

Connected and Automated Vehicles (CAV) An Introduction to Automation AND Commercial Vehicle Applications



Terms to Know?

- Autonomous
- Automated
- Connected (V2I, V2V, V2X)
- LIDAR (Light Detection and Rangi
- Radar
- 5G and DSRC

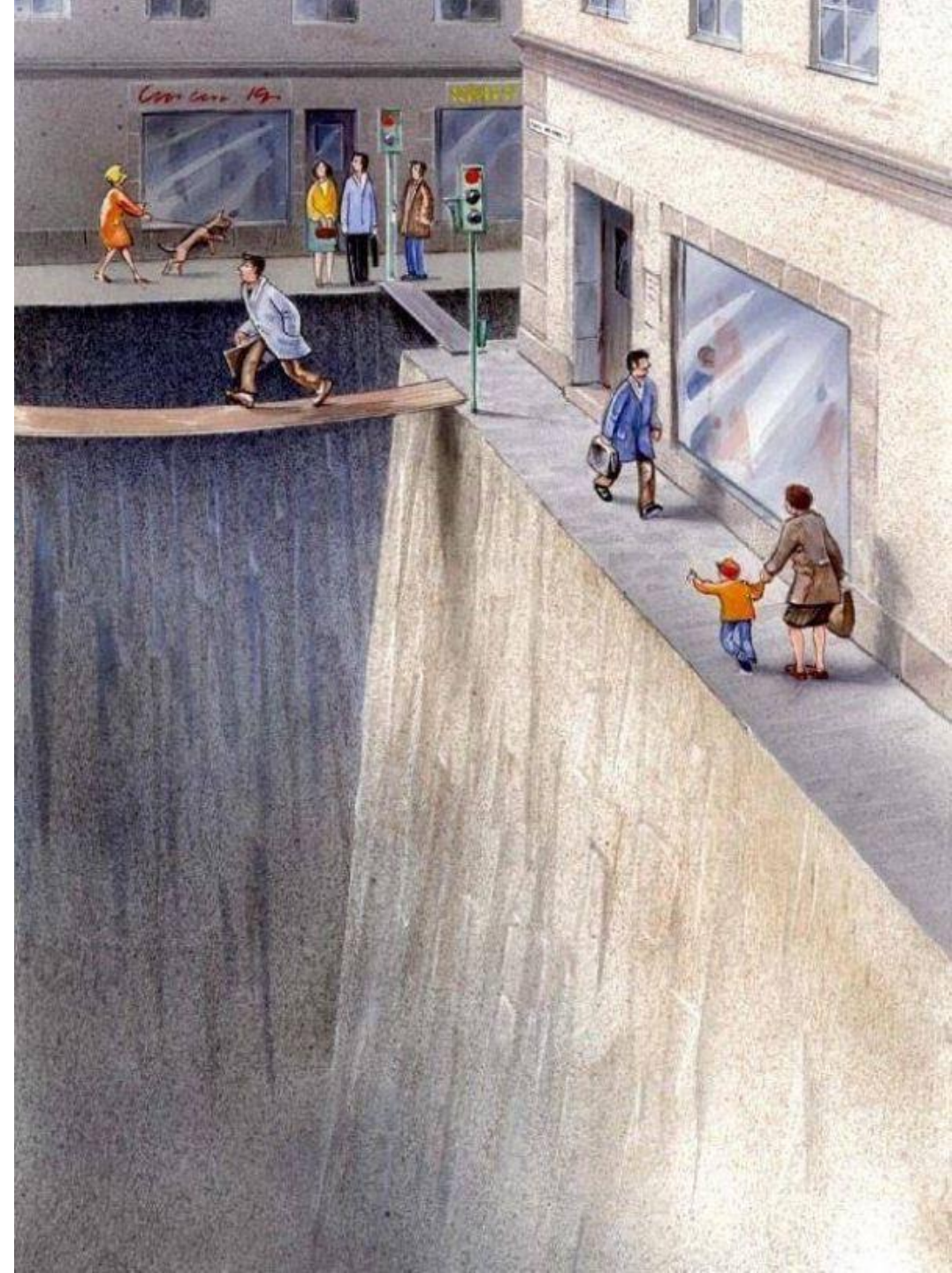


Self-Driving Car Anatomy



Where Have We Been? Where Are We Headed?

