CORNELL ELECTRIC VEHICLES

SPONSORSHIP PACKET

2024 - 2025

Ithaca, NY

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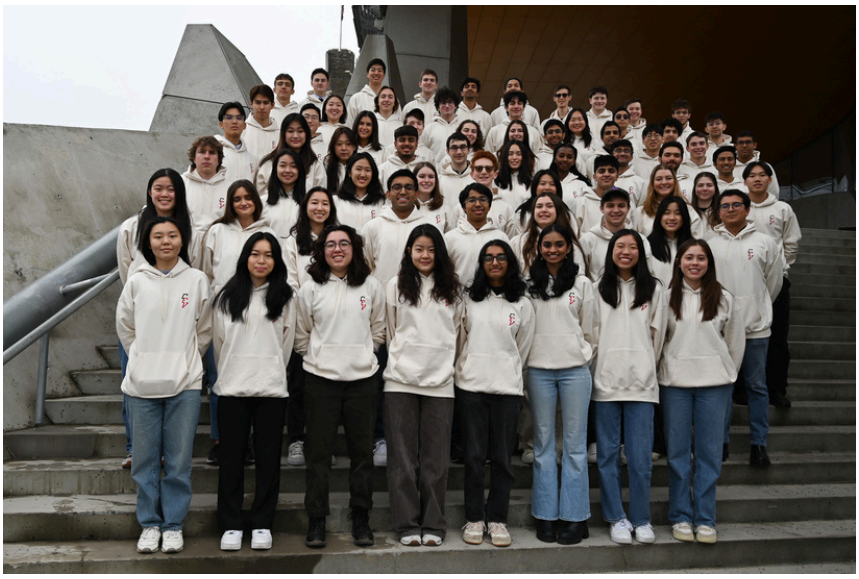
OUR TEAM

CORNELL UNIVERSITY'S FOREMOST PROJECT TEAM DEDICATED TO BUILDING AUTONOMOUS HYPER-EFFICIENT ELECTRIC VEHICLES

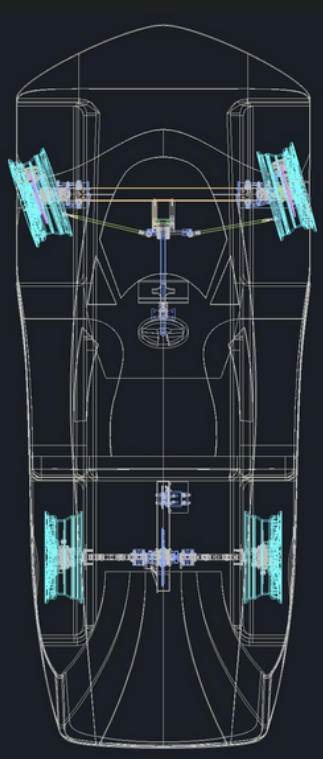


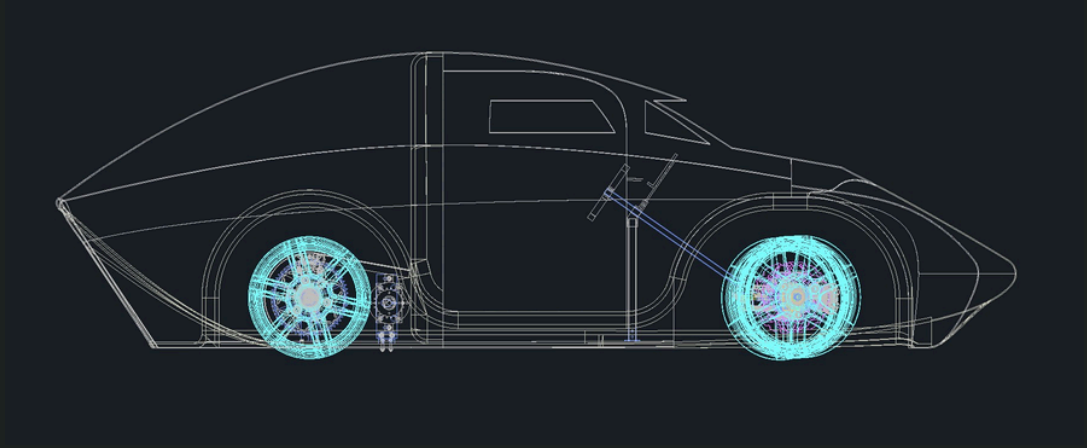
Cornell Electric Vehicles is the foremost team at Cornell University dedicated to building autonomous, hyper-efficient electric vehicles. From our inception in 2014, pre-empting the electrification of the automotive space, and tackling autonomy targets at the magnitude of research and industry initiatives, we consciously lead Cornell's charge towards tomorrow's smart, green transport solutions.

