students will receive 10 hours of compute resources replenished to their account on the first of each month to train and evaluate models.

AWS DeepRacer Student Account Set Up

Educators and students can access [AWS DeepRacer Student](#) and create their account.

Steps to create an account

1. Go to student.deepracer.com
2. Sign up with your email
3. Verify your email with a 6-digit code
4. Complete your profile
5. Opt in to the AWS AI & ML Scholarship program (if applicable)
6. Go to "Profile" in the top right corner
7. Customize your avatar
8. Update your racer name

Complete sign-up for AWS DeepRacer Student

To start using AWS DeepRacer Student, we need a few more details.

Add your personal information to create your AWS DeepRacer Student account.

First name: [text input] Middle name - Optional: [text input] Last name: [text input]

School: Can't find your school on the list? Choose Other to type: [dropdown menu] Current or prospective major: Can't find your major on the list? Choose Other to type: [dropdown menu] Planned year of graduation: Enter the year that you will graduate: [text input]

☐ I certify that I am a student enrolled in high school, university, or community college or an educator or event organizer for students in high school, university, or community college.

Country of residency: [dropdown menu]

Do you want to be considered for the AWS AI & ML Scholarship program? [Learn more in FAQs](#)

The program applications open on February 1, 2023.

What is the AWS AI & ML Scholarship?
The AWS AI & ML Scholarship program, in collaboration with Intel and Udacity, provides students with educational content, career mentorship programs, and 2,500 Udacity Nanodegree scholarships.

Who is this program for?
This program aims to bring diversity to the AI/ML field by focusing on students from around the world who are 16 years and older, and who are underrepresented or underserved in tech.

What are the scholarships?
Each year, 2,000 students receive nanodegree scholarships for the 6-month Udacity AI Programming with Python Nanodegree program. The top 500 students in the first Nanodegree pass a second Nanodegree program, curated specifically for the scholarship recipients. This 6-month program combines deep learning and ML engineering concepts to prepare students for technical careers in AI & ML.

How to apply

Step 1: Learn
Use the learning modules to build a foundation of ML knowledge, and achieve an 80% or better on all required assessments.

Step 2: Submit to the leaderboard
Use your foundational knowledge to train and improve AWS DeepRacer models. To qualify, submit a model that finished the track in under 3 minutes to the AWS DeepRacer Student League.

Step 3: Fill out an application
Once you have completed steps 1 and 2, you'll receive an email with a personal code to use to complete your application and apply for the nanodegree scholarship on the Udacity website. Udacity will contact scholarship winners.

☐ I would like to be considered for the AWS AI & ML Scholarship program, and I accept the [terms and conditions](#).


[I will do this later. Sign out for now](#) [Submit](#)

AWS DeepRacer Student > Profile

Your profile

Customize your profile by choosing a racer name. Your racer name will be displayed on the AWS DeepRacer Student League leaderboard. You can also opt-in for the AWS AI & ML Scholarship program.

Your profile information

 [Change your avatar](#)

Name: A V [Change your name](#)

Racer name: EsteemedPolaris1912 [Change your racer name](#)

School name: San Diego State University [Change school enrollment](#)

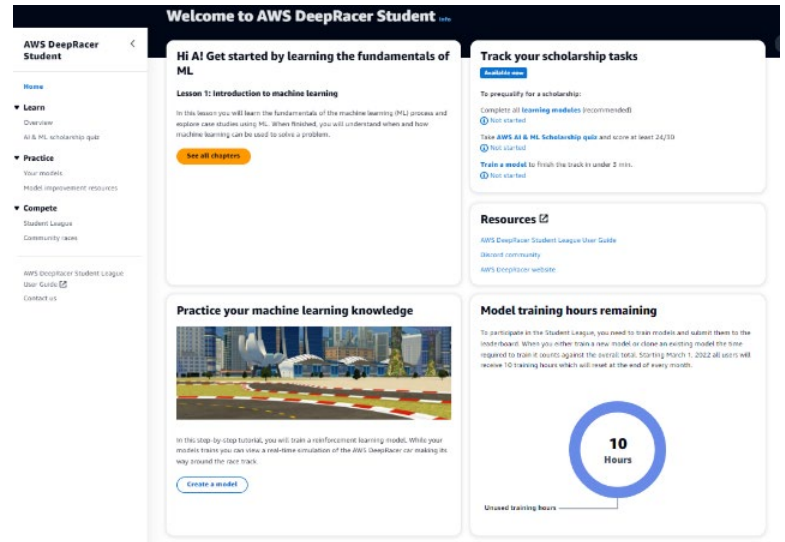
Name of major: Machine Tool Technology [Change your major](#)