- What is an AV and how do they work?
- How far away are AVs?
- What are some of the challenges?
- How will this technology change our lives?
- Will you own one?



The route to the autonomous car

Frank J. Goguen, CFA[®], senior research analyst and John D. Connolly, writer at The Boston Company Asset Management LLC[®] explore the future economic and social potential of driverless cars.

THE BOSTON COMPANY
ASSET MANAGEMENT, LLC

Advantages

Safety
90%
of road traffic accidents are currently caused by human error.¹

Driverless cars could translate into approximately **36,000** lives saved each year and approximately **US\$ 488 billion.**

Social
Greater mobility provided to elderly and disabled people.

People over the age of 65 expected to double in US by **2050.**²



Economic
Morgan Stanley estimates Autonomous cars will result in **US\$ 1.3 trillion** savings every year for the US economy, globally this translates into **US\$ 5.6 trillion.**³

Economic benefits for drivers

- Fuel costs
- Productivity gains
- Accident costs

Potential obstacles

Liability
Who accepts responsibility in the case of an accident?

Legislation
US infrastructure deficiencies mean that **US\$ 10.8 billion** had to be found to keep the Highway Trust Fund solvent until May 2015.⁴

Consumer adoption

Once people accept and trust the systems, adoption rates are expected to climb.

Welcome to the autonomous car



2030

AUTOMATION LEVELS OF AUTONOMOUS CARS

LEVEL 0



There are no autonomous features.

LEVEL 1



These cars can handle one task at a time, like automatic braking.

LEVEL 2



These cars would have at least two automated functions.

LEVEL 3



These cars handle “dynamic driving tasks” but might still need intervention.

LEVEL 4



These cars are officially driverless in certain environments.

LEVEL 5



These cars can operate entirely on their own without any driver presence.

Any
Questions
on
How
AVs
Work?

HOW UBER'S FIRST SELF-DRIVING CAR WORKS

Top mounted **LIDAR** beams 1.4 million laser points per second to create a 3D map of the car's surroundings.

There are **20 cameras** looking for braking vehicles, pedestrians, and other obstacles.

A **colored camera** puts LiDAR map into color so the car can see traffic light changes.

Antennae on the roof rack let the car position itself via GPS.

