

SELF DRIVING CARS

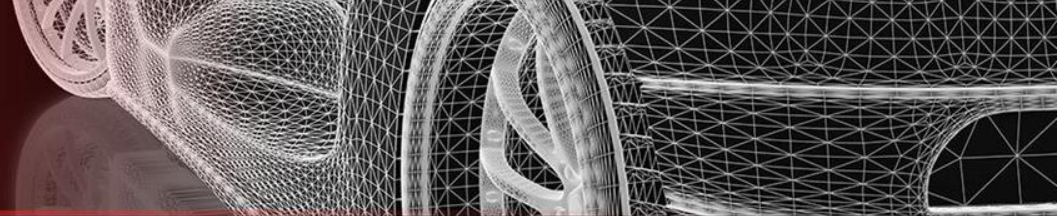
Software Issues

Danielle Richard, Jamie Kim, Reeba Khan, Swopnil Joshi

Self Driving Cars

A wireframe illustration of a car, showing the front and side profile. The car is rendered in a grid-like pattern of white lines against a dark background. The front wheel, headlight, and side mirror are visible. The car is positioned in the upper right corner of the slide, partially overlapping the red header.

- Self Driving Cars (AVs) are cars with an onboard AI that can drive as a human would.
- Hardware required to support this is already available
- Issues in integration and software could delay public availability 10, 20, even 30 years
- The 4 major areas of focus are:
Detection, Identification, Validation, & Ethical Issues



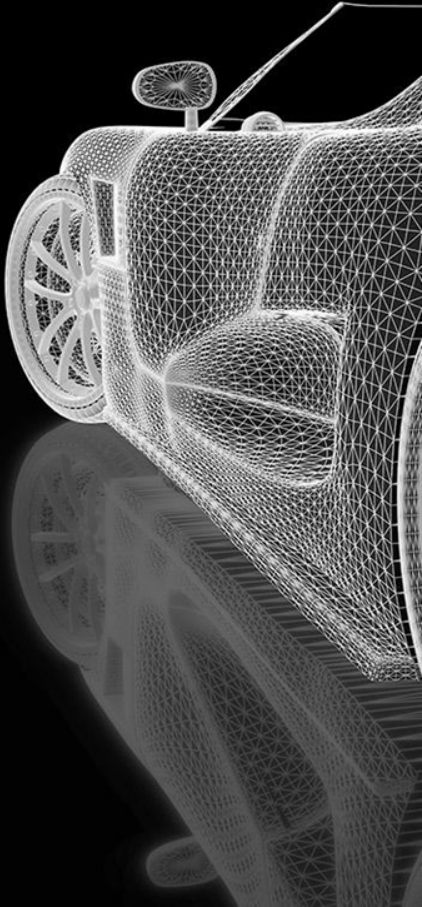
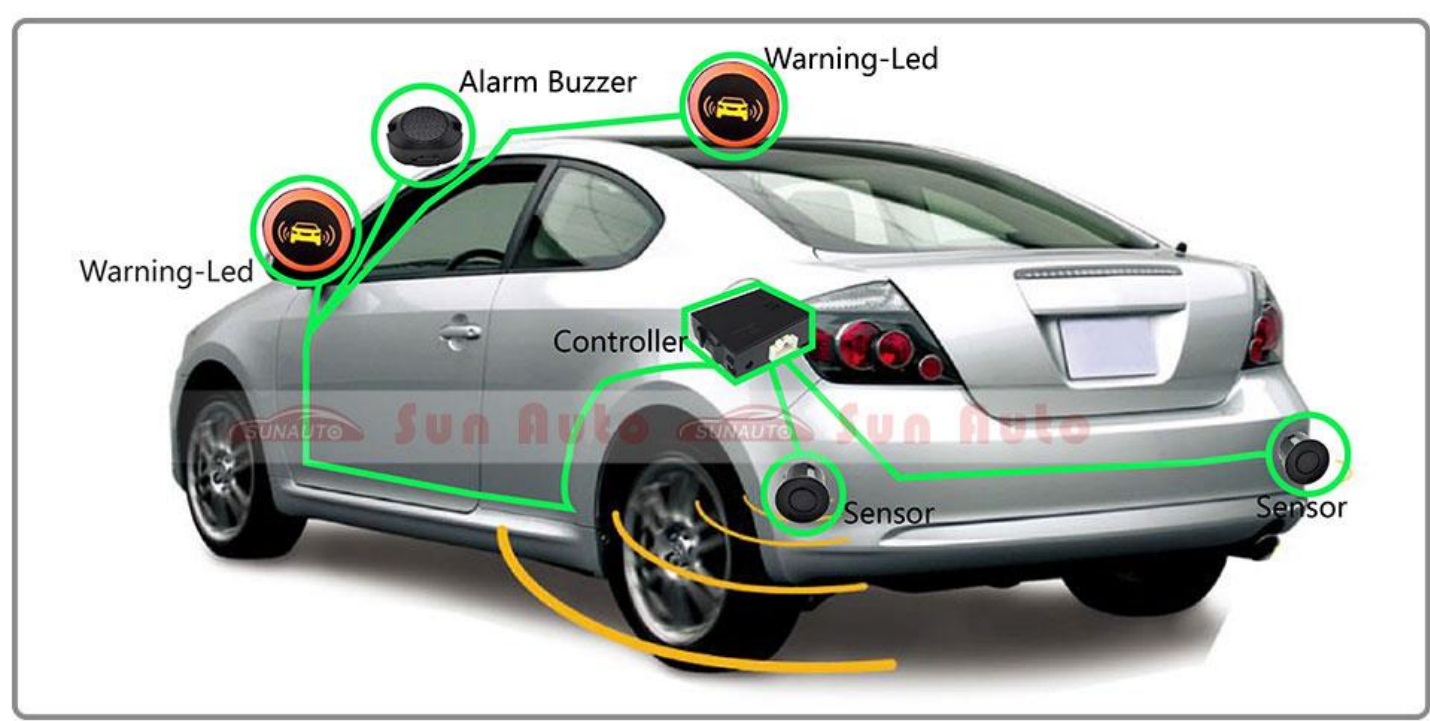
Detection

