

خودروهای خودران

کنکاشی در باب گستره هوش مصنوعی در صنعت خودرو

Decision making -

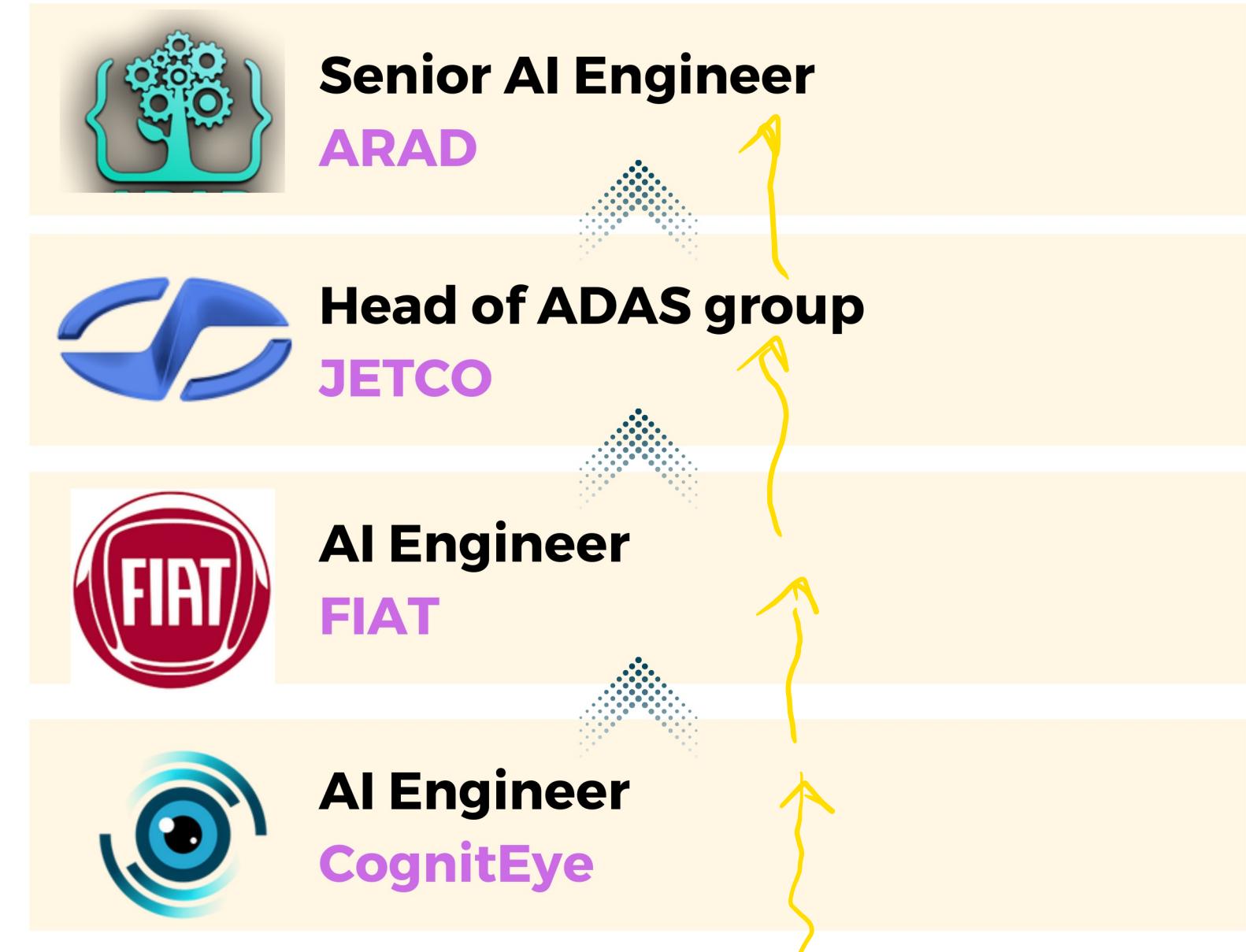
Me

Mahmoud(Amin) Alipour

AI Engineer



<https://www.linkedin.com/in/mahmoudalipour/>



- ✗ **What?**

- ✗ **Why?**

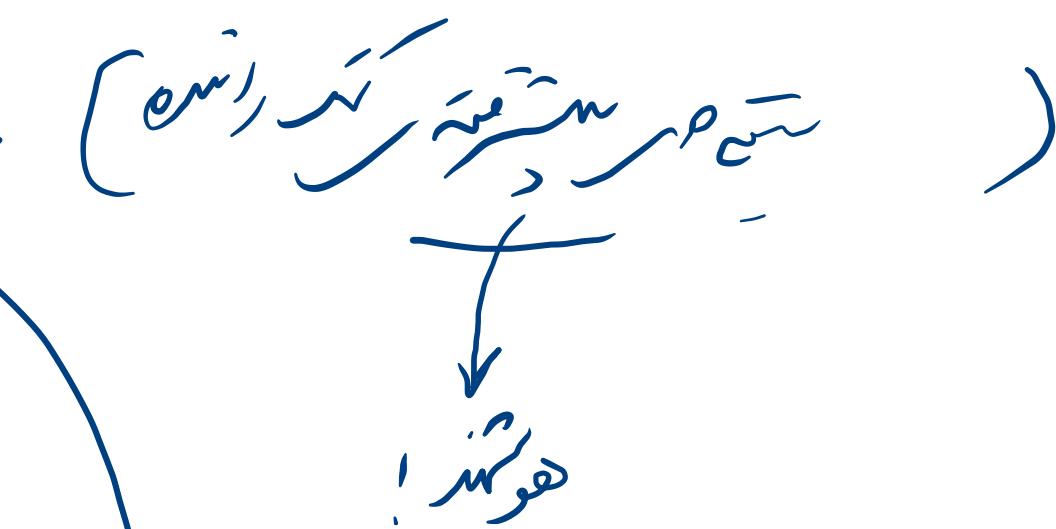
- ✗ **How?**

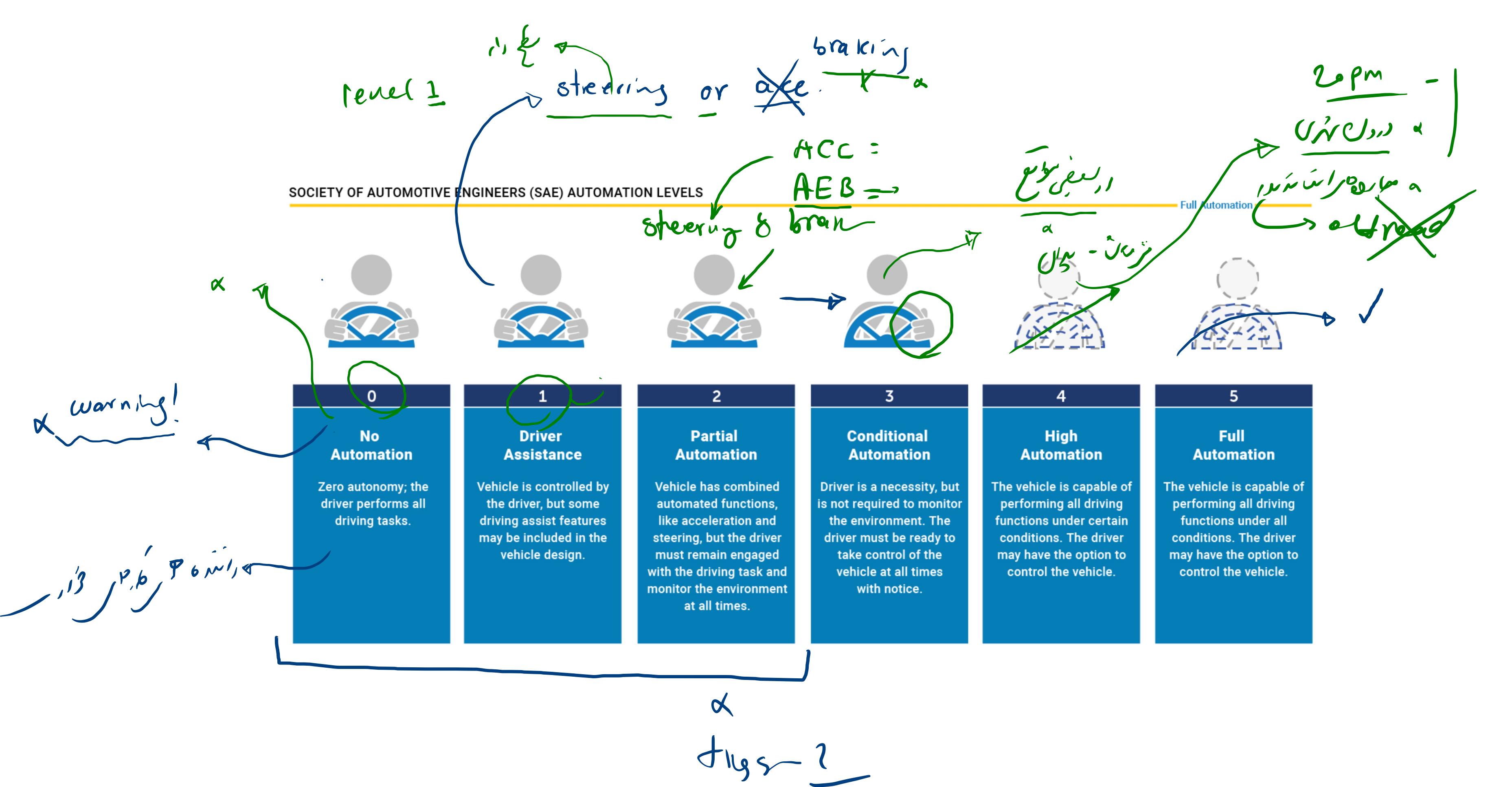
- ✗ **World Situation?**

what?
ADAS

ADAS

Advanced Driver Assistance Systems





جی اے دی اے اس کا
کام چیزیں کہ جائیں

SubSystems

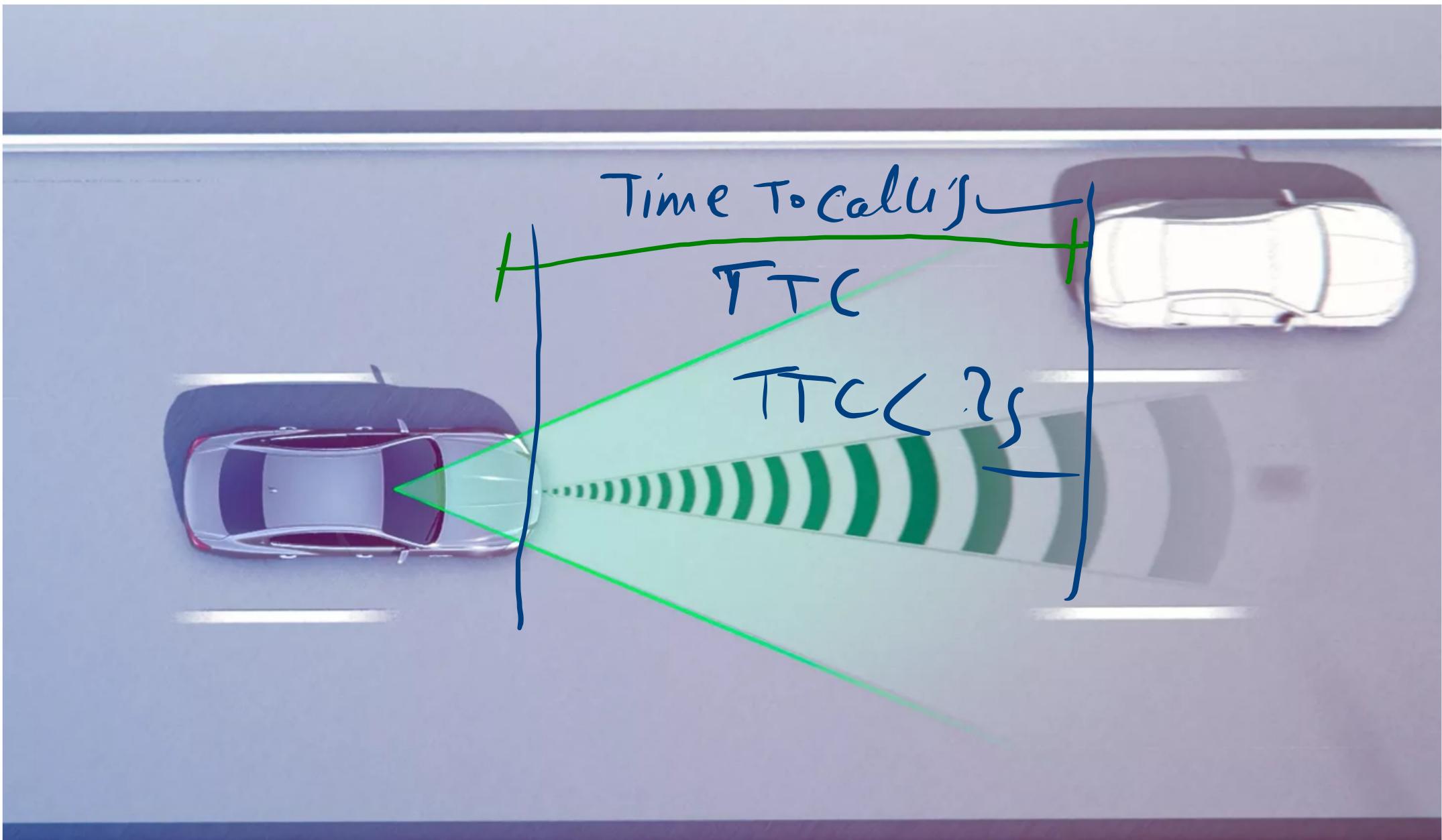
ADAS

FCW

فُورَدْ كَالِيُونْ وَارْنِرْ

Forward Collision Warning

