



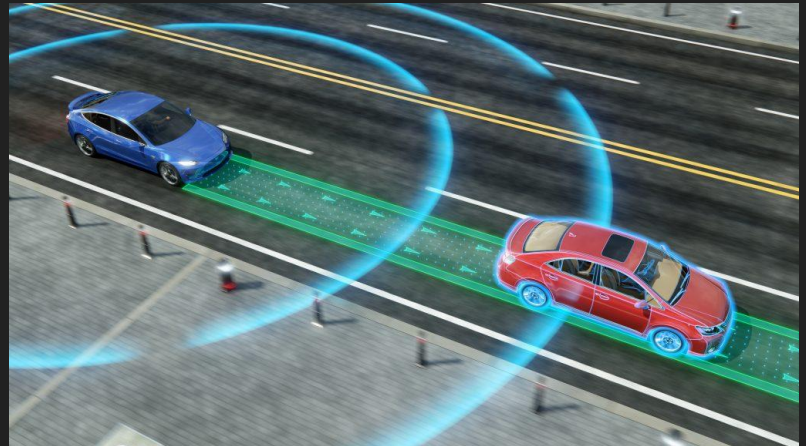
Autonomous Vehicles

Caroline Turner, Drew Pompeii, Justin Vu, Ryan Marcus,
Tress Cochran



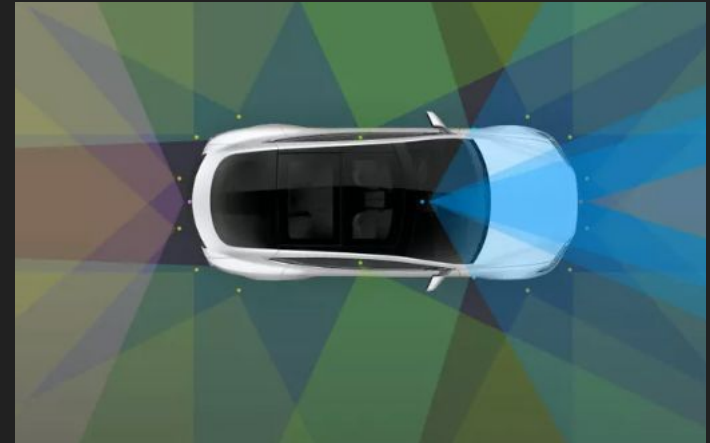
The Technology Behind the Self-Driving Car

- Sensors
 - Already prevalent in previous technology
- Connectivity
 - This is the data that the car has access to in order to understand its surroundings
- Software / Control Algorithms
 - What makes the decisions needed to drive



Complexity of this Technology

- High complexity preventing quicker development
 - Cost and Safety
- Technology is going to need to account for everything
 - Thousands of possibilities on the road
 - Must be done in clear and concise incremental steps
- Technology still in development
 - Building upon “beta” version
 - 5G Cellular Networks



Relevant Companies

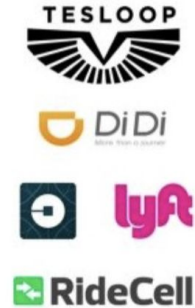
Automakers and Auto Parts Providers



Technology Providers



Services Providers



Start-Ups



Relevant Companies - Waymo

- Alphabet's (Google's parent company) subsidiary
- Leader in the industry (fully-autonomous vehicles)
 - 32 million miles in the real world and more than 16 billion miles in simulation
- In addition to camera, LiDAR, and radar sensors, Waymo cars also use microphones to detect sirens from emergency vehicles for autonomous functionality



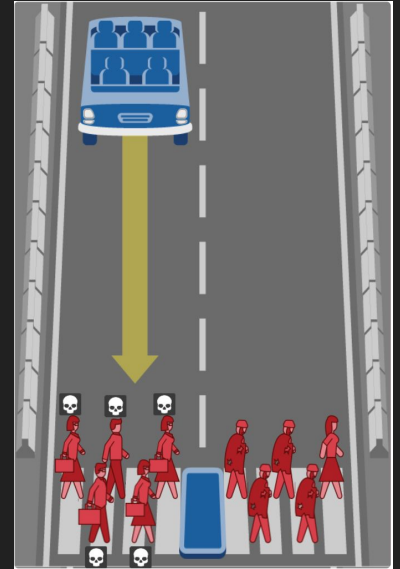
Relevant Companies - Tesla



- Tesla has more production vehicles capable of advanced levels of autonomy actually on the road than any other manufacturer
- Musk has been outspoken about the exclusion of light detection and ranging (LiDAR) navigation technology from his cars.
 - "Anyone relying on LIDAR is doomed. Doomed. [LiDAR is] expensive sensors that are unnecessary." -Elon Musk
- Tesla has more than 600,000 Tesla production vehicles on global roads, having collectively driven more than 3.2 billion kilometers (2 billion miles).

Ethical Dilemmas Due to Self-Driving Cars

- Decisions made immediately by the driver are now programmed into the cars
 - If you have to hit someone, which person do you hit?
 - Priority conflict for safety between the driver and the pedestrian
 - Moral Machine
- Human Error vs Technological Failure
- Trust in the Technology
 - Only 1 in 4 drivers trust self-parking cars



Future

- Self-driving cars will be in commercial use in 10 or more years
- 12 years before fully autonomous vehicles are sold to private industries.
- Only 10% of American consumers will have a self-driving car by the year 2034.

Problems

- Safety & Security (Weather, hacking, etc.)
- Liability
- Pricing
- General Population Perception



Discussion Questions

- When do you think self-driving cars will appear on the market?
- How should an autonomous vehicle prioritize the life of the pedestrian vs. the passengers?
- If money didn't matter, would you feel comfortable owning and using a self-driving car?

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