Hack the road: Decoding car data for safer, smarter vehicles

A Vertically Integrated Projects (VIP) team built on PIVOT, an NSF-funded open platform for vehicle data

Vehicle cybersecurity

Find and stop attacks on the networks inside cars and trucks

Intelligent transportation

Use vehicle data to make travel safer and more efficient

Smart and connected communities

Turn data from many vehicles into insight for cities

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Your car is a computer network on wheels

Cars talk constantly.

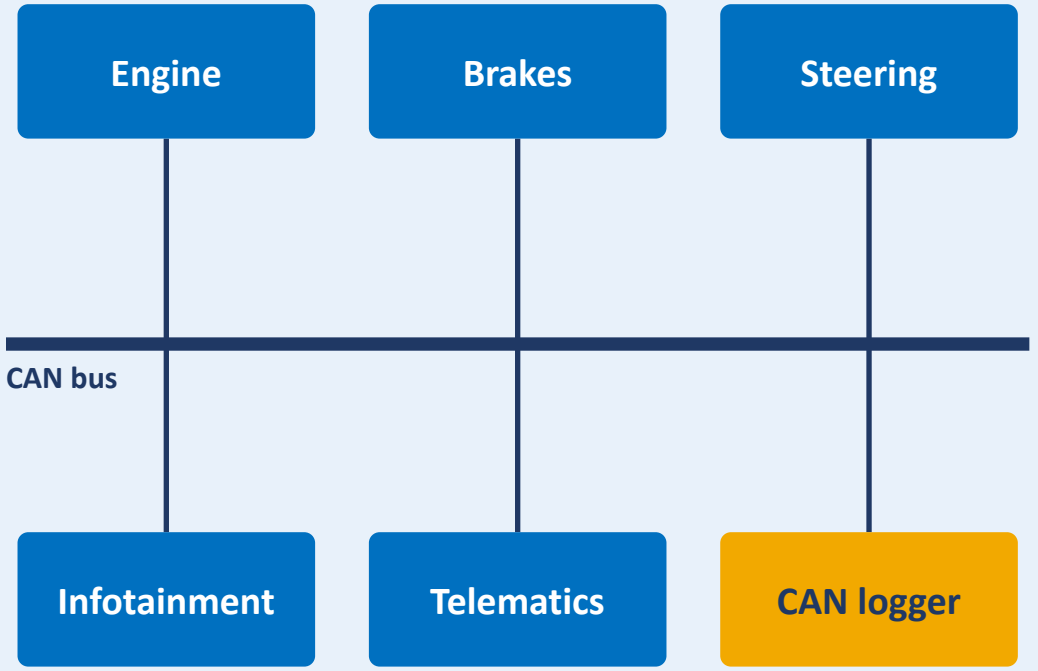
Engine, brakes, steering and infotainment computers exchange messages over an in-vehicle network called the CAN bus.

That chatter is valuable.

It shows how vehicles behave, how people drive, and where attackers could get in.

But good data is scarce.

Real vehicle datasets are hard to collect and raise privacy questions, which slows research.



Our tap into the conversation

PIVOT: An open platform for vehicle data

Platform for Innovative use of Vehicle Open Telematics. An NSF-funded effort by the University of Memphis, Colorado State University and USC Information Sciences Institute, with telematics provider Geotab.



Platform

Infrastructure that hosts the datasets, tools and services



Datasets

Community CAN datasets, Geotab telematics and data from PIVOT loggers



Tools

Open-source software to collect, convert, decode and analyze data



Services

Access to datasets and tools for researchers everywhere



Community

Workshops, cyber challenges and industry partners

What you will get your hands on

U. Memphis Driving Simulator

Drive in the BeamNG simulation environment and capture realistic telematics data, including runs with the Openpilot driver-assistance system.

CAN loggers

Small devices that plug into passenger cars and heavy trucks to record what the vehicle computers are saying.

Vehicle Signal Specification (VSS)

The COVESA open standard for naming vehicle signals. PIVOT demonstrated VSS with BeamNG live at CES 2026.

Real-world vehicle data

Open community CAN datasets, government and transportation data, and Geotab fleet telematics.

Get behind the wheel: The driving simulator



Moza force-feedback wheel, pedals and shifter, a 32-inch ultrawide display, and the BeamNG.tech research simulator

Built by students, for research

An undergraduate and a graduate student assembled the simulator. It produces data for PIVOT and supports research on how people and automated systems drive.

What you could do

- Design driving scenarios and record telematics datasets
- Connect Openpilot driver assistance to BeamNG
- Tell human driving from automated driving in the data
- Stream simulator signals in the open VSS format
- Add the planned VR headset and eye tracking



What does a used car know about you?

35 of 38 used cars on one lot showed personal data on screen

9 of 9 cars with built-in navigation kept the previous owner's trips

$20-$100 buys a used infotainment unit online to examine

Privacy activities, from our team's research on infotainment systems

Image the storage

Copy data from hard drives, Android debug interfaces and flash chips

Dig through the data

Search disk images, databases and logs; recover deleted files

Test the factory reset

Check whether a reset really erases personal data

Survey used cars

Record what screens reveal: paired phones, saved places, trip history

Map data to harms

Classify contacts, locations, messages and logins by the risk they pose

Study AI risks and fixes

Show how AI amplifies misuse, and design verifiable data removal



Pick your lane: Proposed team activities

Drive and record

Design driving scenarios in the simulator and collect labeled datasets for the community.

Build CAN loggers

Assemble, program and test loggers, then install them in volunteer vehicles.

Decode the bus

Reverse-engineer raw CAN messages and map them to standard VSS signal names.

Catch the attacker

Inject simulated attacks and train machine learning models that detect them.

Ship open-source tools

Write converters, dashboards and web features for the PIVOT platform.

Protect driver privacy

Study what vehicle and infotainment data reveal about people, and how to anonymize it.

What you will gain

- **Student Experiences:**
  - Introduction to the concepts of in-vehicle networks (CAN bus) and telematics
  - Vehicle cybersecurity: threat models, attacks and intrusion detection
  - Hands-on work with embedded hardware and CAN loggers
  - Driving simulation and driver-assistance software (BeamNG, Openpilot)
  - Programming in Python on Linux, and teamwork with Git and GitHub
  - Data analysis and machine learning on real vehicle data
  - Open standards and open-source development (COVESA VSS)
  - Digital forensics, privacy and research ethics for vehicle data
  - Technical writing, posters and presentations to research and industry partners

Ready to join?

1. Visit memphis.edu/vip
2. Click Apply Now
3. Choose this team

Questions?

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