is a safety feature that alerts the driver to an imminent collision with a vehicle or object in their path, allowing them time to take evasive action.



RCW

Rear Collision Warning

The primary purpose of RCW is to detect vehicles approaching from behind at a speed that could result in a collision

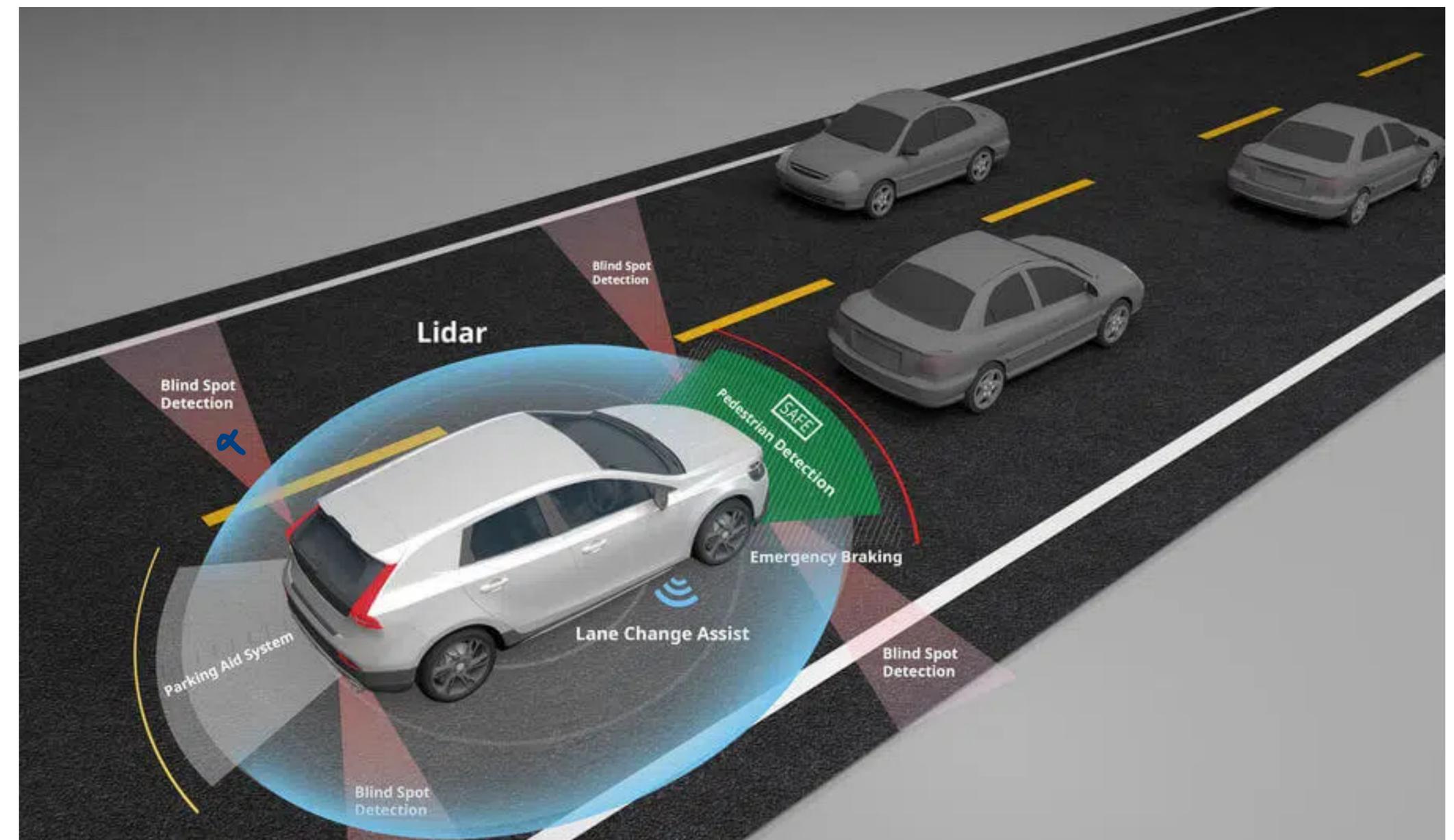


BSD

[warning] ↗

Blind Spot Detection

- ✓ Monitors and alerts the driver to vehicles or objects in the blind spots.

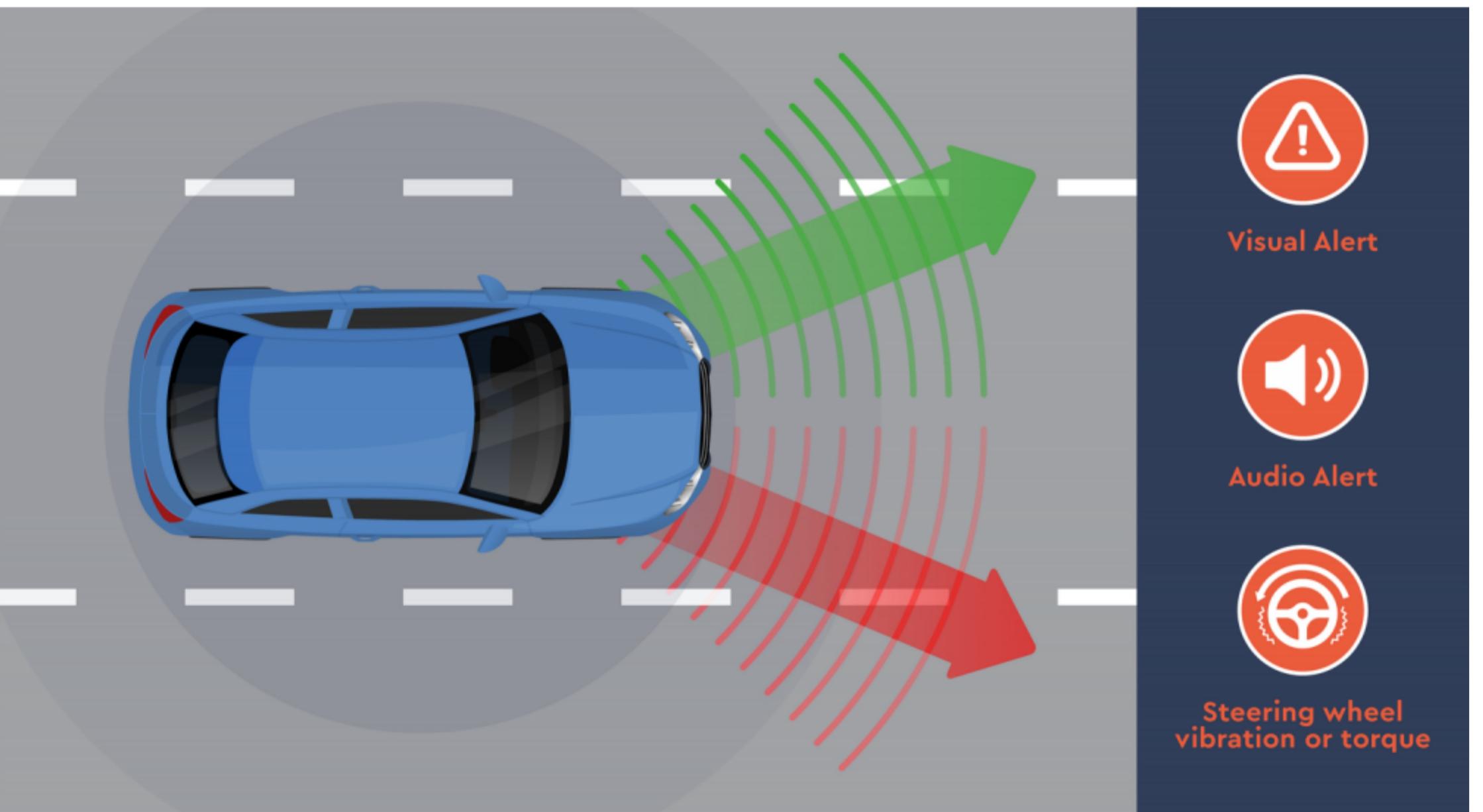


LDW

*leved
warning*

Lane Departure Warning

is a safety feature that alerts the driver when the vehicle unintentionally begins to drift out of its lane without the use of a turn signal.

