Autonomous Vehicle Systems (AVs or AVS)

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WHAT ARE AUTONOMOUS VEHICLE SYSTEMS?

Autonomous vehicles (AVs) operate by using remote-sensing technology to monitor and create and 3D map of their environment.

Machine learning and artificial intelligence are the foundational elements of these vehicles. AVs sometimes called self-driving cars or driverless car are vehicles that uses a combination of sensors, cameras, radar and artificial intelligence (AI) to travel between destinations without a human operator.

Tesla's are partially autonomous vehicles because they have a built in auto driving system but can't technically drive themselves.

WHAT LIES IN THE FUTURE FOR AUTONOMOUS VEHICLES?

If full automation of vehicles are ever to be achieved, many predict that it would bring increased road safety, as human error would be eliminated. Self-driving car technology would reshape land-use patterns, increasing car sharing and eliminating the need for more parking spaces as a self-driving car could drop you off and find a space somewhere else to park.

The SAE AV classification system is broken down by level of automation:

Level 0	Vehicles equipped with no automated features, requiring the driver to be in complete control of the vehicle.
Level 1	Vehicles equipped with one or more primary automated features such as cruise control, but requires the driver to perform all other tasks.
Level 2	Vehicles equipped with two or more primary features, such as adaptive cruise control and lane-keeping, that work together to relieve the driver from controlling those functions.
Level 3	Vehicles equipped with features that allow the driver to relinquish control of the vehicle's safety-critical functions depending on traffic and environmental conditions. The driver is expected to take over control of the vehicle given the constraints of the automated features after an appropriately timed transition period.
Level 4	Vehicles equipped with features that allow the driver to relinquish control of the vehicle's safety-critical functions. The vehicle can perform all aspects of driving even if the driver does not respond to a request to intervene.
Level 5	Fully autonomous vehicles that monitor roadway conditions and perform safety-critical tasks throughout the duration of the trip with or without a driver present. This level of automation is appropriate for occupied and unoccupied trips.

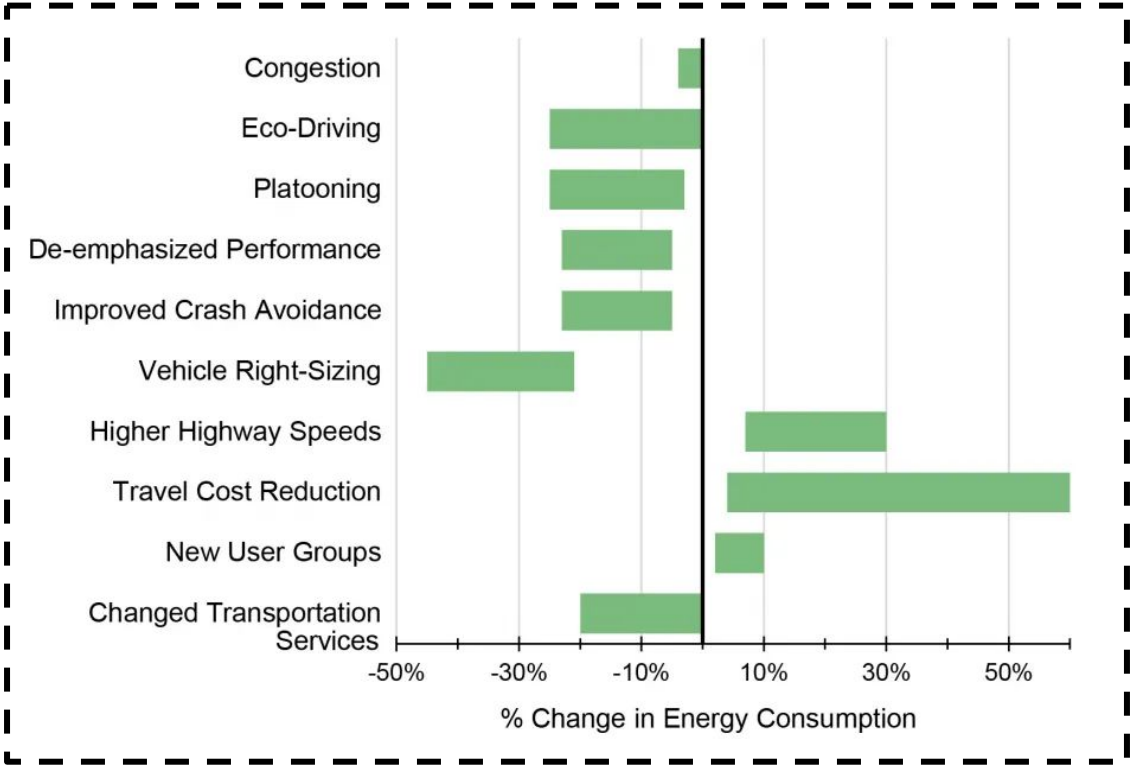
BENEFITS

AVs could improve climate change and reduce energy use if it becomes well-developed enough.