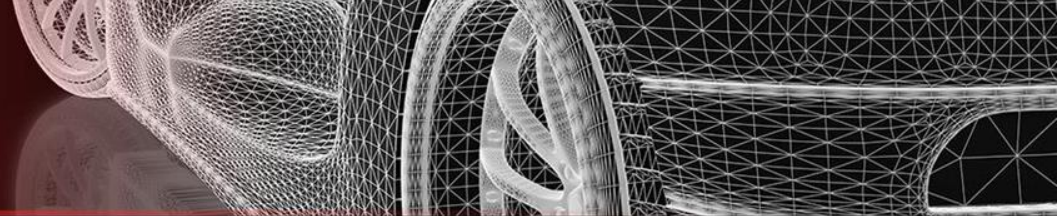
Definition

A wireframe model of a car, showing the skeletal structure of the vehicle. The car is positioned in the upper right corner of the slide, with its front end facing left. The wireframe is composed of a dense network of white lines on a dark background, highlighting the car's form.

- System's awareness of other vehicles and possible obstacles
- Primarily a function of hardware, so already fairly advanced
- Comprised of multiple cameras and sensors
- How many? In what locations?

Example of Sensor System





Identification

Definition

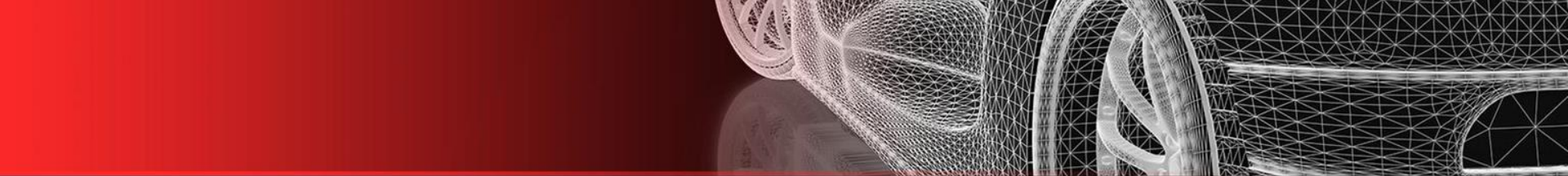
A wireframe model of a car, showing the skeletal structure of the vehicle's body, wheels, and interior components. The model is rendered in a light gray color against a dark background.