Year of graduation: 2024 [Change your year of graduation](#)

Country of residency: United States [Change country](#)

Navigate the AWS DeepRacer Student home page

- Learn: Access 20+ hours of ML foundational content and the scholarship quiz
- Practice: Begin training and evaluating ML models
- Compete: Submit your models to compete in the Global Student League or a Community race



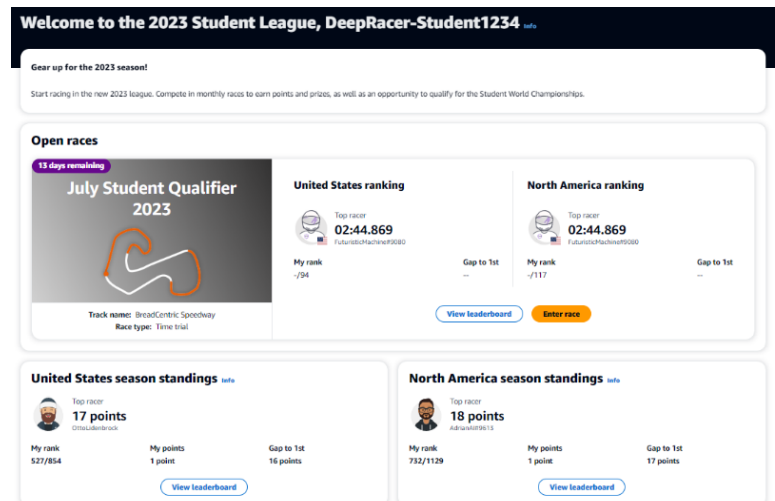
AWS DEEPRACER HANDS ON LABS (VIRTUAL)

Educators can engage students to apply their learnings in a virtual environment through the AWS DeepRacer Student League, private community races, and live virtual racing. We recommend educators to begin with virtual activations as a hassle-free and no cost option to boost student engagement.

DeepRacer Student League

From March through September, students around the globe can compete monthly in the virtual AWS DeepRacer Student League. The student league has an all new competition format giving students more chances to win as they compete against peers in their country and region.

Open to: Any student over the age of 16 and currently enrolled in high school or higher education at an accredited institution globally, subject to terms and conditions.



Free Competition: Each month from March 1 to September 30, students can submit their models to the virtual league on AWS DeepRacer Student for a chance to win prizes. Students can see how they stack up against competitors in their country, region, and worldwide through the leaderboards.

Competition format: Students have 3 minutes to complete their fastest lap on the student league track.

Track Shape: The track changes each month in the Student League to give students new opportunities to test and hone their ML skills. We recommend educators utilize the current month's track in the classroom for students to easily compete in the student league.

Student League Rewards:

- Top 10% of participants in each country will receive a \$50 Amazon.com gift card
- 1st-5th place finishers in each region will receive a \$400 Amazon.com gift card
- 1st place winner in each region will earn a spot in the AWS DeepRacer Student World Championship Semifinal

Student League Championship: The 1st place winner from each region in the monthly student league competition will compete on a global stage in the Student World Championship in October. The top 42 competitors from around the world will compete for \$21,000 USD in tuition-based prizing.

League Rules: Rules and regulations for the current year can be found in the [terms and conditions](#).

Community Races (Private)

Educators can create their own private races through **Community Races** in the AWS DeepRacer console. Hosting a community race gives educators an exciting way to engage students to apply their ML skills, compete against peers, and customize a race to best fit their learning outcomes.

Educators can select their own track, race date, time, and invite students to participate through a unique link for their event. Students can participate in the community race through AWS DeepRacer Student, where they will have monthly access to 10 hours of model training and 5 GB of storage to train their ML models at no cost.

What you need:

Educators will need an AWS account to sign into the AWS DeepRacer console to create and organize races. You will not be charged for setting up or using student community races in the AWS console.

Student community races are asynchronous events that do not require real-time interaction. Students will receive an invitation link to submit a model to the race and view the leaderboard. Racers can submit unlimited models at any time within a date range to climb the leaderboard. Results and videos for classic races are viewable for submitted models on the leaderboard page as soon as the race is initiated.