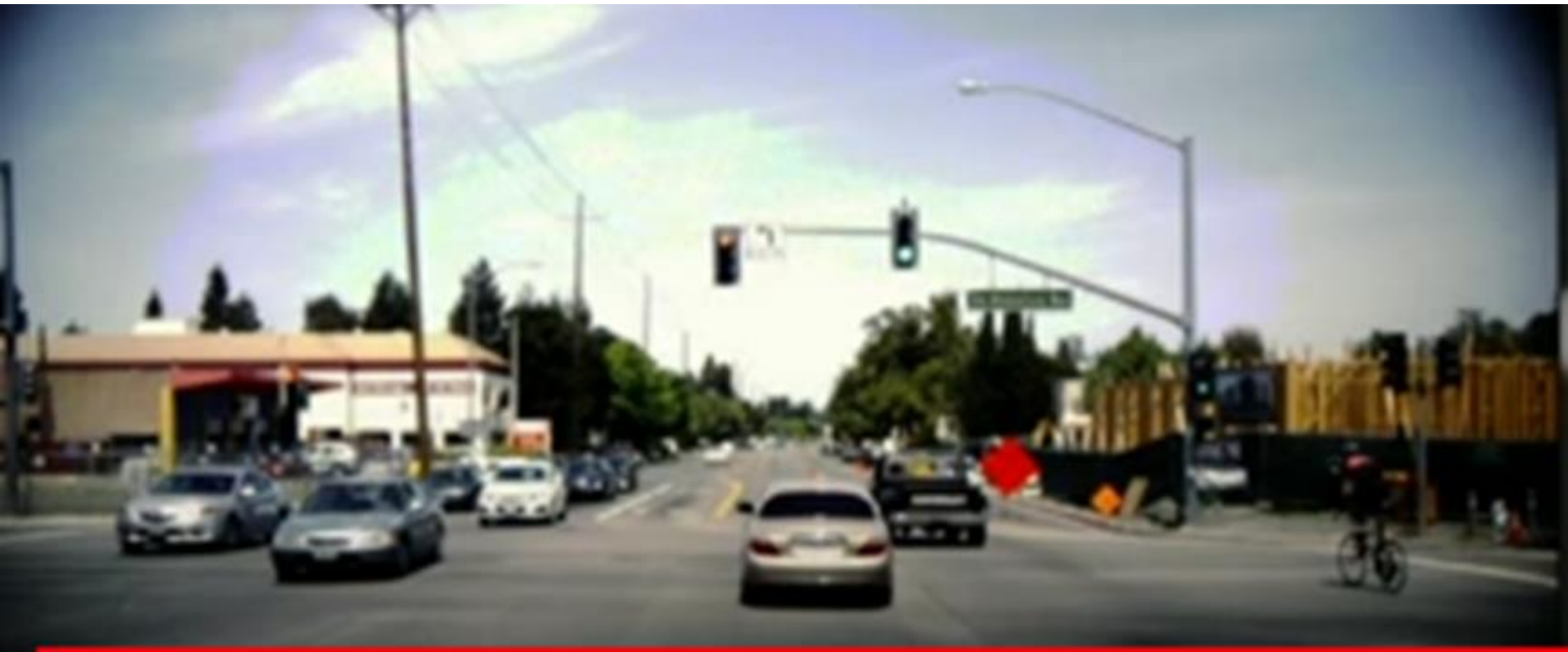


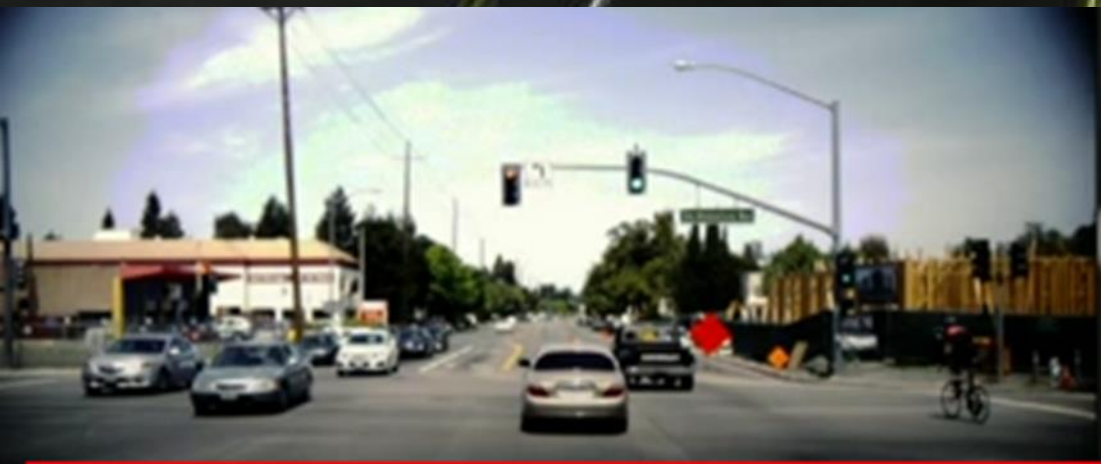
LIDAR modules on the front, rear, and sides help detect obstacles in blind spots.

