This report highlights outreach activities completed by graduate students and postdocs from the Center for Autonomy during the Fall 2025 semester.

AutoDrive Lab Internship

The AutoDrive Lab Internship is a partnership between Del Valle ISD and the Center for Autonomy that teaches high school student interns robotics, electronics, coding, and autonomous systems through project-based learning. Across multiple lessons, interns explored key concepts in electronics, mechanics, and programming to gradually build functioning robots, also referred to as remote controlled (RC) cars.

The Del Valle AutoDrive Lab Internship was planned, designed, and executed by a 16-person team from the Center for Autonomy, including one professor, one project manager, three internship leads, and eleven instructors. Collectively, the team contributed over 200 hours across all aspects of the internship—planning, curriculum design, grant and stipend administration, logistics, instruction, mentoring, and outreach—turning a complex program concept into a fully executed, high-impact experience for interns.

Professor Ufuk Topcu secured critical grant funding for student stipends and engaged his lab group in outreach to support program implementation. Technical Program Manager Meredith Albers led the overall initiative, formalizing the partnership with Del Valle ISD, managing logistics, and ensuring successful program execution. Internship leads, Christian Ellis, Cevahir Koprulu, and Adam Thorpe, shaped the instructional framework, created technical modules, guided instructors, and oversaw the design and testing of autonomous RC cars. Instructors delivered lessons, facilitated hands-on workshops, and provided direct mentoring to interns.

Instructors: Ege Bayiz, Apoorva Kanti, Mustafa Karabag, Po-han Li, Su Ann Low, Alexander Nettekoven, Michal Podolinsky, Jen Rozenbilt, Will Ward, Yunhao Yang, and Philip Zhao

The internship was organized into a sequence of seven hands-on lessons that progressively introduced interns to core concepts in robotics, electronics, and control systems. Together, these activities supported the following learning outcomes:

- **Lesson 1 – Introduction & Project Overview, RC Car Exploration (Oct 28, 2025)**
  Interns explored the mechanical and electronic components of RC cars. They performed guided teardowns, identified sensors and motors, and mapped system schematics to understand vehicle architecture. Instructors led interactive activities and provided one-on-one support to ensure students could correctly measure, reassemble, and conceptualize the integration of mechanical and electronic subsystems.

- **Lesson 2 – Breadboarding & Circuits (Nov 4, 2025)**
  Interns learned foundational electronics, including voltage, current, Ohm's Law, and safe wiring practices. Exercises involved assembling circuits on breadboards with resistors, LEDs, capacitors, buzzers, and switches. Instructors facilitated step-by-step instruction, troubleshooting, and explanations of real-world applications of series and parallel circuits.

- **Lesson 3 – Moto & Servo Control (Nov 11, 2025)**

Interns built analog circuits to operate DC and servo motors and explored principles of polarity, speed control, and directionality. Instructors demonstrated circuit connections, assisted with assembly, and guided students in understanding how software signals can interface with physical hardware via Raspberry Pi GPIO pins.

- **Lesson 4 – Raspberry Pi & GPIO (Nov 18, 2025)**
  Interns learned to program motors, LEDs, and servos using Python scripts on Raspberry Pi. Instructors helped students integrate multiple components, introduce keyboard-based controls, and troubleshoot code and hardware interactions.

- **Lesson 5 – Mechanical Design (Dec 2, 2025)**
  Interns practiced translating measured physical objects into CAD models using TinkerCAD and Fusion 360. Instructors guided interns through exporting models, preparing print files, adjusting settings, and running 3D prints, demonstrating how engineering design is translated into manufacturable products.

- **Lesson 6 – Soldering & Assembly (Dec 9, 2025)**
  Interns learned soldering techniques to permanently mount components on protoboards, completing circuits for LEDs and servo-control interfaces. Instructors demonstrated safe soldering practices, assisted students in assembling circuits, and prepared all worksheets and materials for hands-on activities.

- **Lesson 7 – Integration and Testing (Dec 9, 2025)**
  Interns learned fundamental concepts of motion control and practiced applying them by building motor driver circuits, programming RobotCar classes in Python, and experimenting with movement patterns and sensor integration. Instructors guided students through hardware assembly, coding exercises, and troubleshooting, providing step-by-step support and structured challenges to reinforce both conceptual understanding and hands-on skills.

Tween Code Club – Austin Public Library

The Tween Code Club at the Austin Public Library is a multi-session program designed for pre-teens (ages 8–13) to explore coding fundamentals using visual tools such as Scratch, and later progress to text-based programming in Python. The program fosters creativity, problem-solving, and digital literacy through guided projects, self-paced exercises, and collaborative learning. The beginner-friendly environment allows participants to gain confidence in coding while interacting with peers and mentors.

During the Fall 2025 sessions (October 21, October 28, November 4, and November 18), Center for Autonomy members, Mustafa Karabag and Jen Rozenblit, assisted with program setup, preparation of materials and computers, and hands-on guidance during coding activities. Mentors answered students' questions, debugged code collaboratively, and provided encouragement as participants completed projects ranging from Scratch animations to Python scripts. Mentors also communicated with parents and library staff, and assisted with post-session cleanup to ensure smooth transitions for subsequent lessons.

The internship is funded by the Army Educational Outreach Program (AEOP), a U.S. Army–sponsored initiative that places student interns in active research environments alongside professional researchers and engineers, with the goal of strengthening the national STEM workforce supporting the U.S. Army, the Department of Defense, and related industries.

Girlstart STEM Extravaganza & Spooktacular Events

Girlstart's STEM Extravaganza and Spooktacular are community-focused STEM outreach events designed to engage participants in hands-on science and engineering activities. Volunteers Apoorva Kanti and Sichang Su introduced STEM concepts in fun and interactive formats, fostering curiosity and encouraging exploration of real-world applications. The events attract hundreds of attendees and emphasize creativity, problem-solving, and collaboration.

At the Back-to-School STEM Extravaganza (September 6, 2025), volunteers managed stations such as "Unbreakable Bubbles," where participants learned chemistry concepts through safe, hands-on experimentation with soap and corn starch solutions.

During the Spooktacular event (October 24, 2025), volunteers facilitated learning while maintaining a welcoming, energetic environment for participants. Activities included creating simple electrical circuits using pumpkins, distributing prizes, and guiding children through Halloween-themed STEM challenges.

World of Engineering Outreach Event

On November 8, 2025, Graduates for Underrepresented Minorities (GUM) participated in the World of Engineering Outreach Event, engaging K–12 students and their families in hands-on STEM activities. Center for Autonomy volunteer Sichang Su helped participants create colorful lava lamps using simple materials, exploring concepts such as density, polarity, and chemical reactions in an interactive way.