Setting up a Student Community Race:


1. Open the [AWS DeepRacer console](#).
2. On the **Community races** page, choose **Student community race**.
3. Select **Create race**.
4. Enter an original, descriptive name for the race.
5. Specify the start date and time of the event in 24-hour format. The AWS DeepRacer console automatically recognizes your time zone. Also enter an end date and time.
6. To use the default race settings, choose **Next**. When you're ready to learn about all of your options, go to [Customize an AWS DeepRacer Student community race](#).
7. On the **Review race details** page, check the race specifications. To make changes, choose **Edit** or **Previous** to return to the **Race details** page. When you're ready to get the invitation link, choose **Submit**.
8. To share your race, **Copy** and paste the link into the suggested email template, text message, and favorite social media platforms. Only racers with an invitation link can see a race. The link expires on the race's close date.
9. As your student race time frame comes to a close, take note of who has entered a model and who still needs to do so under **Racers** on the **Manage races** page.

Create a community race Create race

☐ Community race

Community races are available to all customers through the AWS Console.


- Race takes place in AWS Console
- Event creator can take part in the race
- Up to 2 competition formats
- Up to 3 race types
- race tracks



☒ Student community race

Student community races are available to all students with an AWS DeepRacer Student account.

- Race takes place in AWS DeepRacer Student. Students need an [AWS DeepRacer Student account](#) to access the race.
- Event creator can not take part in the race
- Classic race format
- Time trial race type
- race tracks



Customize a Student Community Race:

1. Open the [AWS DeepRacer console](#).
2. Choose **Community races**.
3. On the **Community races** page, choose the **Leaderboard** for the race you want to customize.

4. On the **Race details** page, choose **Edit race**.
5. Expand **Race customizations**.
6. Optionally, write a description for your race that summarizes the goals and rules of the event for participants. The description will appear in your leaderboard details.
7. For **Ranking method** for a classic race, choose between the **Best lap time**, where the winner is the racer who posts the fastest lap; **average time**, where, after multiple attempts within the time-frame of the event, the winner is the racer with the best average time; or **Total time**, where the winner is the racer with the fastest overall average.
8. Choose a value for **Minimum laps**, which is the number of consecutive laps a racer must complete to qualify for submission of the result to the race's leaderboard. For a beginners' race, choose a smaller number. For advanced users, choose a larger number.
9. For **Off-track penalty**, choose the number of seconds to add to a racer's time when their RL model drives off track.
10. You have now completed all the customization options for your student community race. Choose **Next** to review the race details.
11. On the **Review race details** page, review the race specifications. To make changes, choose **Edit** or **Previous** to return to the **Race details** page. When you're ready to get the invitation link, choose **Submit**.
12. Choose **Done**. The **Manage races** page is displayed.

Step 1
Add race details

Step 2
Review race details

Step 3
Invite participants to your race

Add race details [info](#)

You can edit these details at anytime until the race starts

Race details

Compete in a league of your own. Organize a virtual race for friends, colleagues, and school mates.

Name of the racing event
Add a descriptive name so your participants can identify the community race. For example: <schoolname/classname>-<teachername>-<year>.

The event name must have 3-64 characters. Valid characters: A-Z, a-z, 0-9, . ! ? () _ (underscore) - (hyphen) and spaces.

Choose race dates
Choose a start and close date in 24-hour format (Argentina Standard Time) America/Buenos_Aires.

Competition tracks
Decide which track the racers will compete on.

Sort by

[View more race tracks](#)

▼ Race customizations

Manage a Student Community Race:

All student community races are only visible to individuals who have received an invitation link. Participants can freely forward invitation links. However, to join a race, participants need an [AWS DeepRacer Student account](#). First-time users must complete the account creation process before they can join the race. Students only need an email address to set up an account.

As the race organizer, you can:

- Edit race details (including the start and end dates)
- Remove participants
- End races
- Delete races

The screenshot displays the AWS DeepRacer Student console interface. At the top, there's a navigation bar with 'Test Track' and 'Info' tabs. Below this, the 'Race overview' section provides details about the race type (Time trial), description, race dates (August 16-18, 2021), and time zone (UTC-03:00). It also includes a competition track map and rules. The 'Racing times and ranking' section shows the world fastest time (00:50.391) and the user's ranking (-/22). A 'Race leaderboard' section is visible at the bottom, showing a table of participants with their ranks, names, times, and gaps to the first place.