- The ability to recognize that an object is within the path ahead is fairly simple.
- Determining what exactly that object might be is far less black and white.
- How long does the system have to decide what an object is?

Accuracy in Identification

Motorcycle
or
Bicycle?

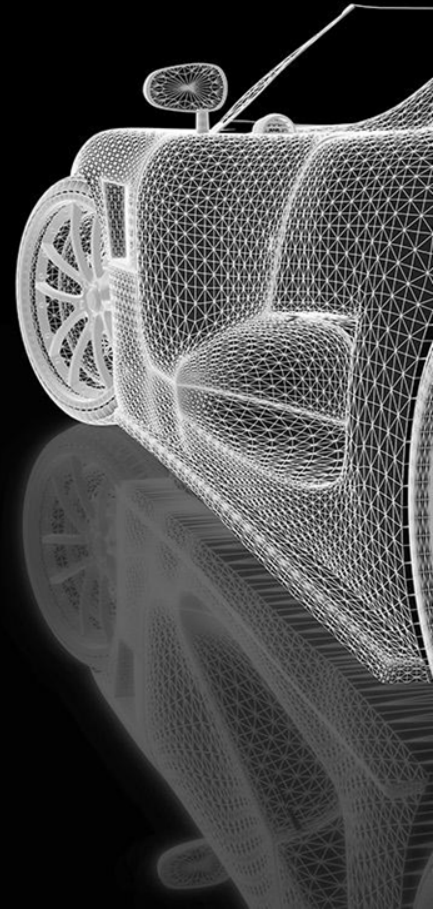




Validation

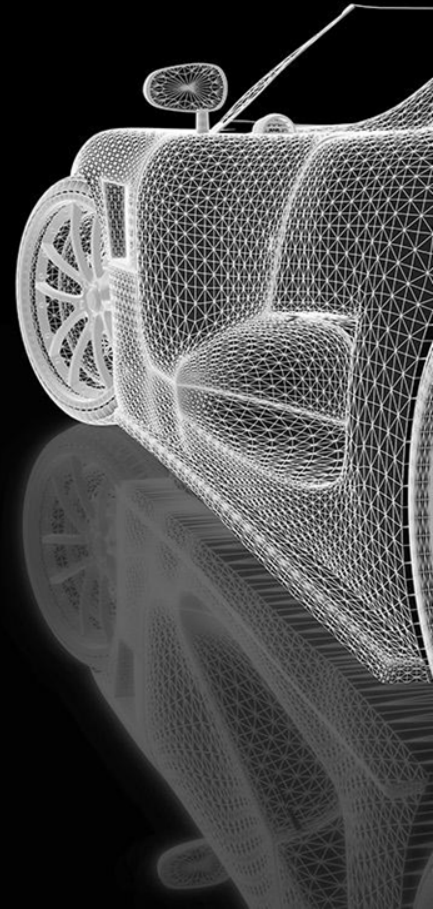
Self-driving car's AI

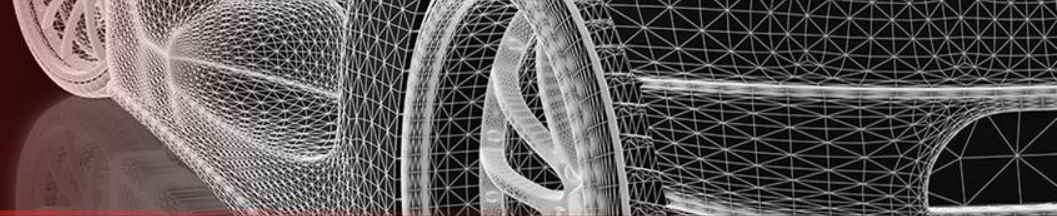
- Most autonomous decision making is based on programming software with if-then scenarios
- If-then programming augmented with AI
- Requires a continuous stream of data and instructions to make real-time decisions
- Needs to be validated through testing



