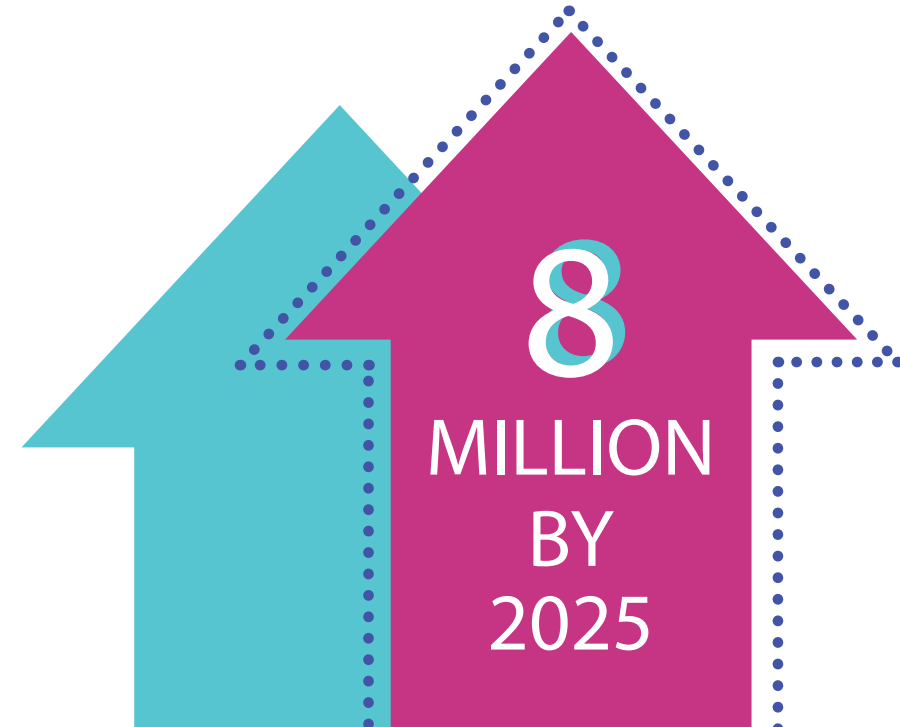


DEFINING THE 6 LEVELS OF SELF-DRIVING AUTONOMY

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Self-driving cars are not all created equal. While researchers predict 8 million autonomous vehicles will be on the road by 2025, their self-driving capabilities will differ. SAE International updated the SAE J3016 in 2021 to clarify how the automotive industry can define driver support systems and advanced driver assistance systems.



THE LEVELS OF AUTOMATION IN VEHICLES BREAKS DOWN INTO SIX DIFFERENT CATEGORIES:

- LEVEL 0 ▶ No Driving Automation
- LEVEL 1 ▶ Driver Assistance
- LEVEL 2 ▶ Partial Driving Automation
- LEVEL 3 ▶ Conditional Driving Automation
- LEVEL 4 ▶ High Driving Automation
- LEVEL 5 ▶ Full Driving Automation

Today's car market offers different autonomous capabilities, and the selection of vehicles is growing. So let us explore the different driving levels and which cars are better equipped to dominate the road.

No Driving Automation→ LEVEL 0

At this level, the human driver is entirely in control and performs all the dynamic driving tasks (DDT). Cars with active safety systems that may provide alerts or momentary emergency actions. Such subsystems as blind-spot detection, stability control, forward-collision warning, or automatic emergency braking are considered level 0 because the safety systems do not drive the vehicle.

VEHICLES: The majority of cars on the road today are Level 0.



Driver Assistance→ LEVEL 1

Level 1 is the simplest form of vehicle automation with at least one driver support. The system can perform a sustained and operational design domain (ODD) specific subtask in either the lateral or longitudinal direction as part of a DDT automation. The driver must supervise the driving automation system by performing the object and event detection and response (OEDR) and other dimensions of the vehicle motion. The automation is short-term and meant to assist the driver.

VEHICLES: The Audi 2021 lineup has both adaptive cruise control and hands-on lane-centering.



Partial Driving Automation→ LEVEL 2

In comparison to Level 1, Level 2 performs DDT automation for longer periods. The ODD performs extended motion in the lateral and longitudinal direction, but the driver is still expected to have their hands on the wheel for any emergency OEDR actions. The SAE J3016 classifies this as automated movement under the driver's supervision.

VEHICLES: The 2021 Genesis G70 can perform adaptive cruise control down to a stop.



Conditional Driving Automation→ LEVEL 3

The Level 3 of self-driving automation is a significant step up from Level 2 and is not legal yet on U.S. roads. Conditional driving automation introduces sustained and ODD-specific performance by an automated driving system (ADS). Here the driver is not constantly supervising the vehicle but instead is on standby and must be ready to take control in an emergency. However, the car is driven entirely by the ADS and artificial intelligence software to make movement decisions based on its environment. An example of Level 3 driving is a vehicle capable of performing all DDT in a low-speed area or in stop-and-go freeway traffic.

VEHICLES: The Honda Legend became the world's first commercially available Level 3 autonomous car in 2021.



High Driving Automation→ LEVEL 4

High driving automation is a complete ADS and does not require any human interaction to operate the vehicle, even in emergencies, as the car is programmed to stop in the event of a system failure or emergency. These cars are expected to be the future of autonomous taxis and public transportations. Depending on the vehicle features, certain Level 4 vehicles may require human intervention to finish the route or handle transitions, such as exiting the freeway, and their capabilities may be restricted to a given geographical region. An external dispatcher may also be needed to program the destination of the vehicle.

VEHICLES: Waymo, owned by Alphabet Inc., is a Level 4 vehicle, and is currently testing its self-driving taxi service out of Phoenix, Arizona.



Full Driving Automation→ LEVEL 5

The highest level of automation, Level 5, requires no human interaction whatsoever. The route planning, the vehicle DDT, and the transitions between low and high-speed zones are controlled entirely by the ADS. These vehicles are not bound geographically, nor are they affected by external conditions such as weather or congested traffic environments. The only human input needed is to pick a destination.

VEHICLES: There are currently no Level 5 vehicles on the road today.