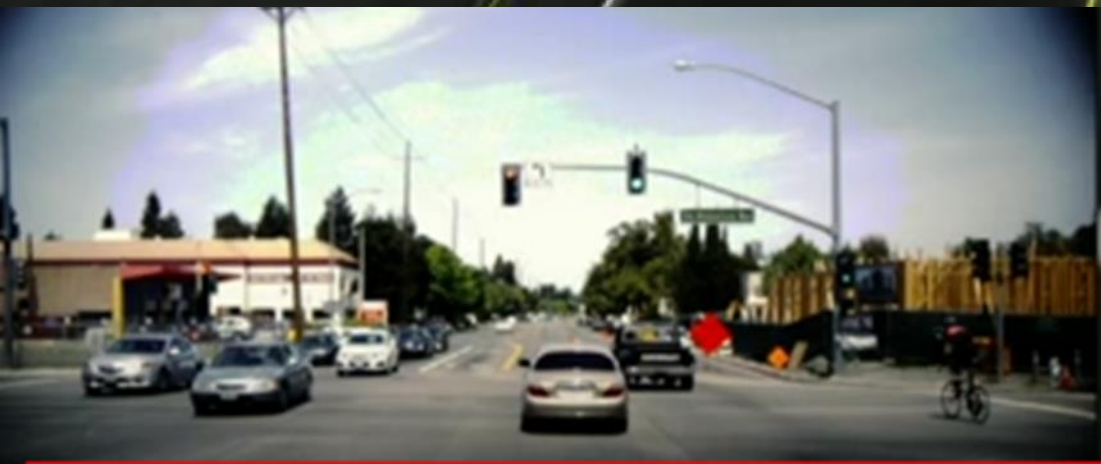
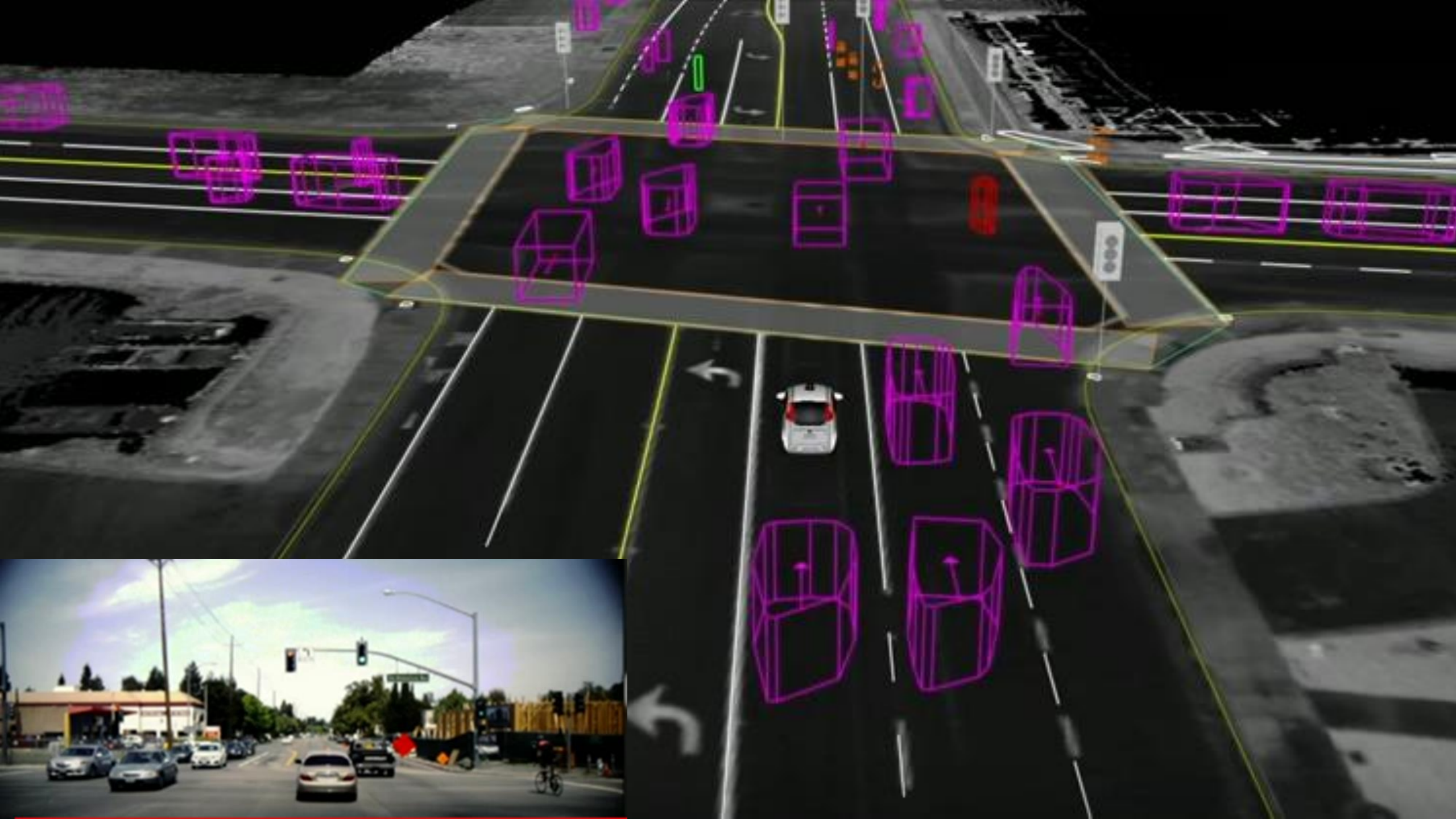
A **cooling system** in the car makes sure everything runs without overheating.