Testing AI

- Waymo, Uber doing testing on states like California and Arizona
- 2018 study from Society for Risk Analysis shows that participants believe self-driving cars needs to be four to five times safer than human driven vehicles



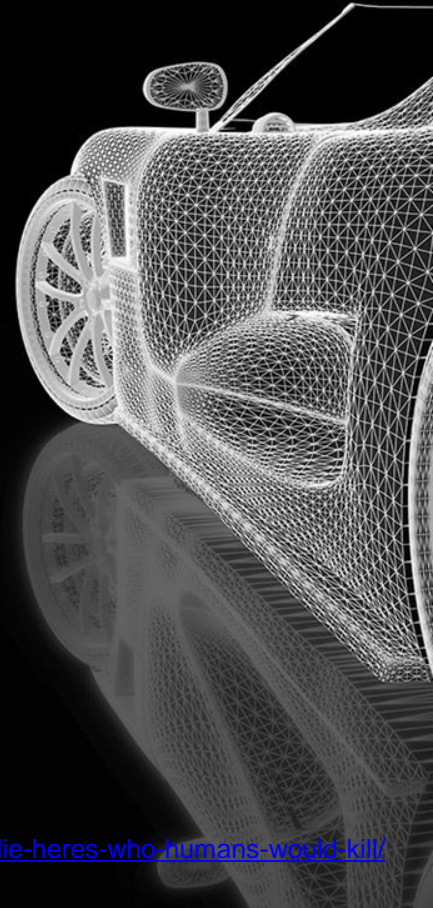
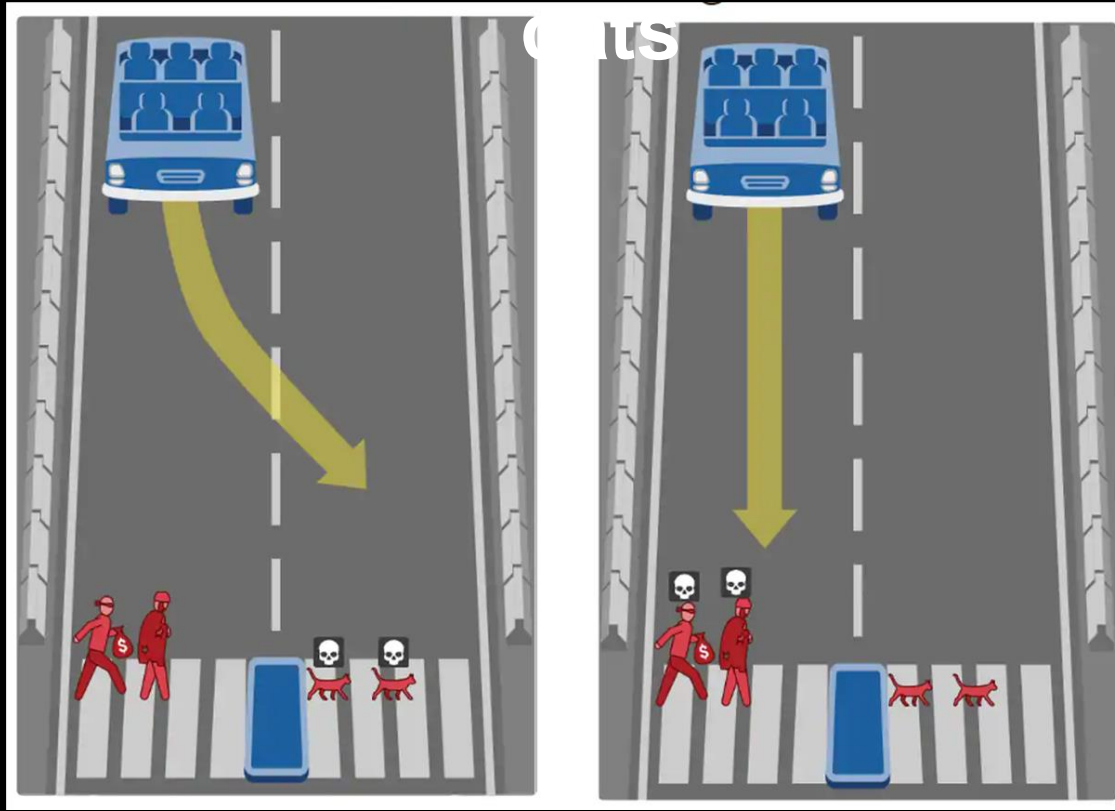