Improvements in safety and public health which include:

- Increased productivity, quality of life, mobility, accessibility, and travel, especially for the disabled and elderly
- Reduction of energy use, environmental impacts, congestion, and public and private costs associated with transportation
- Increased increased number of car sharing
- Safer and less room for human errors ie. crashes, drunk driving, distracted driving like texting while driving

CHART OF THE ENERGY CHANGES IF MORE PEOPLE USED AVS:



HARMS/PROBLEMS

-Potential security issues such as data security & cyberattacks

-Not enough regulations and laws for AVs driving

-Distrust against AVs and a potential safety issues

-Weather and other things could affect sensor performance on AVs

WHY AUTONOMOUS VEHICLES HAVEN'T BEEN FULLY AUTOMATED? (CHALLENGES)

1. **Road conditions** - Unpredictable
2. **Weather conditions** - Autonomous vehicles have to be able to adapt to all conditions
3. **Traffic conditions** - Some people/cars don't follow traffic rules which would disrupt an Autonomous vehicles system and make it confused.

4. **Accident Liability** - If an autonomous vehicle has an accident a question posed is who would take responsibility for it?

   Additionally, due to the nature of autonomous cars, the occupants will mostly be in a relaxed state and may not be paying close attention to the traffic conditions. In situations where their attention is needed, by the time they need to act, it may be too late to avert the situation.

5. **Radar Interference** - Autonomous cars use lasers and radar for navigation. When this technology is used for hundreds of vehicles on the road, will a car be able to distinguish between its own (reflected) signal and the signal (reflected or transmitted) from another vehicle?

Main market leaders

Waymo (U.S.)

Tesla, Inc. (U.S.)

Cruise (General Motors) (U.S.)

Aurora Innovation (U.S.)

Aptiv (Ireland)

Uber ATG (U.S.)

Nuro (U.S.)

Baidu Apollo (China)

Mobileye (Intel) (Israel)

Zoox (Amazon) (U.S.)

Valeo (France)

Yandex Self-Driving Group (Russia)

Volvo Car Corporation (Germany)

Hyundai (South Korea)

Main market: the most important group of customers for a company's products or services, or the place where they are:

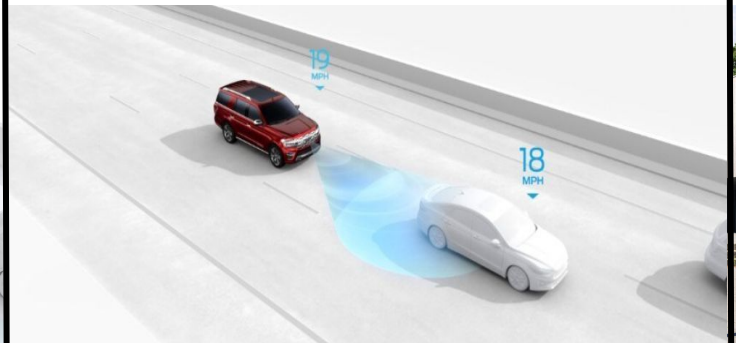
ACTIVITY:

We will pull up questions/statements on each slide and if you think yes raise your hand; if no, then keep your hand down. These questions are opinion-based.

MORE EXAMPLES (WHAT AUTOMATED VEHICLE SYSTEMS DO WE HAVE ACCESS TO CURRENTLY?)

In newer cars they have lane-keeping systems that keep you from crossing the boundaries of a lane if it was not intentional.

In newer cars there are also adaptive cruise control systems that help road vehicles maintain a safe following distance and stay within the speed limit.



Many cars are marketed as autonomous vehicles however, they are only partially automated with the features showed on the left.

2023 BMW X5 has Autonomous driving features that cost: $63,300

Do you think AVs are safe?

Are AVs more beneficial than they are harmful?

Would you use AVs in the future?

End of Activity :)


QUESTIONS

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