Our deeply knowledgeable 70+ person organization spans every degree level, and operates at the pace of a startup. Determined to endow our members with deeply employable skills, we have repeatedly produced industry-grade vehicles, using industry design and manufacturing methodologies. Having placed highly at Shell Eco-Marathon, the premier global energy efficiency competition, we are a respected team operating at the limits of emergent technologies. We're proud to be the first college student team in the nation to design and build a full-size, autonomous car from scratch. Whether ADAS or driverless vehicles, CEV is continuing work at the leading edge of innovation.

MECHANICAL

The mechanical subteam designs, manufactures, and tests the vehicle's body, structures, and mechanisms. We enhance efficiency through weight optimization, aerodynamic design, material selection, and precision machining. Our vehicle features an ultra-lightweight carbon fiber monocoque, 48V dual-motor RWD drivetrain, custom wheel hubs and uprights, and a two-wheel double wishbone suspension. This year, we are also integrating autonomous steering and braking capabilities, allowing the vehicle to switch seamlessly between self-driving and manual modes. Our 2025 competition vehicle will showcase these innovations, highlighting our commitment to design, manufacturing, and rigorous testing. The mechanical team is divided into four subsystems:

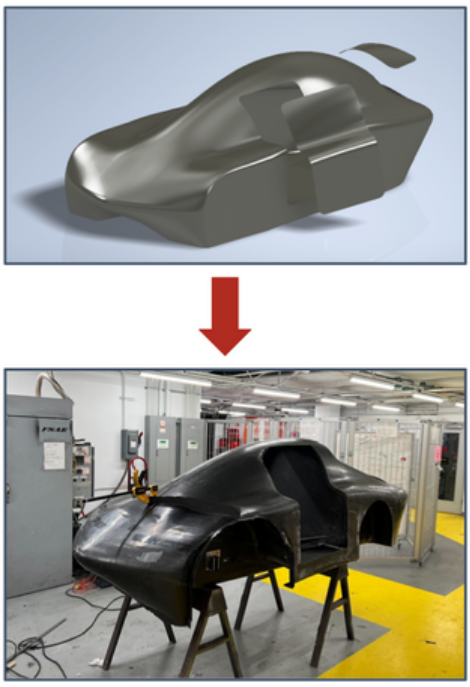




CHASSIS

The Chassis subsystem designs and manufactures our vehicle's lightweight and aerodynamic carbon-fiber monocoque. The team uses industry-standard CFD, surface-modeling, and composite analysis software to optimize the monocoque for aerodynamic efficiency and structural integrity. This year's monocoque will feature:

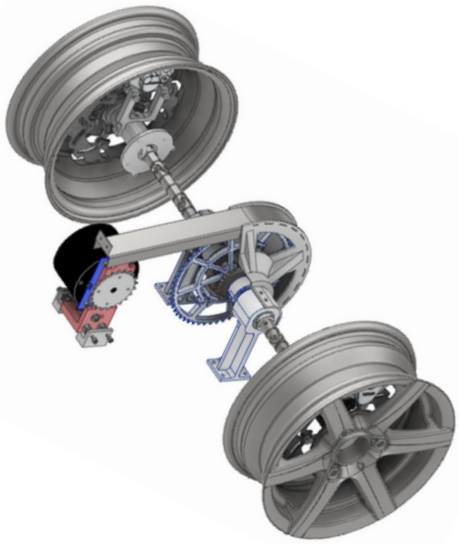
- Larger interior compartment and new doors for driver comfort
- Load-bearing baseplate and strut bar
- Fire-proof bulkhead