Ethical Issues

Thief and a homeless man

VS

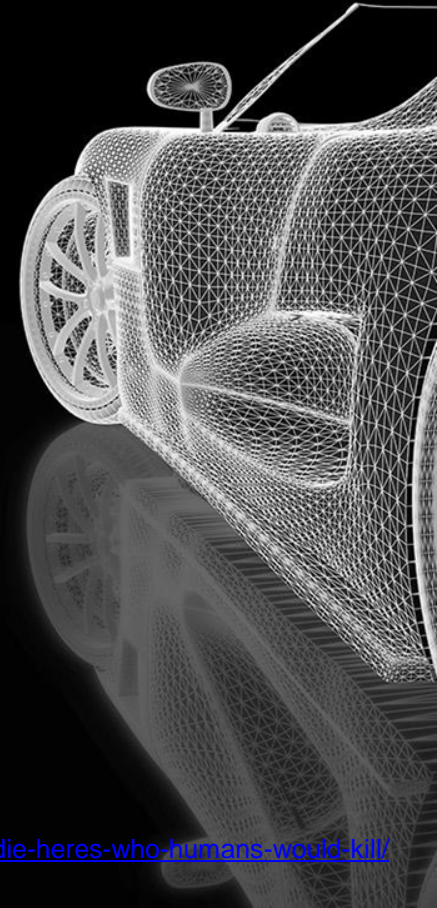
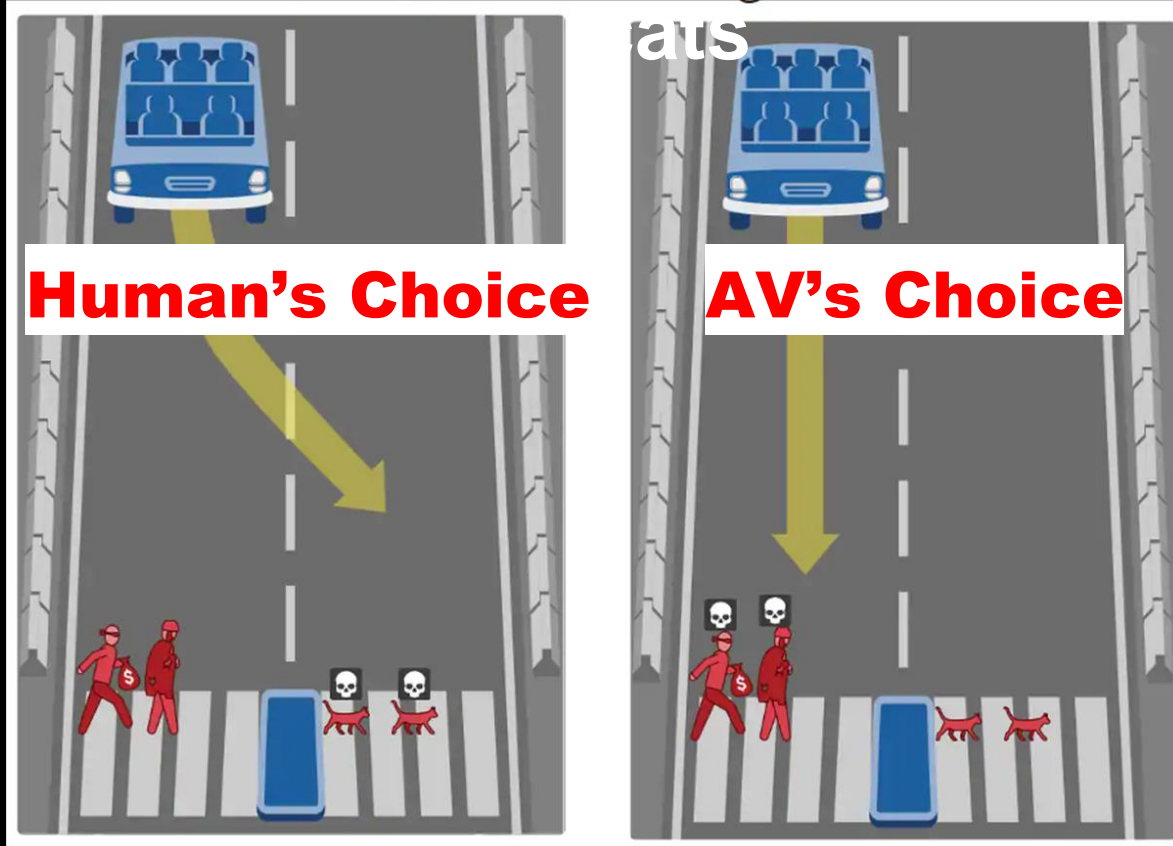
2 adorable