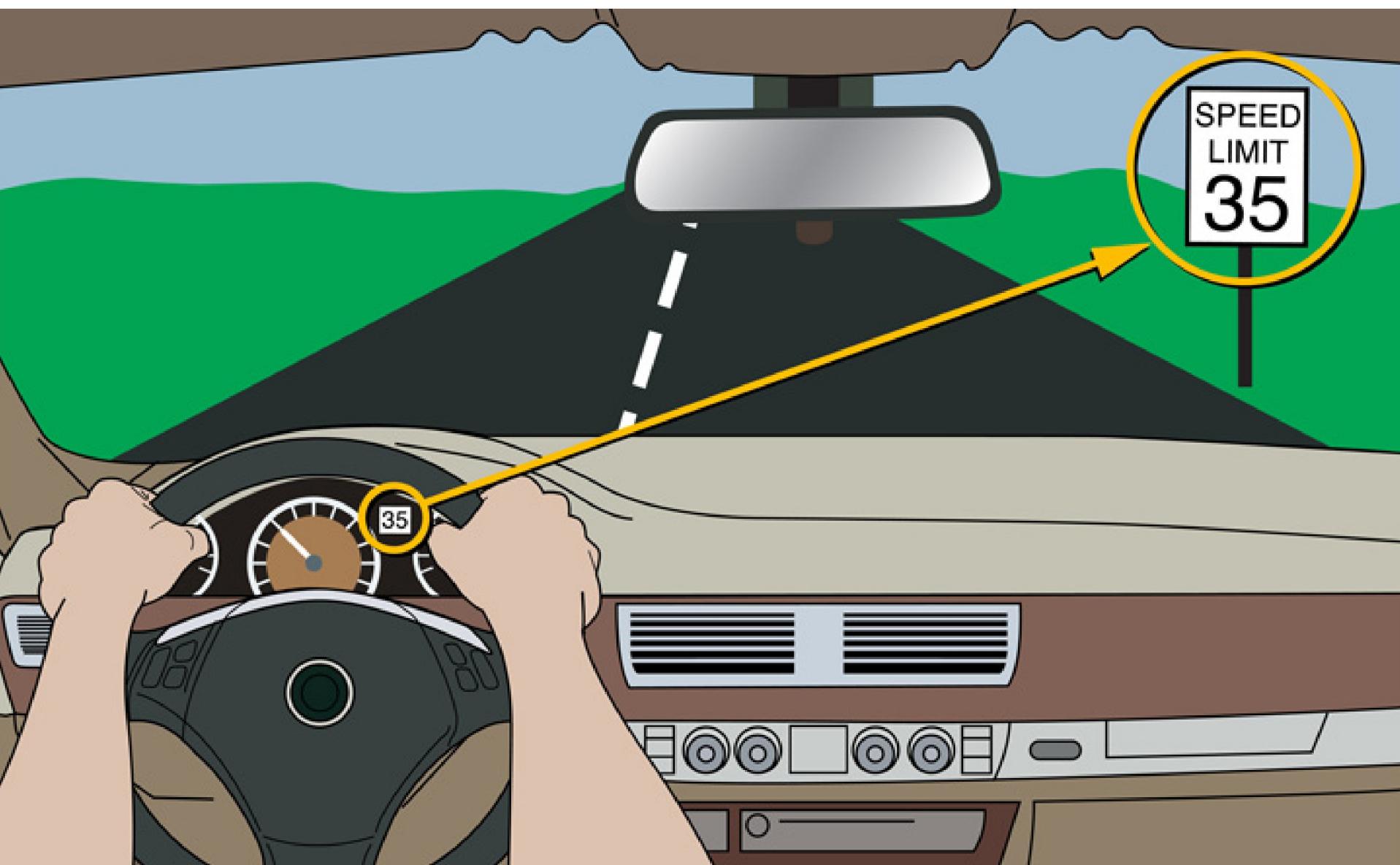


TSR

warn

Traffic Sign Recognition

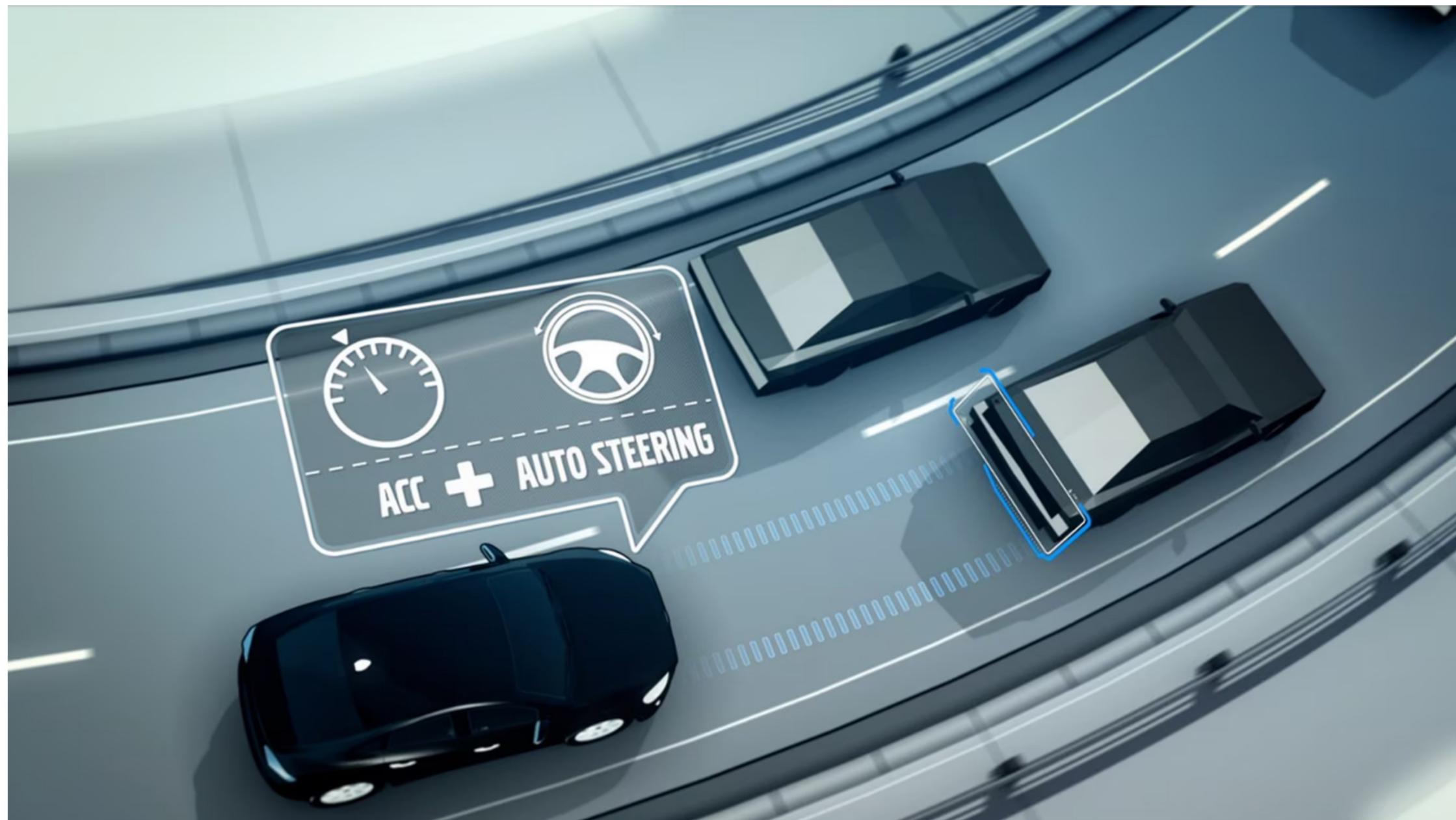
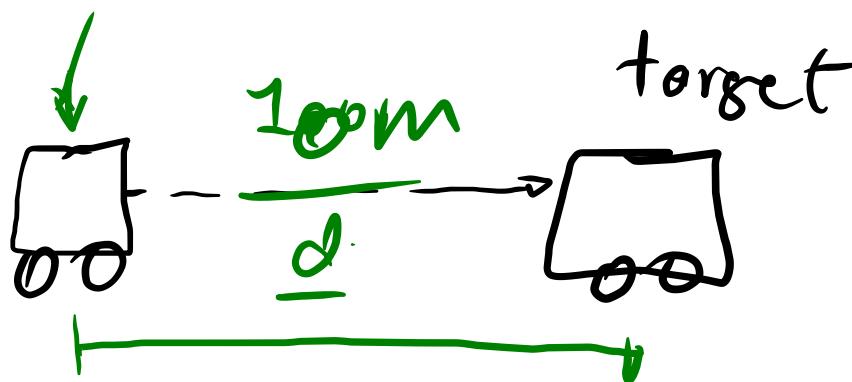
Detects and reads traffic signs, displaying the information to the driver.