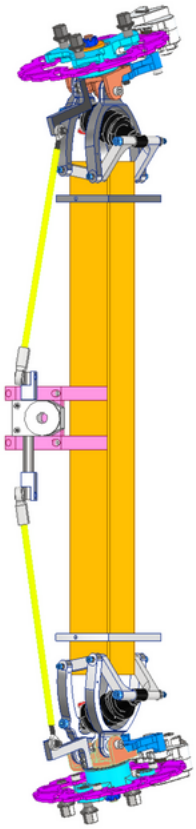


DRIVETRAIN

The Drivetrain subsystem designs the most efficient powertrain possible for our rear-wheel drive vehicle. The team selects the motor and gearbox best optimized for our driving conditions; they also work closely with the Electrical team to develop a reliable dynamometer to load-test the motors and validate our custom motor controllers. This year's drivetrain will feature:

- 2x 48V motors with 7:1 gearboxes
- Custom driveshafts
- New support structures to direct load path away from critical components





STEERING

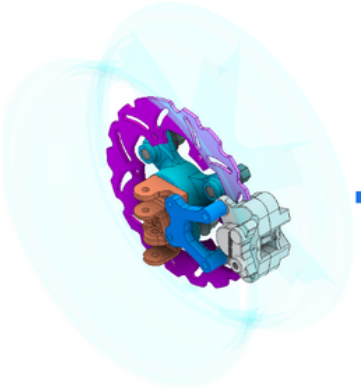
The Steering subsystem designs the manual and autonomous systems that allow for smooth driving and precise control of our vehicle. The team defines our vehicle's dynamic characteristics by calculating our steering and suspension geometry; they also work closely with the Autonomy and Electrical teams to implement autonomous steering and braking capabilities. This year's steering system features:

- Autosteer gearbox
- Autobrake gearbox
- Custom linkages to support rack-and-pinion steering
- Lightweight double wishbone suspension and uprights

MECHANICAL AUTONOMY

The Mechanical Autonomy subsystem works in tandem with the Steering, Autonomy, and Electrical teams to develop the testing rigs and feedback control loops that allow us to validate and tune our autonomous steering and braking systems. This year, the team is working on:

- Autosteer and autobrake benchtop test rigs
- Optimal sensor selection
- Manual override system

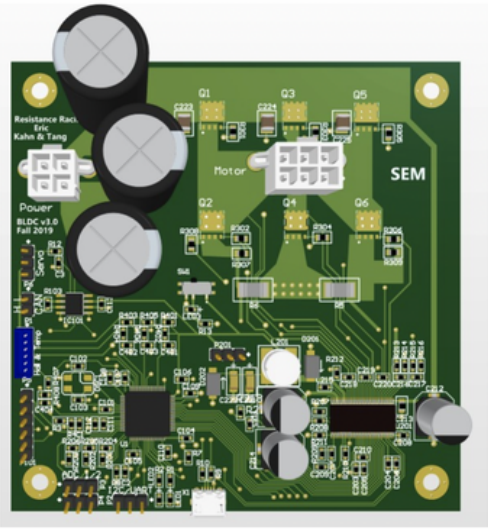


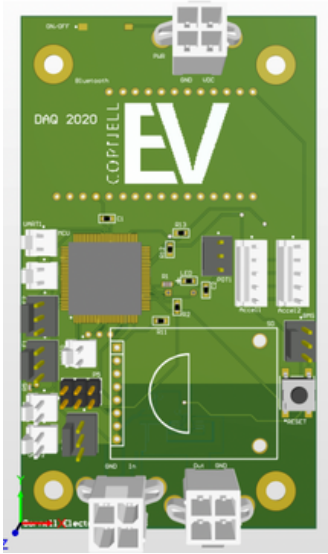
ELECTRICAL

Taking a more “under the hood” role, the electrical subteam supplements the brawn of our mechanical build with the brains of our electrical systems. Our subteam designs the printed circuit boards onboard our vehicle, and implements the medley of sensors and electrical equipment necessary to meet the car’s functional requirements, as well as meet the team’s automation and efficiency goals. This year, we’re aiming to optimize our existing competition-critical systems and redesign some of our older systems such as the Motor Controller, and the Data Acquisition System (DAQ). Additionally, this year we’re moving to a dual-motor rear wheel drive system. This means our Motor Controller project doubles in scale as we control two motors and implement an electrical differential.