Thief and a homeless man

VS

2 adorable



Ethical Dilemmas

A wireframe illustration of a car, showing the front end, including the hood, headlights, and front wheel. The car is rendered in a white wireframe style against a dark background.

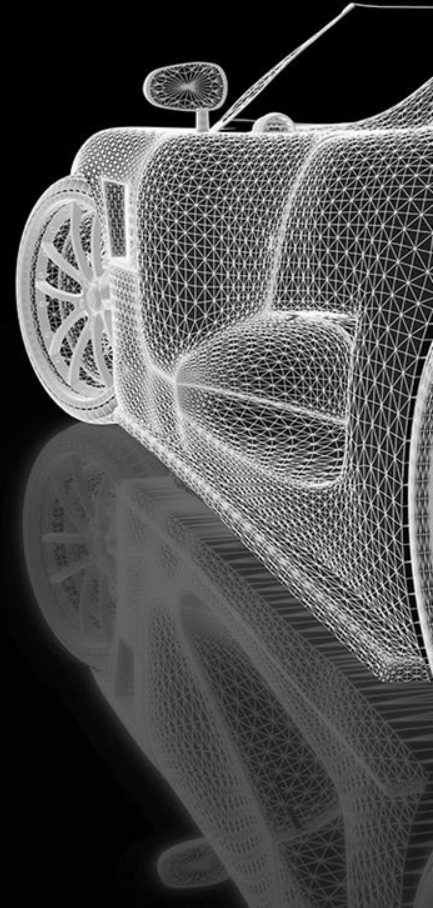
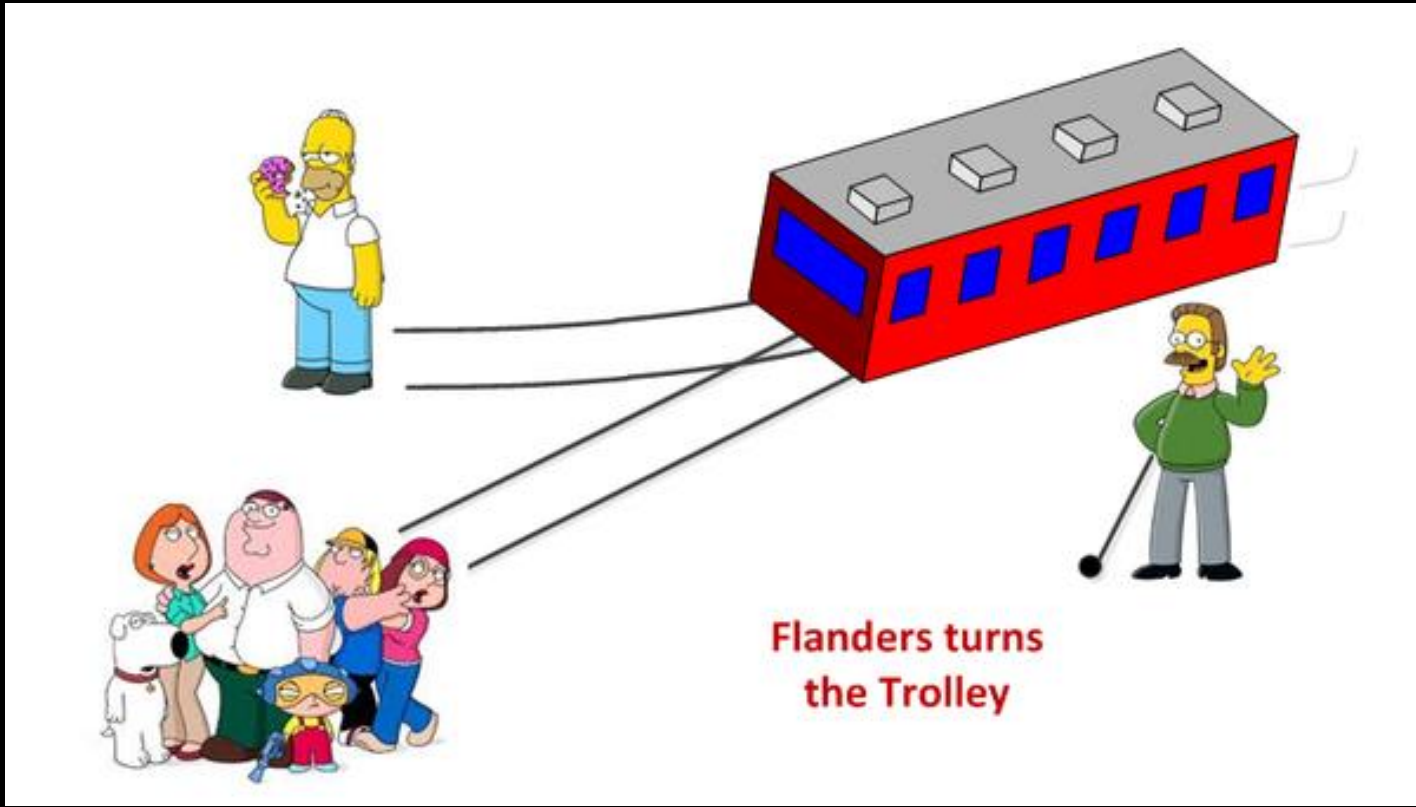
AV's SE program should make selections
prioritizing People over Pets