Rank	Racer	Time	Gap to 1st	Video	Off-track
1	CyberneticsArgument#0551	00:50.391	-	View	0
2	SequentialBreaker#2141	00:50.465	+00:00.074	View	0
3	DraftLambdas#9584	00:51.126	+00:00.735	View	0
4	AccessableNode#0682	00:51.662	+00:01.271	View	0
5	KSC	00:52.796	+00:02.405	View	1
6	Adonis#5339	00:52.998	+00:02.607	View	0

To manage an AWS DeepRacer Student community race

1. Sign in to the AWS DeepRacer console.
2. Choose **Community races**.
3. Select **Manage races**.
4. On the **Manage races** page, choose the race that you want to manage.
5. Choose **Race details** and select **Edit**.
6. To view the event's leaderboard, choose **View race**.
7. To reset the event's invitation link, choose **Reset invitation link**. Resetting the invitation link prevents anyone who has not yet chosen the original link from the race. Resetting the invitation link does not affect existing participants in the race.
8. To end a race, choose **End race**. This ends the race immediately.
9. To delete the event, choose **Delete race**. This permanently removes this race from the AWS console and AWS DeepRacer Student.
10. To remove a participant, choose the **Racers** tab, select one or more participants and select **Remove racer**. Removing a participant from an event prevents them from joining the race.

Live Virtual Racing

Educators can run a live virtual race for students to compete in real time without the cost or resources to set up a track. Live virtual racing is compatible in AWS DeepRacer and not through AWS DeepRacer Student. Educators must use a in AWS DeepRacer to download student's models from AWS DeepRacer Student and then upload their models into the AWS DeepRacer console. Due to increased complexity, we recommend using the community race option instead. If you are interested to host a live virtual race, follow the resource guides below for set up and logistics.

- **Step 1:** [Set up a Multi-user account](#) (Important: Ensure the spend is set to \$0 to not incur costs. All model training should be done in AWS DeepRacer Student for free)
- **Step 2:** [Download AWS DeepRacer Student Models](#)
- **Step 3:** [Run a LIVE race](#)
- **Step 4:** [Broadcast a LIVE race](#)

AWS DEEPRACER HANDS ON LABS (IN PERSON)

In person races are a great tool to build excitement amongst your students to see their ML models come to life. Host an in-person race to provide an engaging event that your team can attend in-person. In-person racing includes a physical track and AWS DeepRacer vehicle devices. Students can easily download their models from AWS DeepRacer Student and to use in a physical AWS DeepRacer device.

Due to the resources, time commitment and cost to effectively setup and host an in-person AWS DeepRacer event, we highly recommend educators to first engage through virtual activations. Virtual events come with a much lower time and financial investment.



Once you and your students feel ready to take your skills to a live track. You will need to ensure you have the adequate event space requirements, procurement of equipment and knowledge to set up and run the event.

Check out how other schools have hosted their very own AWS DeepRacer Student in person event!

- [University of Kansas](#)
- [University of Calgary](#)

Event Space Requirements

The correct event space is an important requirement for a successful event. Below are key considerations for an event.

- **Space Size:** Space should be large enough for the respective track size **plus* at least 3-6 feet around the outside for viewers to stand/sit.**
- **Lighting:** To avoid issues with the camera, please ensure the space has reduced or eliminated any glare or dark shadows caused by sun/lighting.
- **Capabilities:** Most events require at least 4 power outlets for battery chargers, extension cords, etc.
- **Tables:** At least one large table (2 are preferred) is required for the "Pit" area where cars and gear are stored and batteries charged.
- **Leaderboard (Optional):** We recommend a large TV or projector to allow for a leaderboard. This greatly enhances the experience and competition.

Event Materials & Equipment

To successfully run an in-person event, educators must secure the proper equipment including tracks, barriers, AWS DeepRacer devices, and execution kits.