ACC ~~~~~ } $\xrightarrow{\text{Level 1}}$
~~~~~ }  $\xrightarrow{\alpha}$  2

## Adaptive Cruise Control

Maintains a set speed and distance from the vehicle in front.



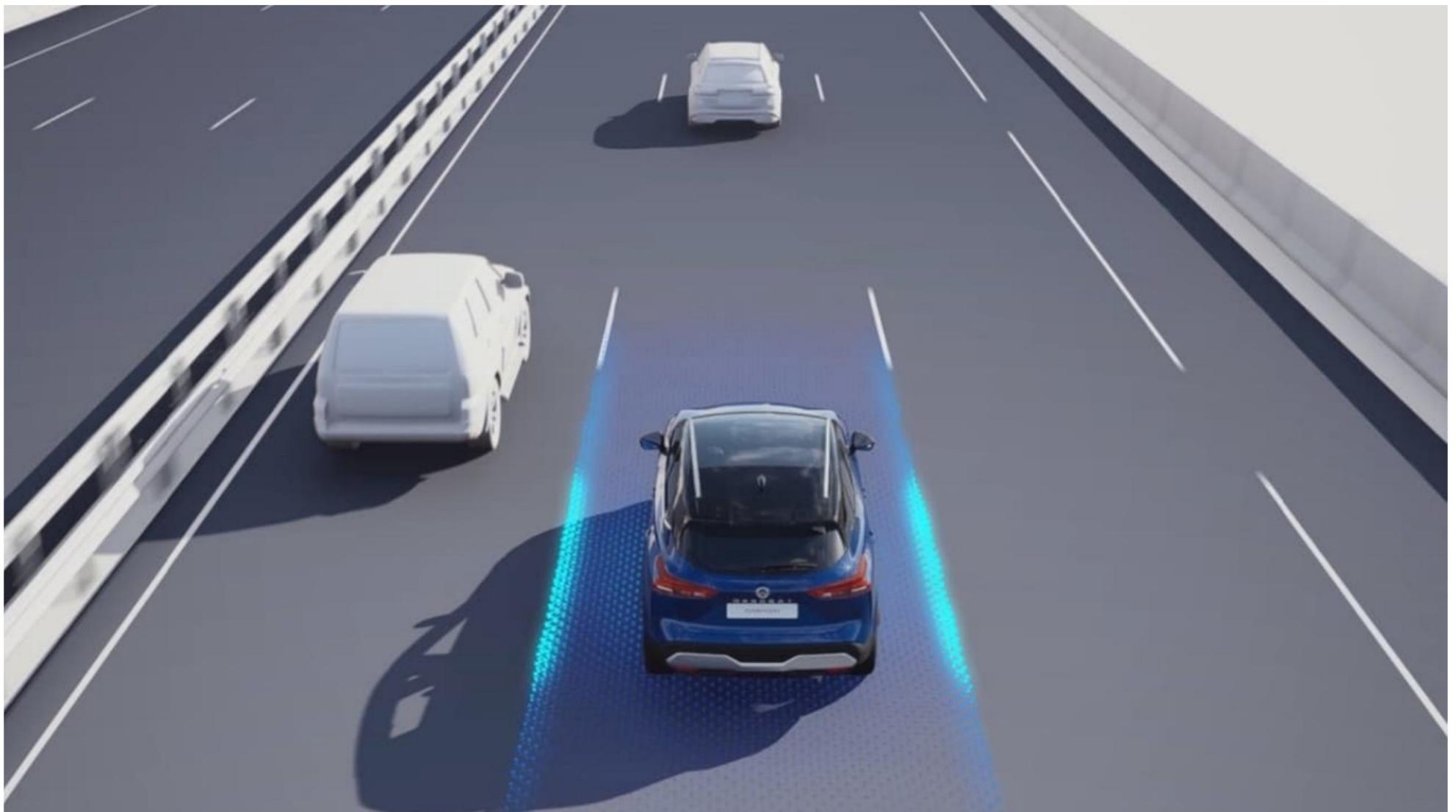
**LKA**

# **Lane Keeping Assist**

is a system that actively helps the driver stay within their lane by providing steering inputs or corrective actions when the vehicle starts to drift out of the lane without signaling.

level 1

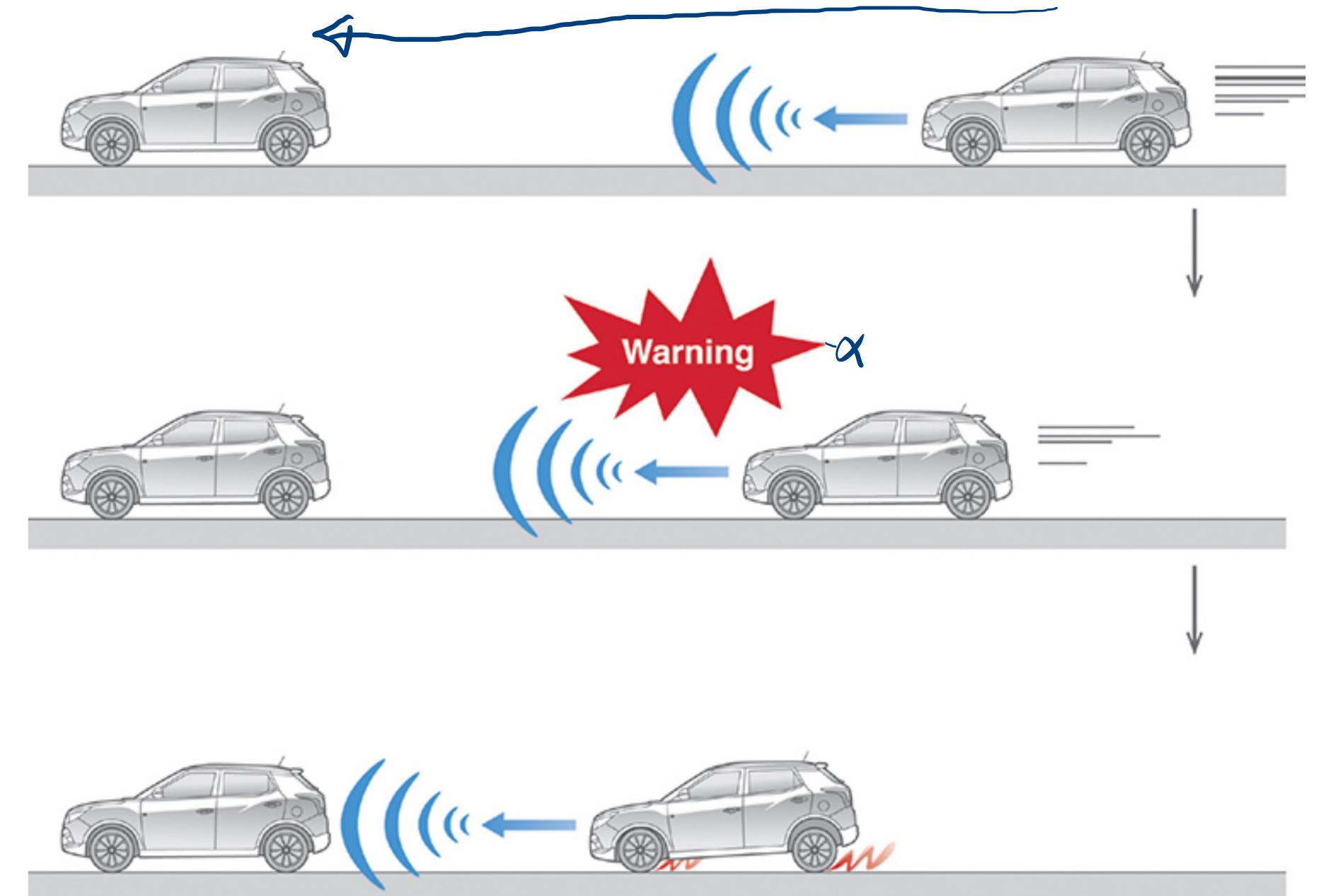
Jug

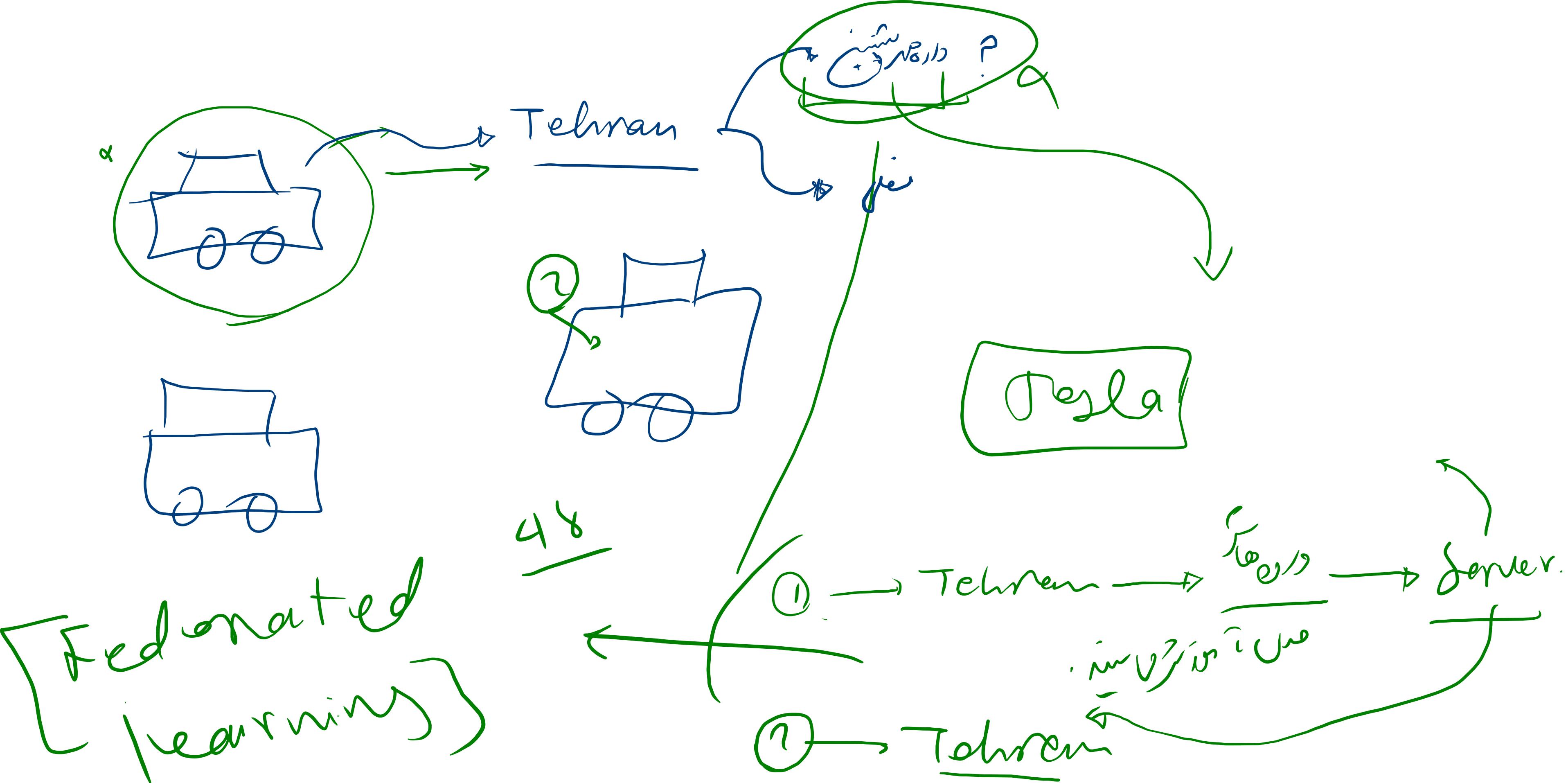


**AEB**

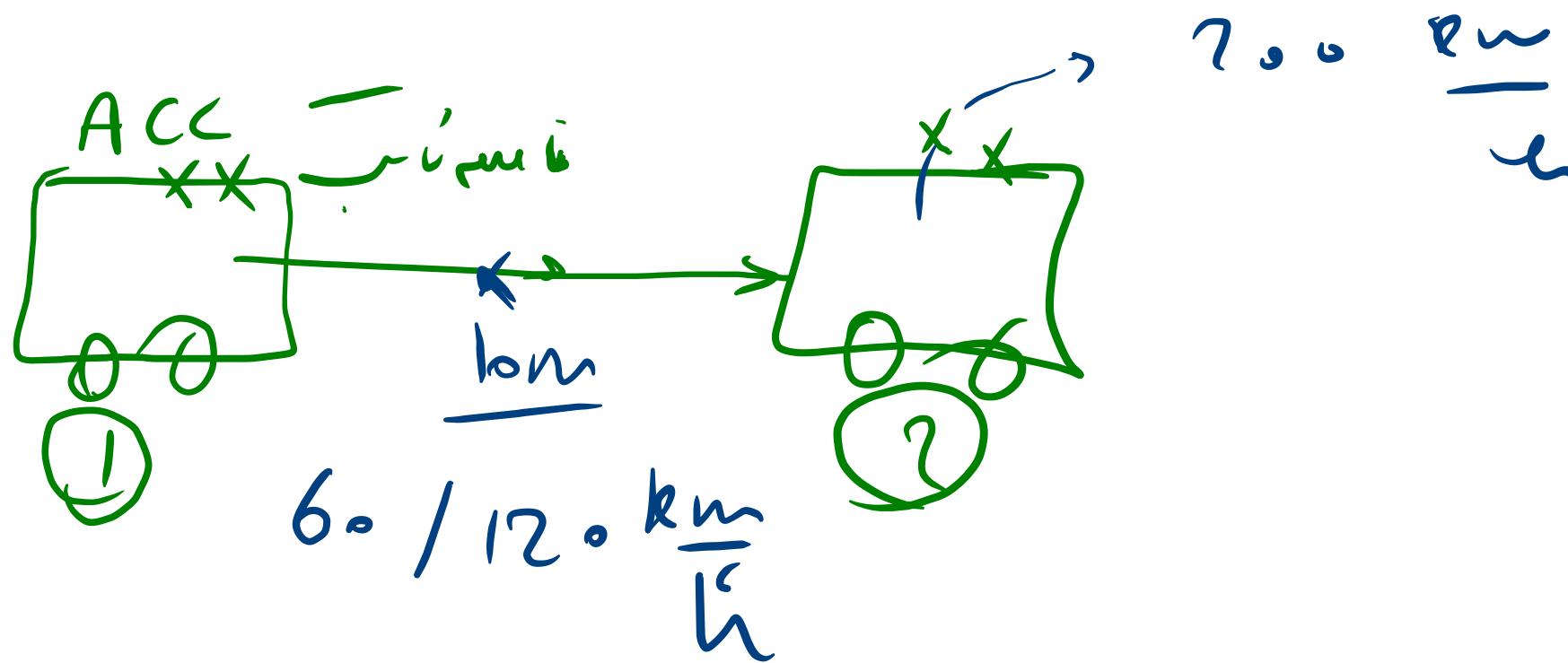
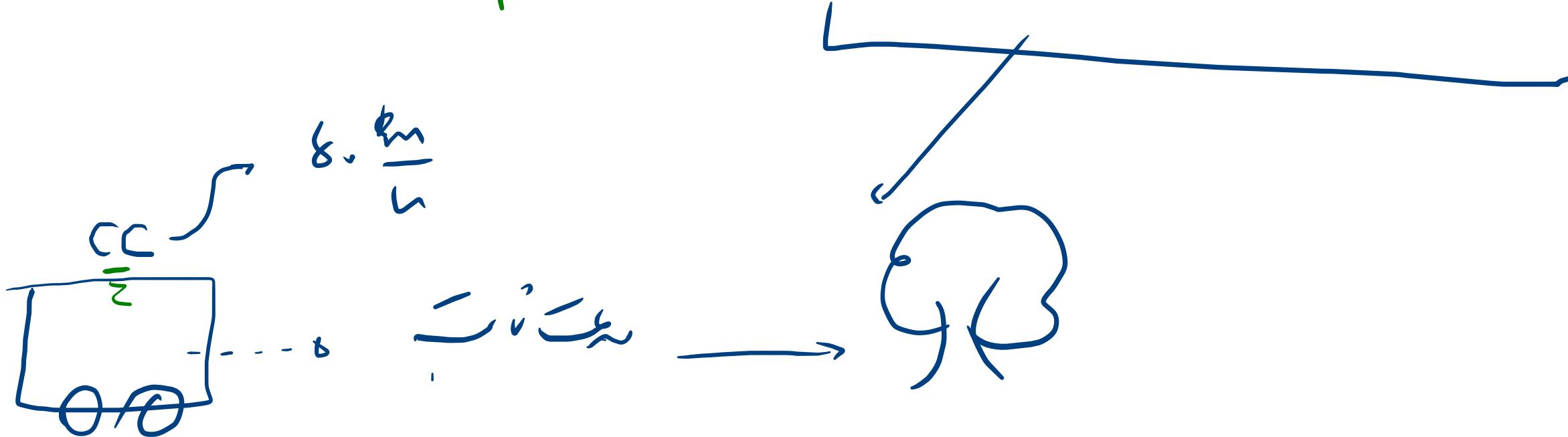
## Automatic Emergency Braking

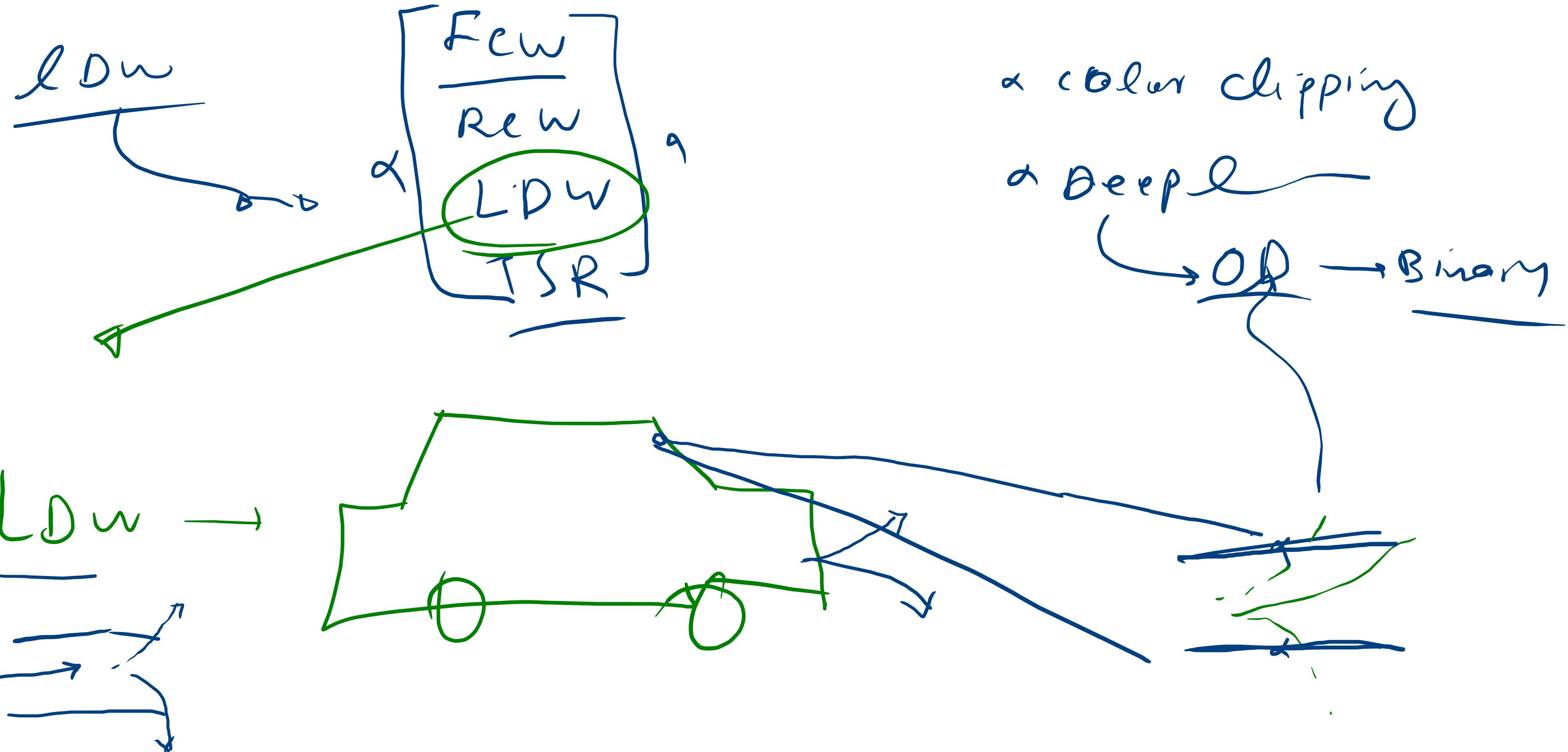
Detects an imminent collision and can apply the brakes automatically to prevent or mitigate the impact.





ACC → Adaptive cruise control.