1. People
2. Pets

A single Person

VS

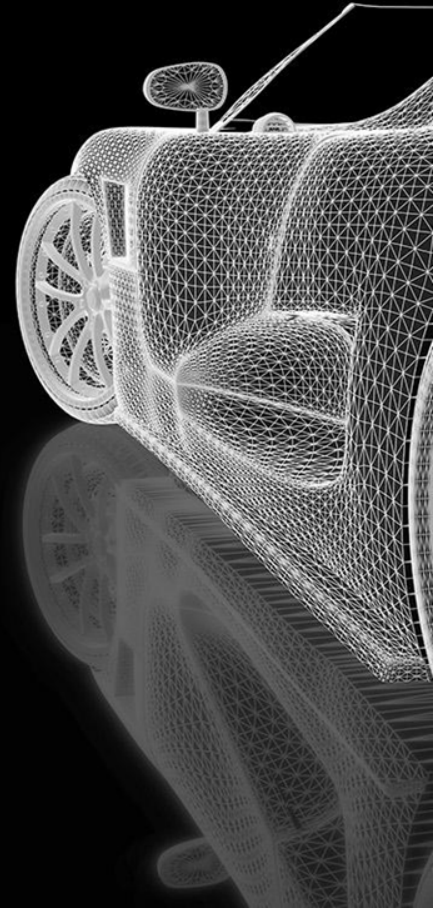
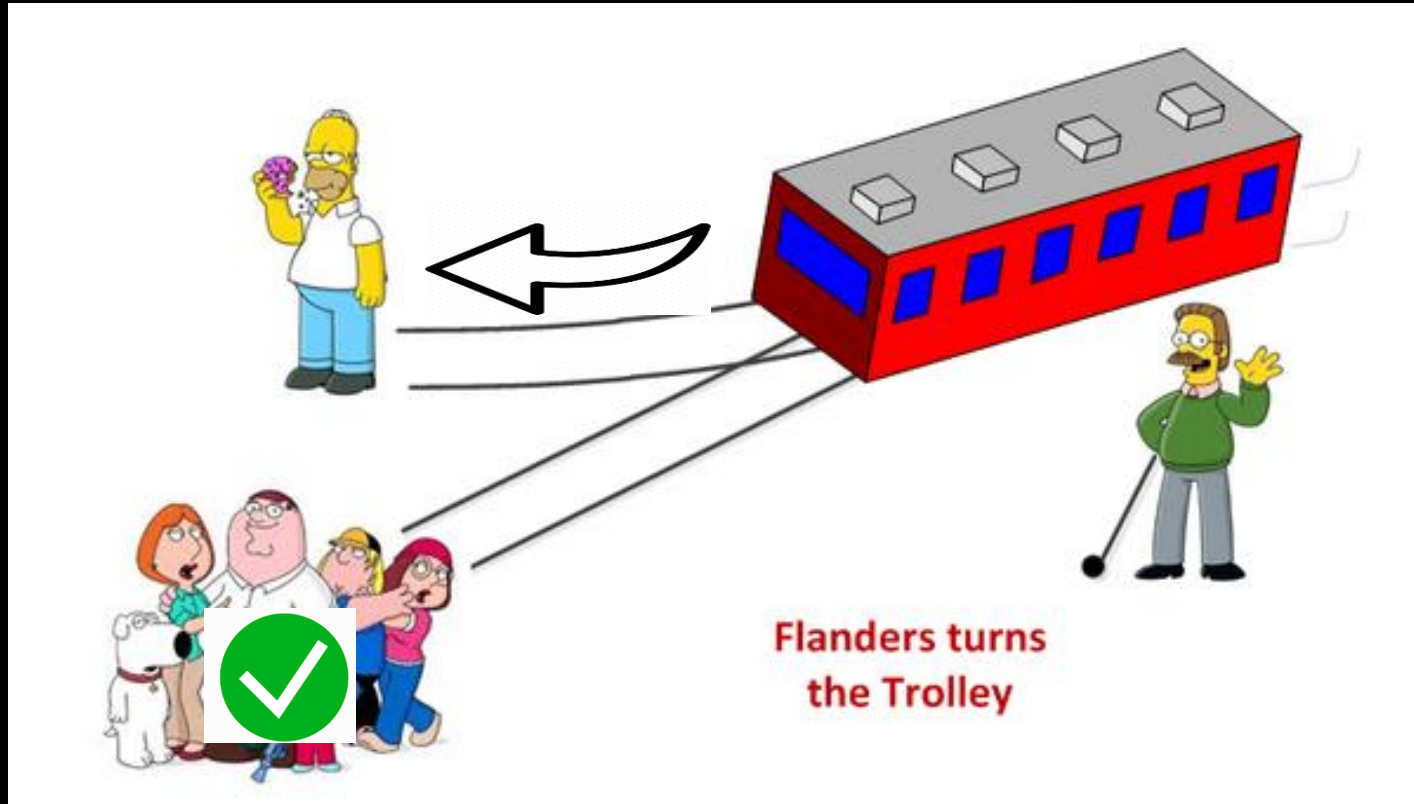