Race Track & Barriers:

A-to-Z Speedway

Footprint: 18' x 27' (5.5m x 8.3)

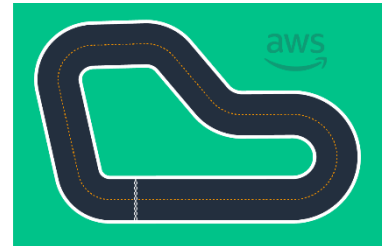
Boxed Size: 25"x25"x5" (63.5cm x 63.5cm x 12.7)

Track: \$890

Barrier: \$2,000

Amazon.com [Track Purchase Link](#)

Amazon.com [Barrier Purchase Link](#)



AWS DeepRacer Cars:

AWS DeepRacer Device (Recommend Car)

7.5 x 7.5 x 7.5 inches

19.05 x 19.05 x 19.05 centimeters

AWS DeepRacer: \$399

Amazon.com [DeepRacer Car Purchase Link](#)



DeepRacer Evo Device

(Not recommended as training is more expensive)

7.5 x 7.5 x 7.5 inches

19.05 x 19.05 x 19.05 centimeters

AWS DeepRacer Evo: \$598

Amazon.com [DeepRacer Evo Car Purchase Link](#)



AWS DeepRacer Event Execution Kits: Review the full list of materials required to execute an in-person event under “Additional Resources” page X.

AWS DeepRacer Device Set Up: After you finish training and evaluating an AWS DeepRacer model in the AWS DeepRacer simulator, you can deploy the model to your AWS DeepRacer vehicle. You can set the vehicle to drive on a track and evaluate the model's performance in a physical environment. This mimics a real-world autonomous race. Before driving your vehicle for the first time, you must set up the vehicle, install software updates, and calibrate its drive-chain sub-system. Follow the directions outlined in the [Developer Guide: Operate your AWS DeepRacer vehicle](#).

Track & Barrier Set Up: To drive your AWS DeepRacer autonomously and to test your reinforcement learning model in a physical environment, you need a physical track. Your track resembles the simulated track used in training and replicates the environment used to train the deployed AWS DeepRacer model. Follow the directions outlined in the [Developer Guide: Build your physical track for AWS DeepRacer](#). For the best experience, we recommend using pre-printed tracks and track barriers. Using pre-printed tracks and barriers facilitates the smooth set up and installation of the AWS DeepRacer track environment. Pre-printed tracks and barriers as well as details for estimating space and other requirements for events are available at [AWS DeepRacer Storefront](#).

Event Day Execution: We recommend using a time trial format giving each student 3 minutes on the track to complete their fastest lap time. Ensure you outline the race rules, penalty and prizing prior to the event day.

Track & Barrier Set-Up: 60-120 minutes. Tracks purchased through the AWS DeepRacer storefront typically come in one (1) folded-up vinyl track which is laid out. Barriers come in two different sized coroplast panels (30+ panels) with supporting legs. These will need to be assembled with provided zip ties. Set-up take 30-60 minutes.

Car Preparations & Network Testing: 60-120 minutes. Cars need to be updated and tested before the event. Watch the videos below to set up your AWS DeepRacer car. These videos and more resources can be found the AWS DeepRacer [Getting Started](#) webpage.

- **Step 1:** [Unboxing AWS DeepRacer](#)
- **Step 2:** [Assembling AWS DeepRacer](#)
- **Step 3:** [Calibrating AWS DeepRacer](#)

Race Day (Sample Run of Show)

- **Event Prep.** Final Prep of vehicles. Team is briefed on roles & responsibilities.
- **Event Start.** Opening Remarks, Event Agenda, Instructions on how to participate
- **Racing.** Timing varies by event. Recommended 4-8 hours.
- **Final Races (optional).** Top X teams/racers; Used as a final competition among top teams
- **Event End.** Tear Down & Clean-Up. Allow for 1 hour to tear down items and pack up.

Roles

- **Mechanic.** This individual is responsible for ensuring the Pit is tidy, batteries are charged, and all cars are prepped and ready at all times.
- **Track Boss.** Track Bosses are responsible for following the AWS DeepRacer car on the track and placing it back on if there is an off-track event. Given the physical nature of the program, it is recommended that all able members rotate through this role.
- **Time Keeper.** This member is responsible for any timekeeping and/or leadership board needs. They also support the Crew Chief.

COLLEGIATE LEAGUE STRUCTURE

If you find yourself working across multiple schools, classes, or with large groups, an inter-collegiate league offers an exciting way to take the competition to the next level. Using community races, you can create an entire league structure for students to participate in tournament style. We recommend groups to host their own community races against one another to then advance to the next round of competitions. The sky is the limit with how you can set up competitions, see below for a sample format:

Sample Format

1. **Preliminary Rounds (Virtual):** Schools can utilize a virtual community race for students to train their models through AWS DeepRacer Student. Educators can set up and manage their own race and leaderboards to track student progress with community racing. We recommend having students practice on the same track used in the playoffs.
2. **Playoffs (Virtual):** Schools can compete against one another through a private community race or in a live virtual race. We recommend using time trial to give each student 3 minutes on the track to complete their fastest lap time.