MOTOR CONTROLLER

The dual motor controllers we’re designing and populating this year leverage high-efficiency control algorithms to manage each motor in our dual-motor rear-wheel-drive system. These controllers are synchronized with each other and feature firmware that implements an electrical differential, allowing the motors to spin at different speeds when taking turns. The controllers also implement sinusoidal hybrid control and field-oriented control for precise and efficient motor drive.



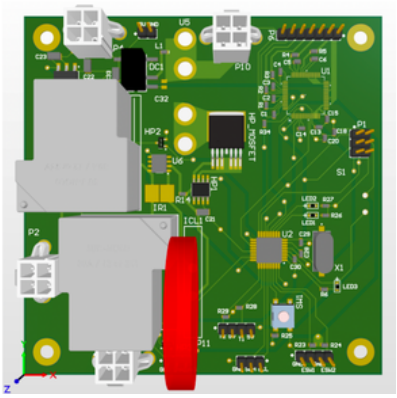


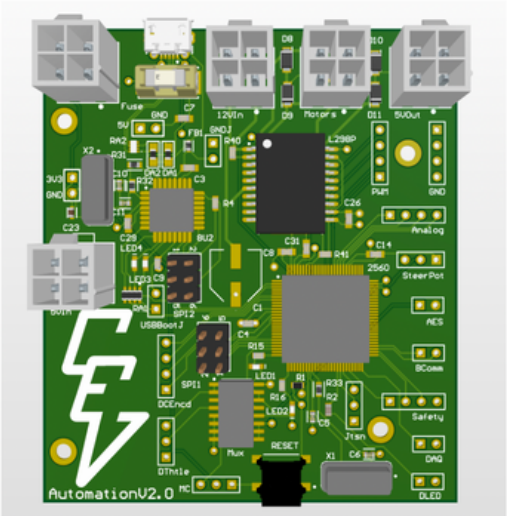
DATA ACQUISITION SYSTEM (DAQ)

The nervous system to our car. DAQ implements all the sensors necessary to gauge our mechanical performance. It also manages the equipment our software team requires to implement autonomous driving.

BATTERY MANAGEMENT SYSTEM (BMS)

The BMS is the caretaker to our 48V LiPo Battery. It monitors the status of the battery's cells, implements overcurrent, overvoltage, and overtemperature protection, as well as maintains its healthy and efficient function through active cell-balancing.





AUTOMATION

The automation board converts software autonomy outputs to signals for mechanical actuation, and simultaneously enables vehicle control via remote control.

DATA APPS & ANALYSIS

The Data Apps and Analysis subteam develops web and mobile applications to visualize and analyze data collected by the data acquisition board developed by the electrical subteam.

In addition to real-time dashboards, the data apps and analysis subteam manages a database and historical dashboard, which the electrical and mechanical subteams use to gain insights and plan their next iterations. Subteam projects include: a Driver Dashboard, a Live Timing Dashboard, and a Historical Dashboard.

The Data Apps and Analysis subteam is also developing an AR Windshield, which entails displaying live information about the vehicle using a heads-up display that is projected onto the windshield. This project aims to also integrate with all subteams' autonomy divisions, so that features including displaying the car's optimal path on the windshield can also be added in the future.