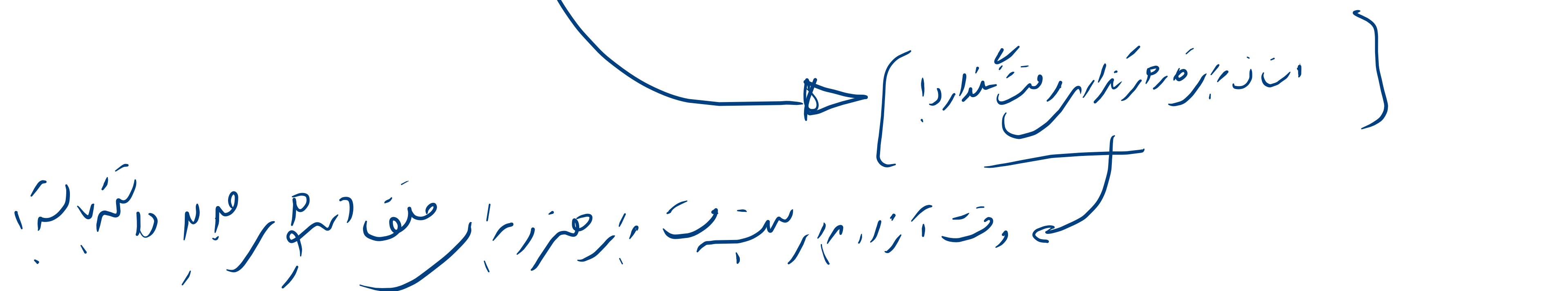




**why?**  
ADAS

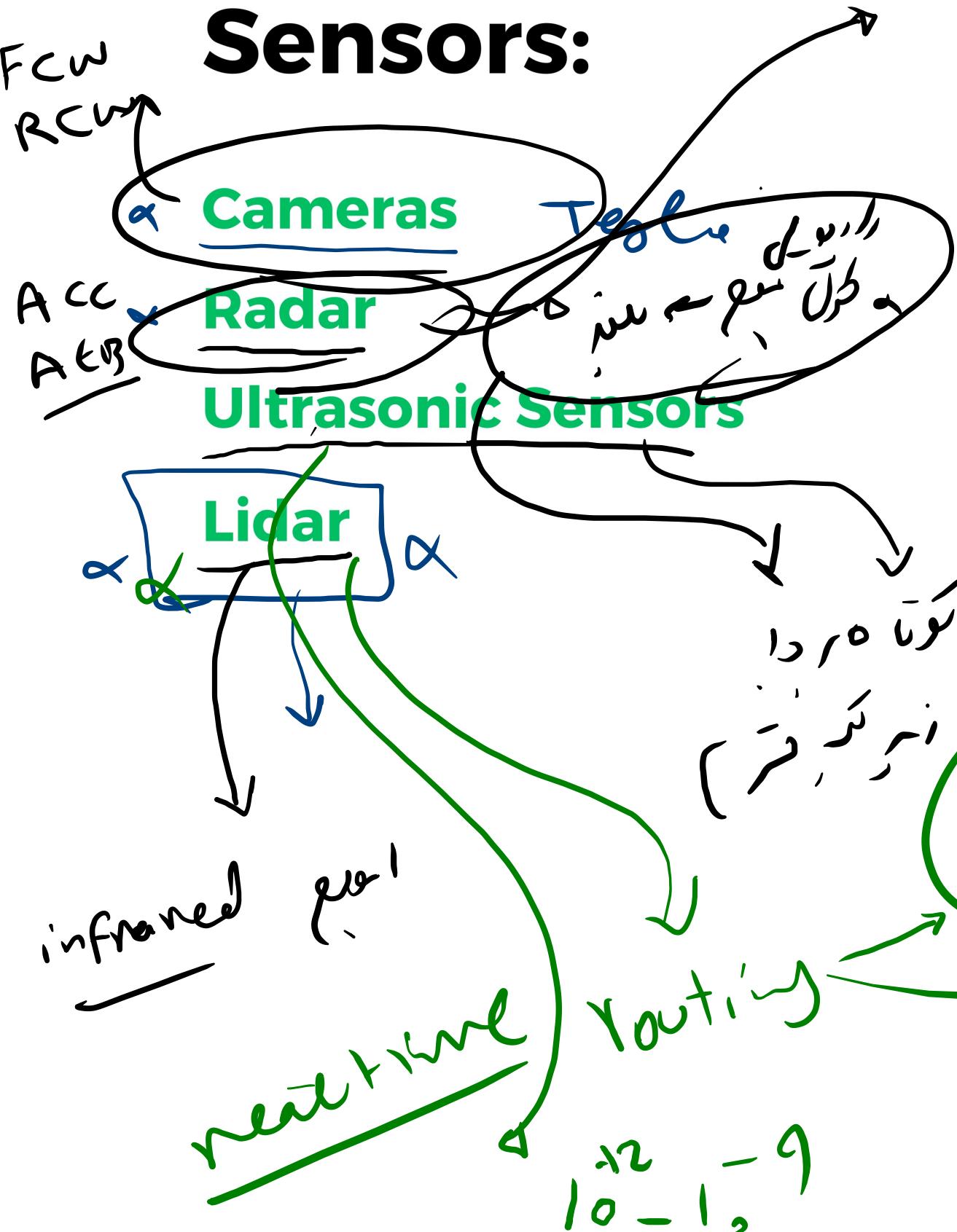
## Purposes (Why?):

These systems are designed to **improve vehicle safety** and **enhance the driving experience** by automating, adapting, and enhancing certain aspects of vehicle systems **for safety and better driving**. ADAS technologies can alert the driver to potential problems, implement safeguards, and take over control of the vehicle to avoid accidents.



**How?**  
**ADAS**

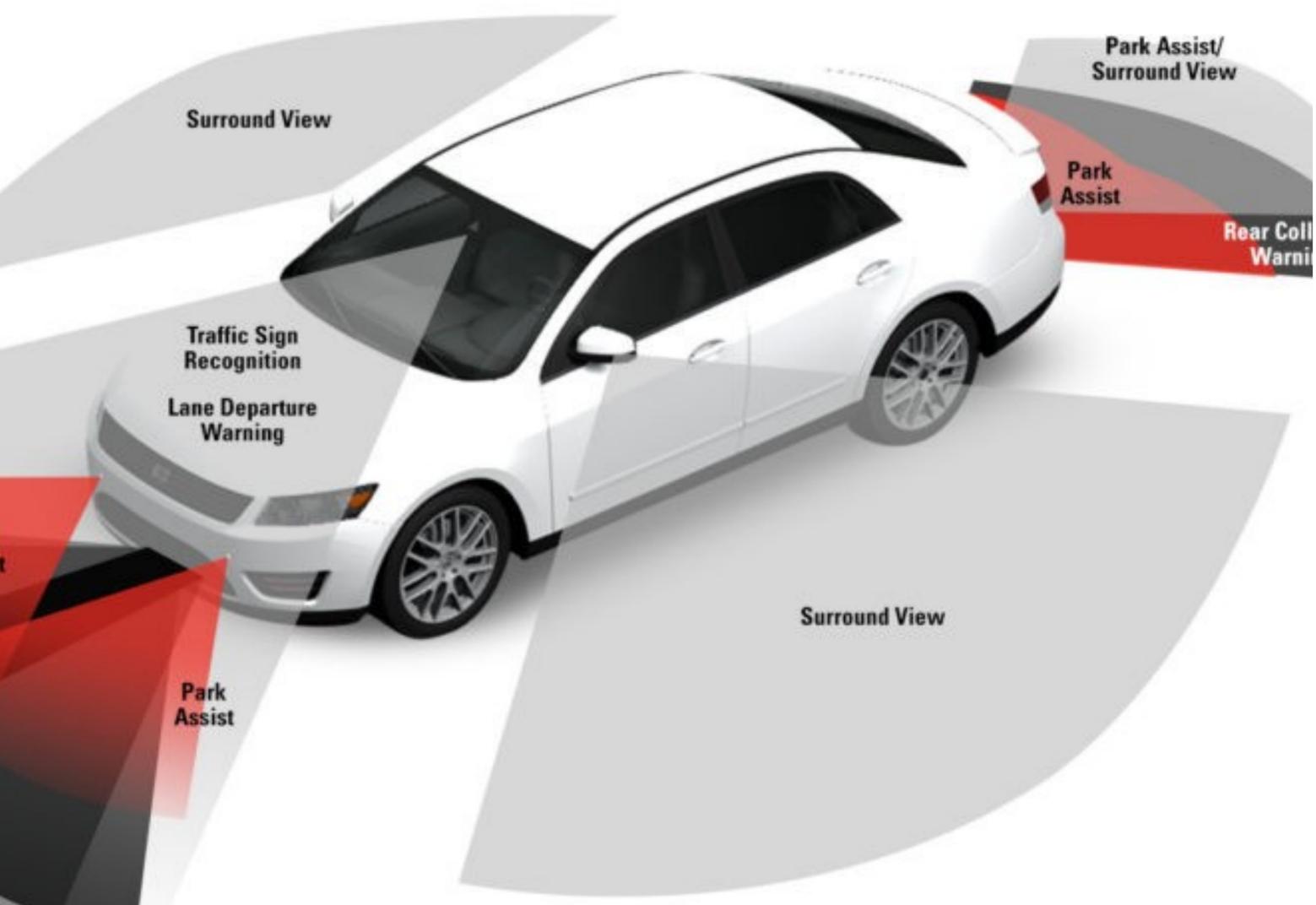
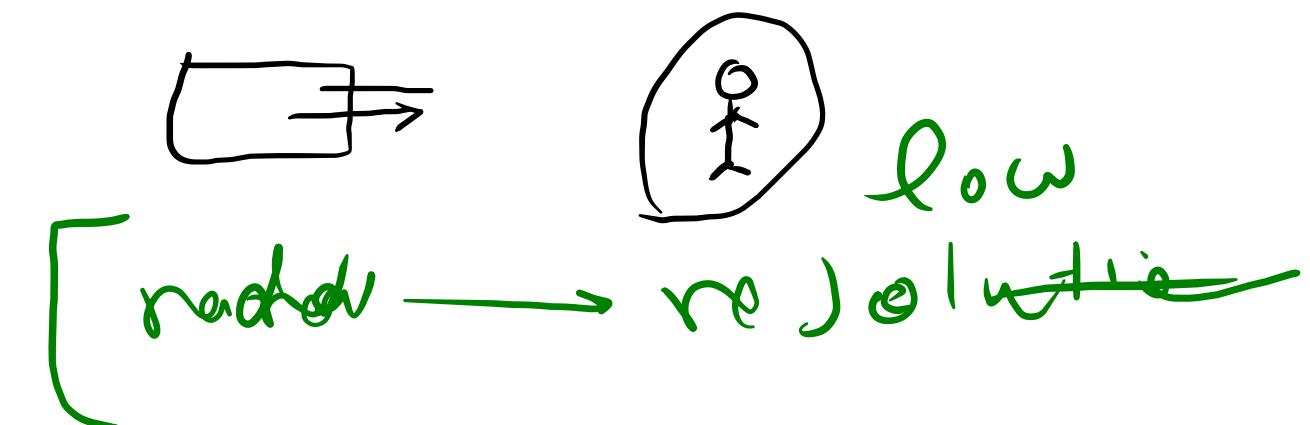
# Sensors:



FCW  
RCW

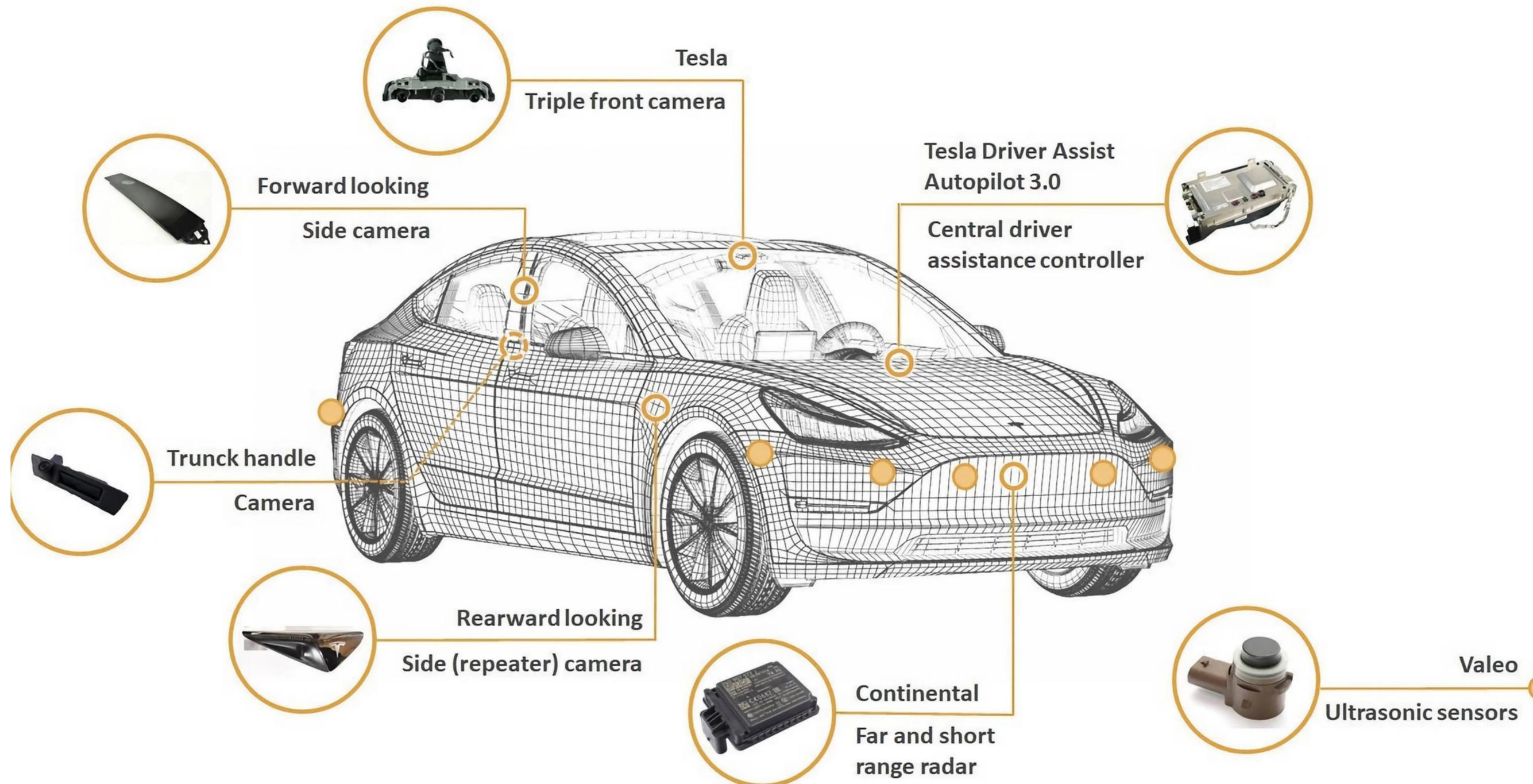
## ADAS: THE CIRCLE OF SAFETY

- Long-Range Radar
  - Adaptive Cruise Control
- Short/Medium-Range Radar
  - Cross Traffic Alert
  - Rear Collision Warning
- LIDAR