Playoff Schedule: Schools can build a bracket or playoff schedule to decide which schools will advance to the championship

3. **Championship (Virtual or In Person):** Host a championship event with the top schools advancing. You can follow the same structure outlined above for a virtual community race or live virtual race. If time, resources and location allow, you can also host the championship on a live track for students to compete in person.

Please note AWS does not provide legal guidance on competitions or prizes of value.

ADDITIONAL RESOURCES

- AWS DeepRacer Student [User Guide](#)
- AWS DeepRacer Educator Tools [User Guide](#)
- AWS DeepRacer Amazon.com [Store Front](#)

AWS DeepRacer Event Execution Kits:

Below are the recommend items our Pit Crew likes to have in their toolkit to effectively run an in-person race. Use the below as a checklist for your next event. If you or your school already owns items listed you do not need to buy brand new.

Purpose	Item	Purchase Link (Amazon.com)	Estimated Total Cost
Flashing Cars	USB Keyboard	https://www.amazon.com/dp/B014EUQOGK	\$23
	USB Mouse		
	4-Port USB Hub	https://www.amazon.com/dp/B07L32B9C2	\$18
	Portable Screen (Must have HDMI capability)	https://www.amazon.com/dp/B088TLQR3K	\$150
	2 USB Sticks (Pre-flashed with 20.04 and Looping video) (32GB+)	https://www.amazon.com/dp/B082ZGHXK8	\$10
	HDMI Cable (M to M) - 3ft	https://www.amazon.com/dp/B014I8SIJY	\$6
	HDMI Cable Adapter (F to F)	https://www.amazon.com/dp/B00V7SFR8Y	\$8
	Extension Cord	https://www.amazon.com/dp/B07N4H4SQX	\$15

Running Event	WiFi Router	https://www.amazon.com/dp/B0B8J18F4D	\$135
	Tablets (2) - Chrome must be installed*	https://www.amazon.com/dp/B094Q89NKH	\$260
	Tablet Chargers (x2)	Incl. with Tablets	
	Tablet Covers/case	https://www.amazon.com/dp/B096P9VM69	\$23
	Power Strip (x2)	https://www.amazon.com/dp/B014EKQ5AA	\$16
Batteries & Power	Extra LiPo Batteries (8)	https://www.amazon.com/dp/B07Z5PLHQP	\$120
	LiPo Bag (Safety Bag) (2)	https://www.amazon.com/dp/B0823PVJ6R	\$11
	Li-Po Battery tester	https://www.amazon.com/dp/B0178P8H9U	\$19
	USB LiPo Charger - 2 pack (3)	https://www.amazon.com/dp/B09779H1LR	\$24
	USB Charging Bank	https://www.amazon.com/dp/B01NCQJ5V0	\$69
	USB-to-USBC charging cables - 5 pack	https://www.amazon.com/dp/B08PXWYKTB	\$9
	Compute Batteries (4)	https://www.amazon.com/dp/B07PBM5HN8	\$116
Misc.	Pelican Case (w/ padded divider	https://www.amazon.com/dp/B000I60L2S	\$433
	Painters Tape	https://www.amazon.com/dp/B002YCGNXA	\$10
	Duct Tape - Checkered	https://www.amazon.com/dp/B0058DV71A	\$8
	2-Sided Vinyl Tape (Track-to-Floor) - 30Y	https://www.amazon.com/dp/B0BPJ1YLLY	\$25
	Scissors	https://www.amazon.com/dp/B001BKHHGS/	\$6
	Multi tool (Includes Pliers)	https://www.amazon.com/dp/B07DD69QN3/	\$30
	Post-It Notes	https://www.amazon.com/dp/B000078UWA	\$4
	Pen	https://www.amazon.com/dp/B000QYLCWK	\$4

	Zip Ties	https://www.amazon.com/dp/B07B5N8N7K	\$11
	Label Maker	https://www.amazon.com/dp/B09BK3FVLZ	\$53
	USB-to-Ethernet Adapter	https://www.amazon.com/dp/B00M77HMU0	\$14
EST. TOTAL			\$1,630