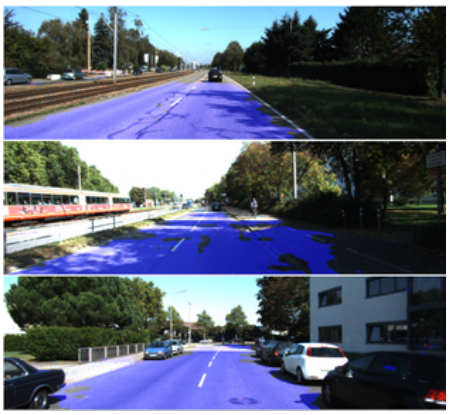
AUTONOMY

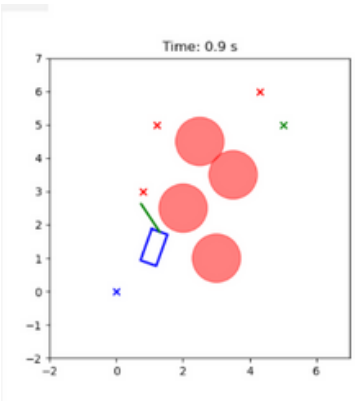
The Autonomy subteam develops the robotics algorithms and software that enables CEV to be the first college student team in the nation designing and building a full-size, autonomous car from scratch. We use a combination of classical, data-driven, and deep-learned solutions for perception, localization, and motion planning, the core pillars of robotics.

In addition to testing our work in simulation, we also build prototype vehicles to support rapid autonomy development. The autonomy subteam works at the forefront of both research and industry, leveraging up-to-date sensors from sponsors and keeping up with recent research progress in computer vision and robotics.

PERCEPTION, LOCALIZATION, AND PLANNING

The autonomy subteam develops its own solutions to these core pillars of robotics, prototyping algorithms and integrating them into our ROS-based stack. We prioritize understanding the underlying concepts in order to achieve better results.





OPERATIONS

The Operations subteam is a multifaceted team that spans the entire spectrum of business operations that helps to ensure the seamless execution of CEV's mission. We focus on maintaining the website, forming sponsor and public relations, tracking our finances, and designing graphics.

We've undergone a complete transformation of our website, and the results are truly impressive. Not only does it highlight our future goals and vision, but it also adds an element of fun with captivating effects and engaging graphics that truly elevate the user experience.

A Breakdown of Our Operations:

Sponsor Relations

- Collaborates with external organizations, building and maintaining partnerships that support our endeavors. This teamwork ensures we have the resources needed to make our projects successful.

Finance

- Manages budgets, tracks expenses, and makes sure our finances are in order, ensuring we can allocate resources efficiently to advance our mission.

Graphic Design

- Uses a variety of tools to design everything from the merchandise to visually appealing infographics.

COMPETITION

Cornell Electric Vehicles competes annually in the Shell Eco-Marathon, one of the world's top energy efficiency competitions with over 700 universities from 52 countries participating, to create the most efficient vehicle.

In the past, we have traveled to the Indianapolis Motor Speedway and competed in the Electric Prototype Category, placing 3rd in 2019 and 5th in 2018. Starting in 2022, we switched to the Electric Urban Concept Category, which is modeled after passenger cars, to better align with industry standards and allow us to pioneer the future of high-efficiency electric cars.

We recognize that the future of the automotive industry lies in autonomous vehicles, and recent pushes for sustainability only cement the importance of autonomous electric vehicles, so this year we are developing and integrating Level 2 autonomy into our competition vehicles for the upcoming 2025 Shell Eco-Marathon.

SPONSORSHIP TIERS

Sponsorship Benefits	TERAWATT $4000+	GIGAWATT $2000-$3999	MEGAWATT $1000-$1999	KILOWATT $500-$999	WATT $100-$499
Graphic Decals on Car	3x Max Size (20x20cm)	2x Large Size	2x Small Text Decal	2x Small Text Decal	
Recruitment Guidance and Information	●	●			
Logo on Banner in Team Office	●	●	●		
Thank You Plaque	●	●	●		
Resume Book	●	●	●		
Logo on all CEV Publications	●	●	●		
Info Session open to Cornell Community	●	●	●		
Social Media Spotlight	●	●	●	●	
Company Name listed in all CEV Publications	●	●	●	●	●
Company Logo on CEV Website	●	●	●	●	●
Thank You Letter	●	●	●	●	●

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CONTACT US

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THANK YOU FOR YOUR CONSIDERATION!