  - Emergency Braking
  - Pedestrian Detection
  - Collision Avoidance
- Ultrasound
  - Park Assist
- Cameras
  - Traffic Sign Recognition
  - Lane Departure Warning
  - Park Assist
  - Surround View

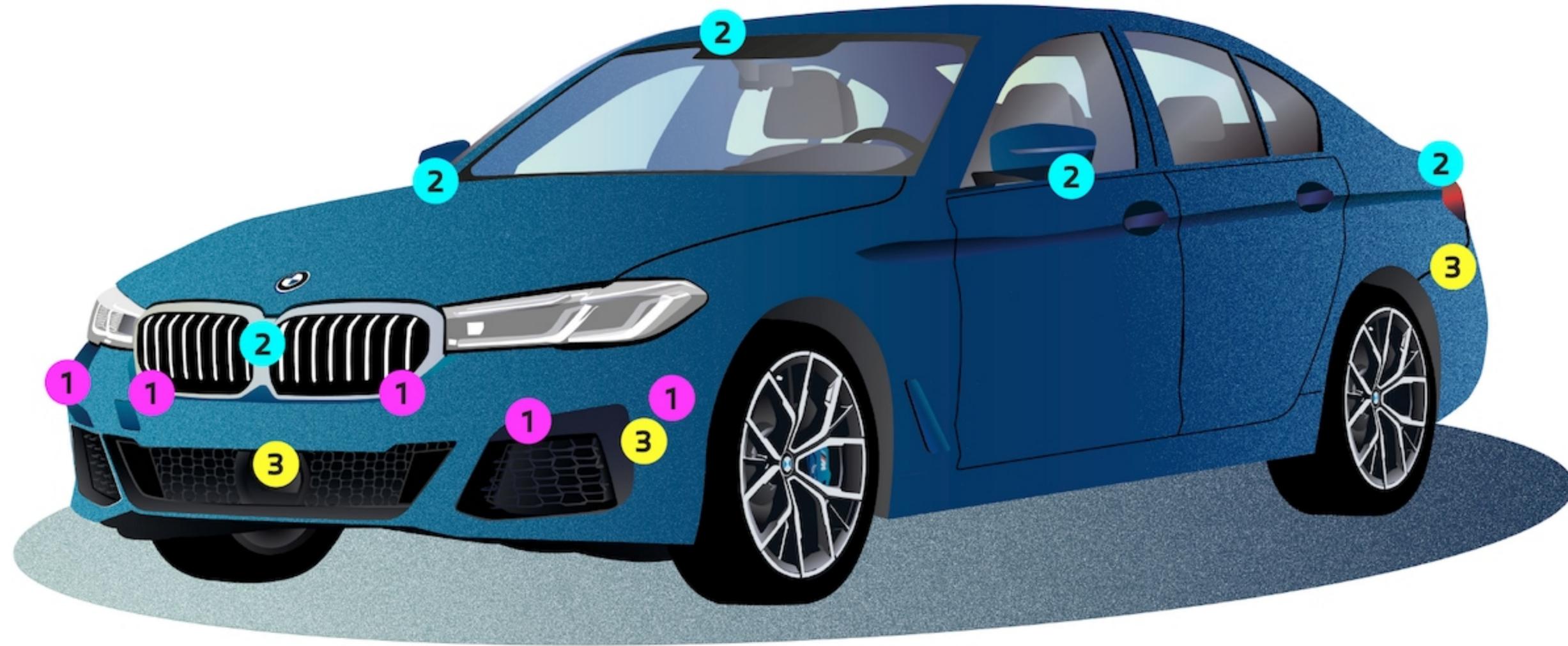


# Tesla Model 3 Sensors and Computing - analyzed by System Plus Consulting

Source:Automotive Teardown Tracks, 2020



Lidar

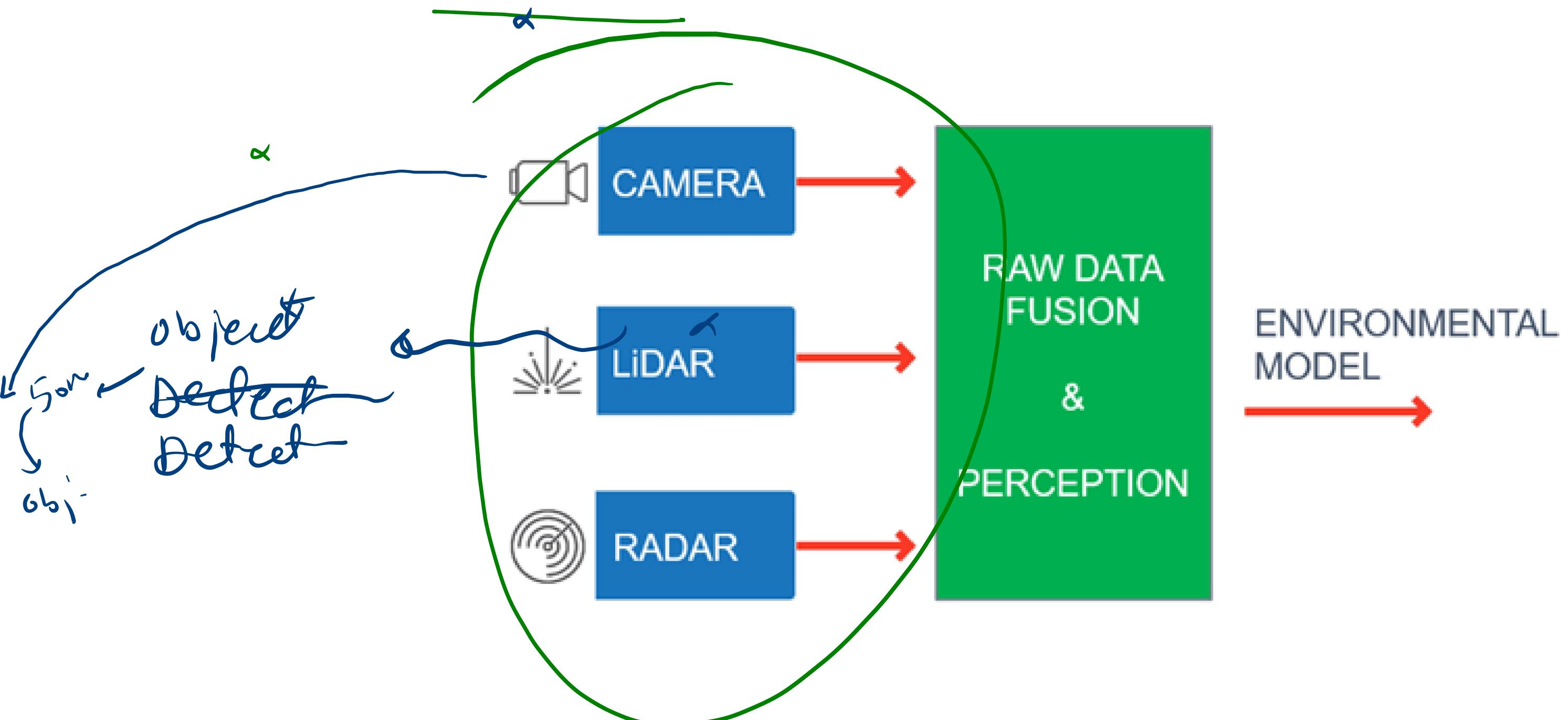


## BMW 320i Sport

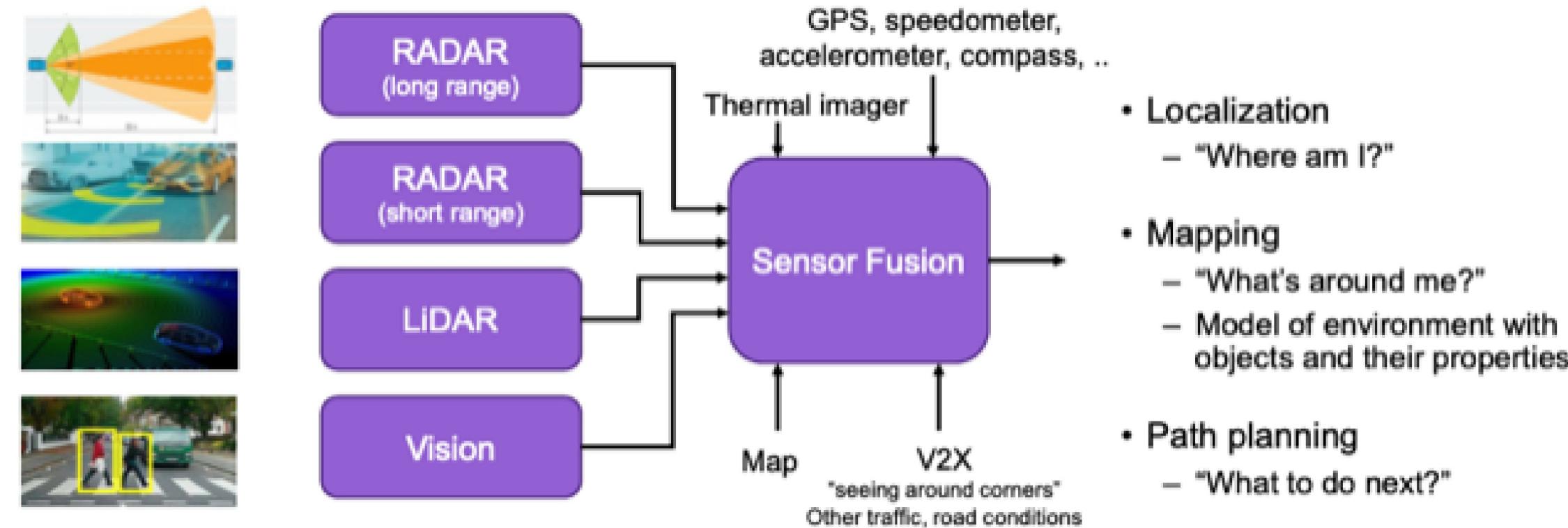
**1. Ultrasonic sensor / 2. Camera / 3. Radar**

<https://www.bmw.com/en/innovation/automotive-sensors.html>

# Sensors Fusion:

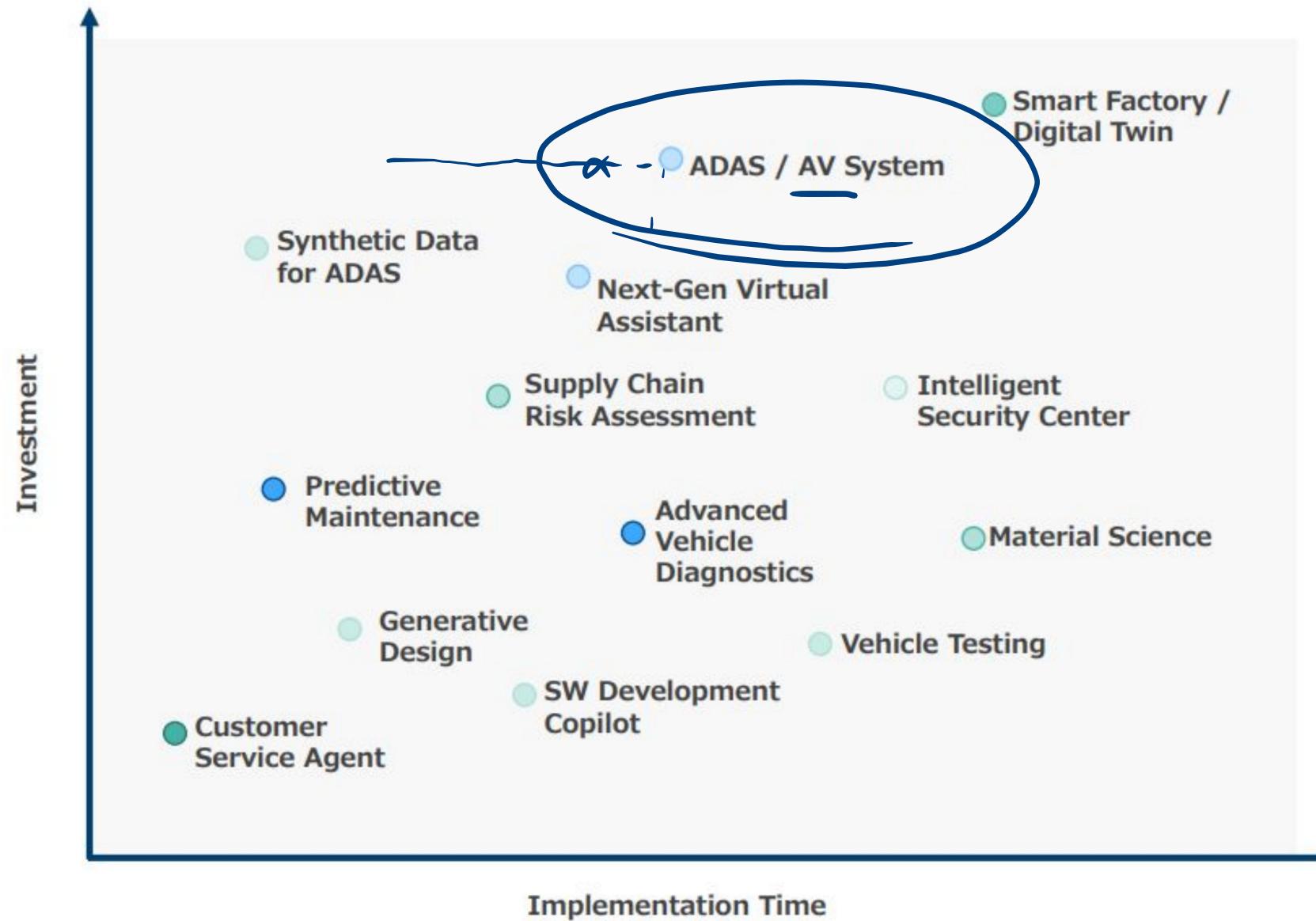


# High-Level Architecture of ADAS Systems



# **What will happen?**

## Where Next?

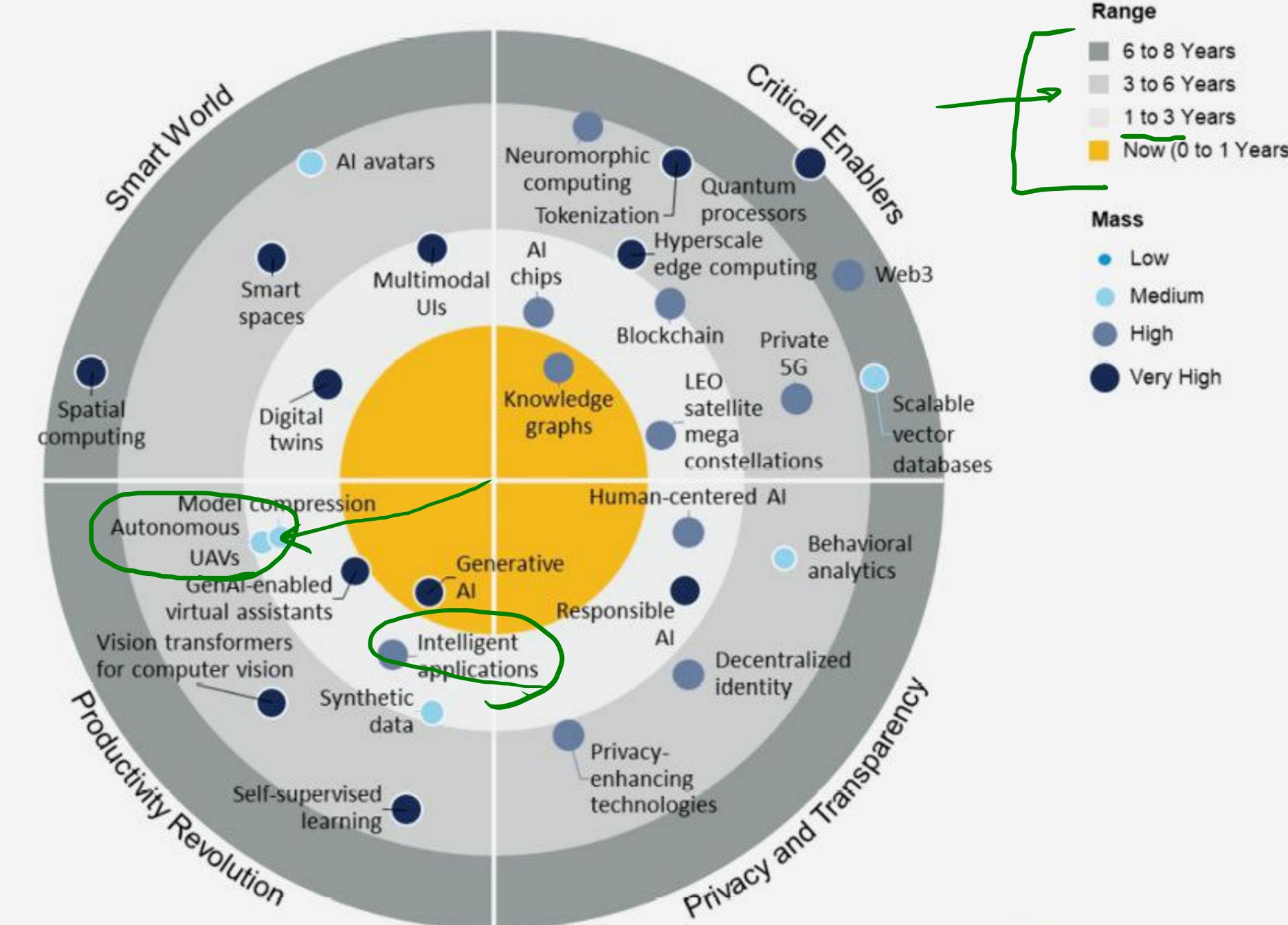