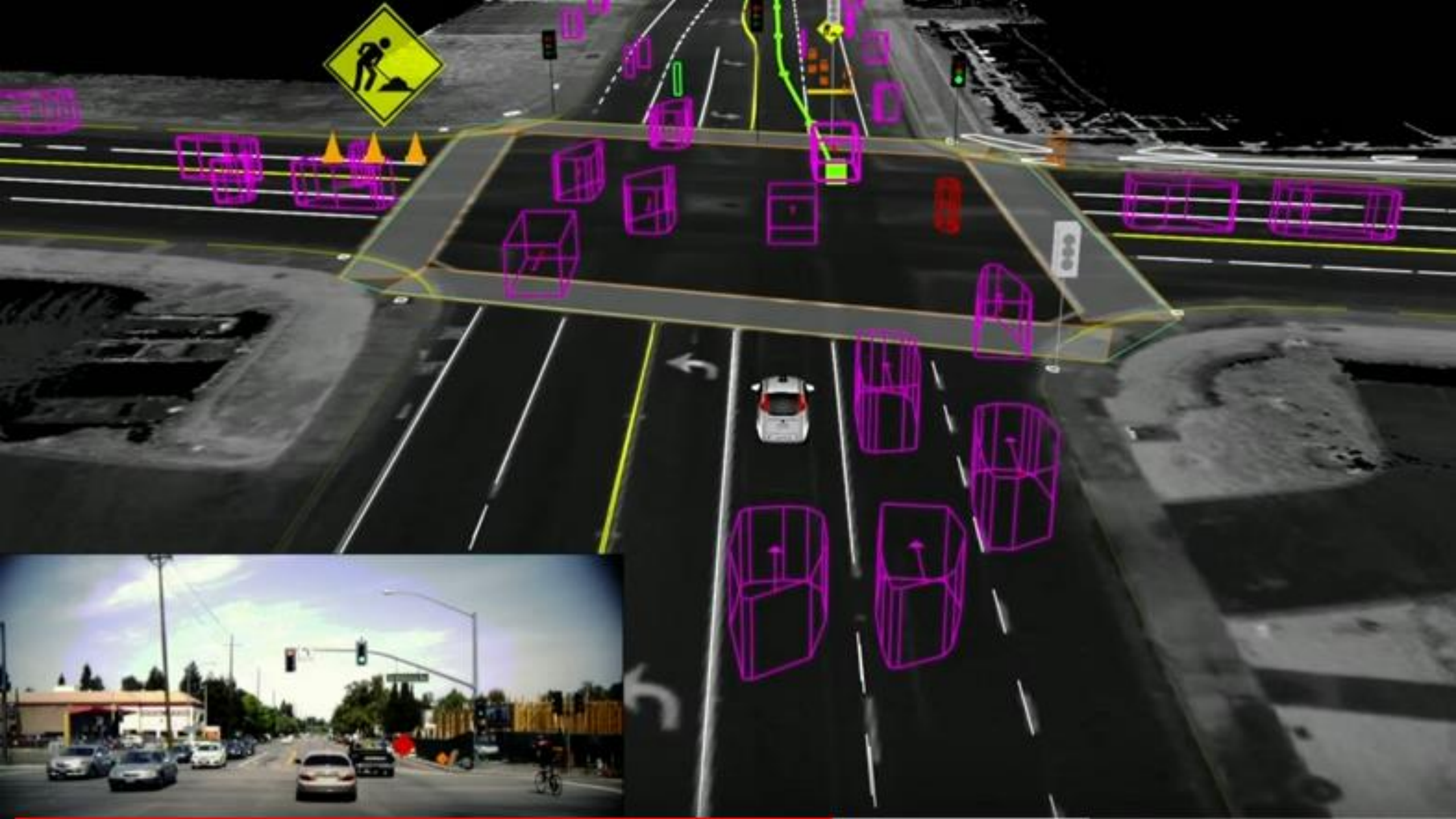


View From the Camera of the Car



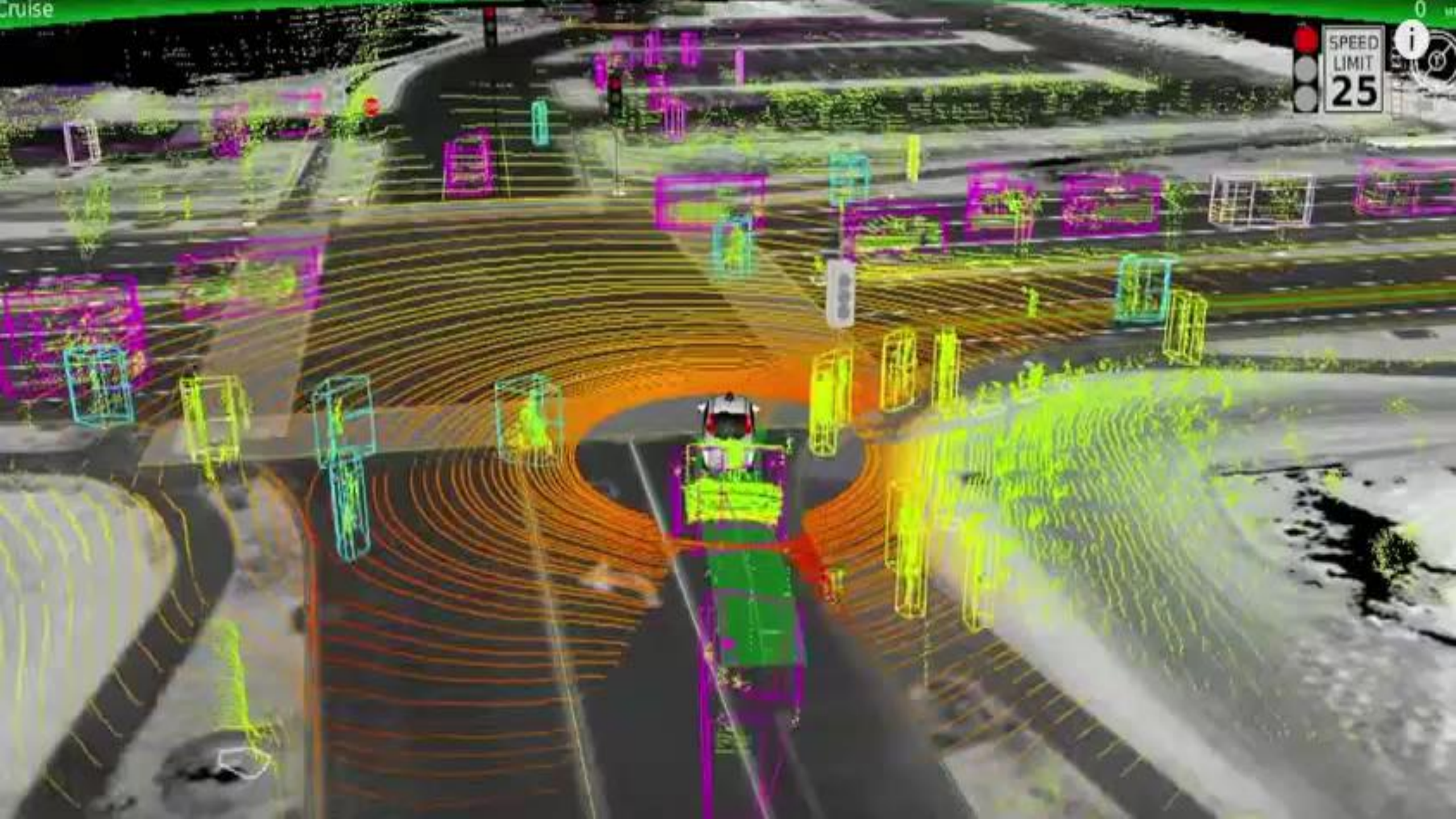












NETFLIX

**BLACK
MIRROR**





LIVE



THOMAS ROBERTS
ANN ARBOR, MI



What Challenges Exist?



What does the future of AV look like?



A white, box-shaped autonomous delivery robot is shown from a rear-quarter perspective. The robot has a white body with the FedEx logo printed on the back. The logo consists of the word "Fed" in purple and "Ex" in orange, with a registered trademark symbol (®) to the right. The robot is mounted on a white chassis with two large, treaded black tires and a smaller front wheel. It is positioned on a concrete sidewalk in front of a house with dark blue siding and white trim. A white railing and a young tree are visible in the background.

FedEx®