### Key takeaway

SBD has evaluated some use cases related to the automotive industry and determined which ones should be of high priority based on implementation time and investment.

- The LLM-powered virtual assistant will transform in-car experiences with its deep grasp of human intentions, multi-objective capability, and swift responses. However, integrating LLM-powered virtual assistants into vehicles and making a seamless experience on the road requires more fine-tuning effort.
- Predictive Maintenance and Advanced Vehicle Diagnostics can be facilitated using traditional ML algorithms, eliminating the need for Gen AI. However, gathering such data demands a robust information infrastructure for both the vehicle and its service network.
- Customer Service Agent on either an OEM website or app can be a quick win to leverage Gen AI with very little fine-tuning and can be implemented in weeks.
- Smart Factory takes a longer time and more investment to build and fine-tune with digital twin technology. However, this is an ideal moment to begin as most OEMs are preparing their new EV plants.

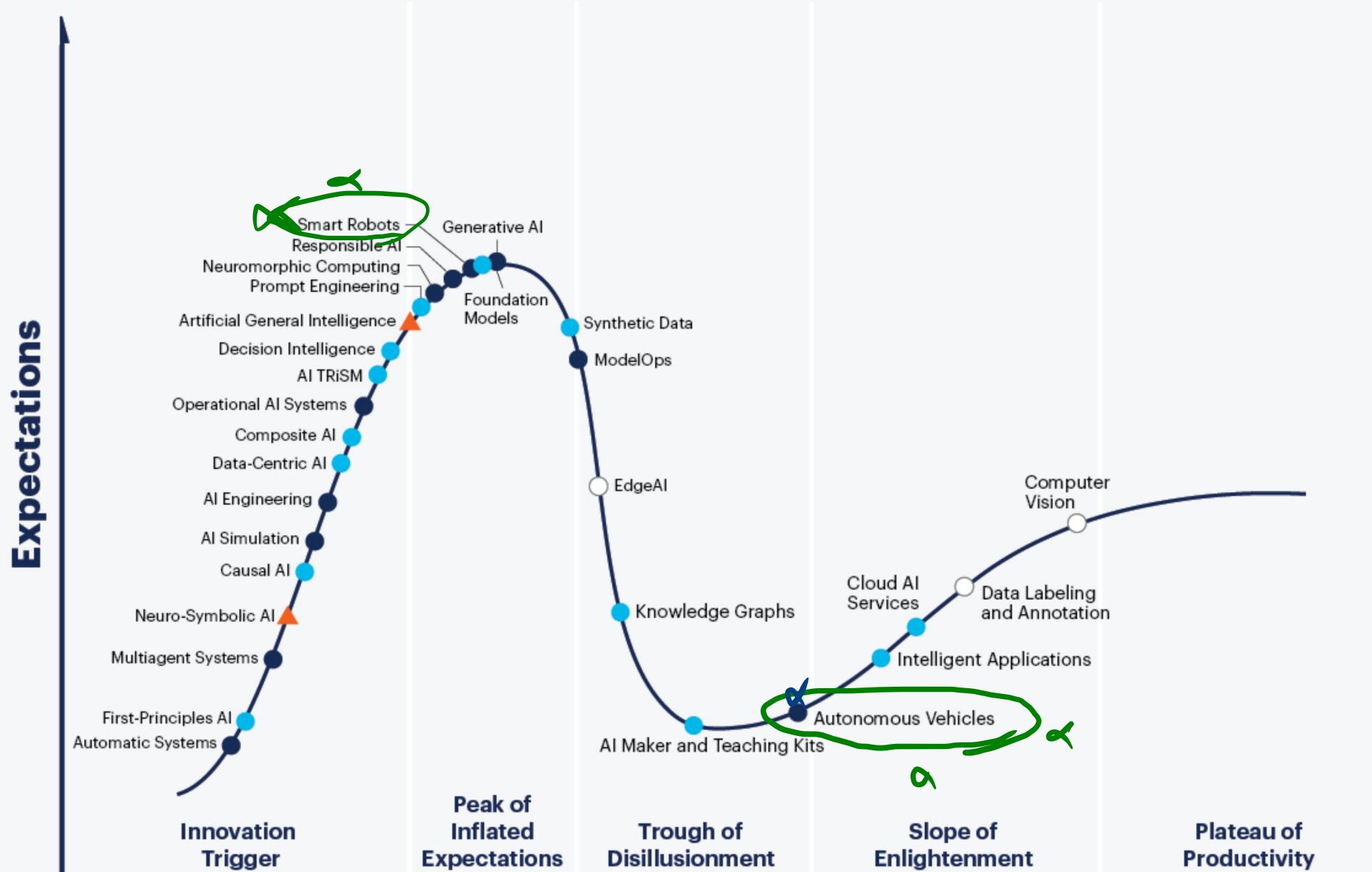
# Impact Radar for 2024



Source: Gartner  
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# Hype Cycle for Artificial Intelligence, 2023



Plateau will be reached:

○ less than 2 years   ● 2 to 5 years   ● 5 to 10 years   ▲ more than 10 years   ✖ obsolete before plateau   As of July 2023

[gartner.com](https://gartner.com)

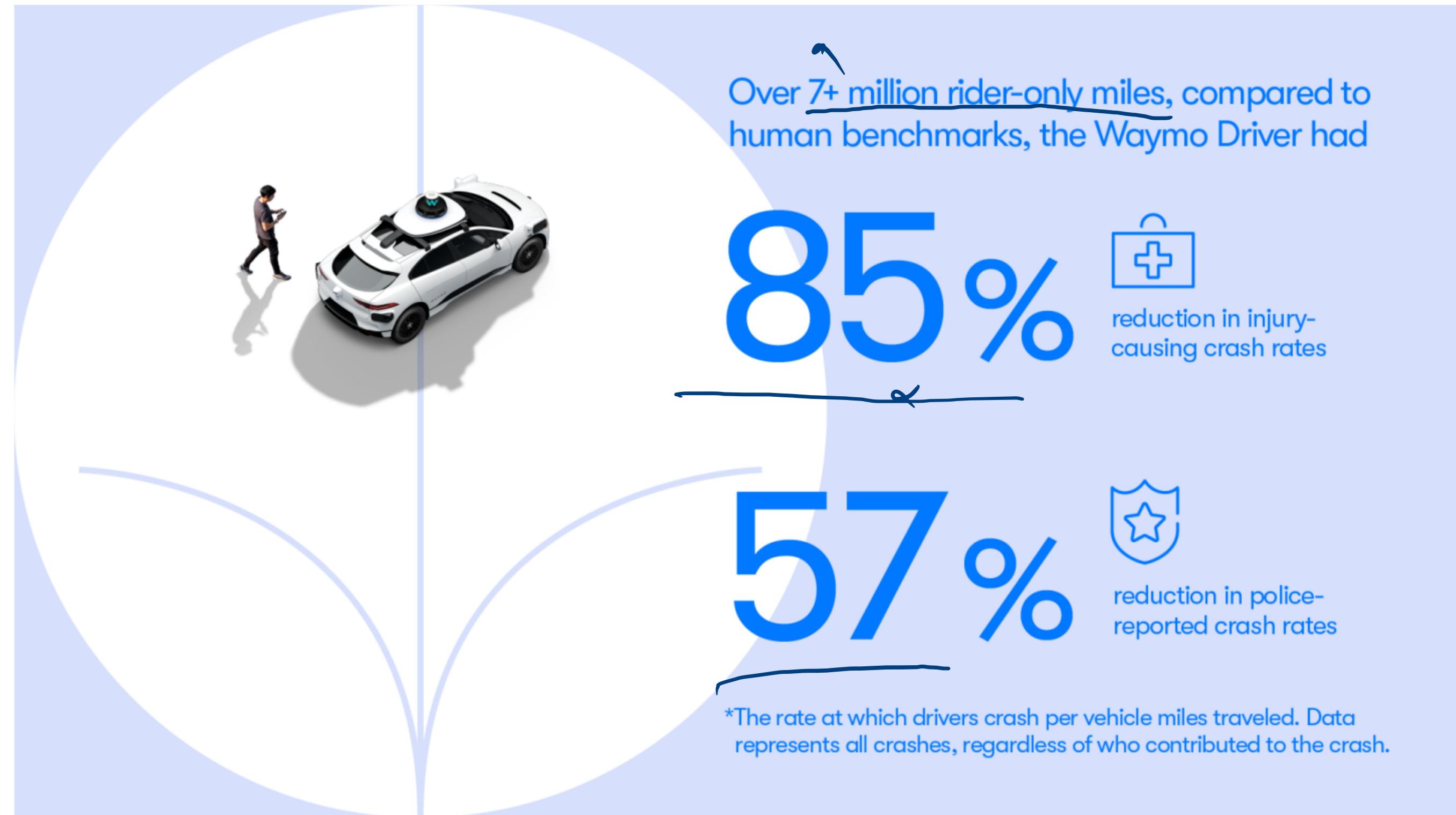
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# **GIANTS**



WAYMO



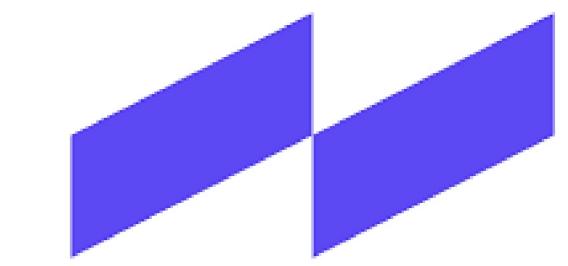


4 - 5

5 mil  $\alpha$



**cruise**





# Thank You