Many People



A single Person

VS

Many People



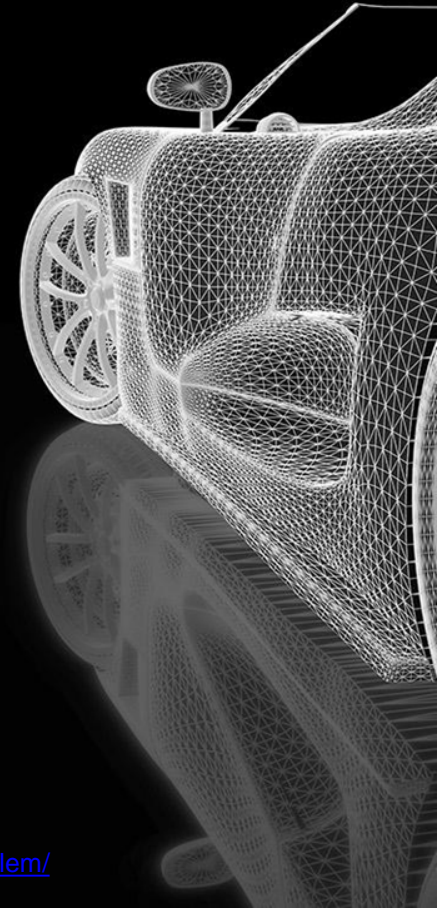
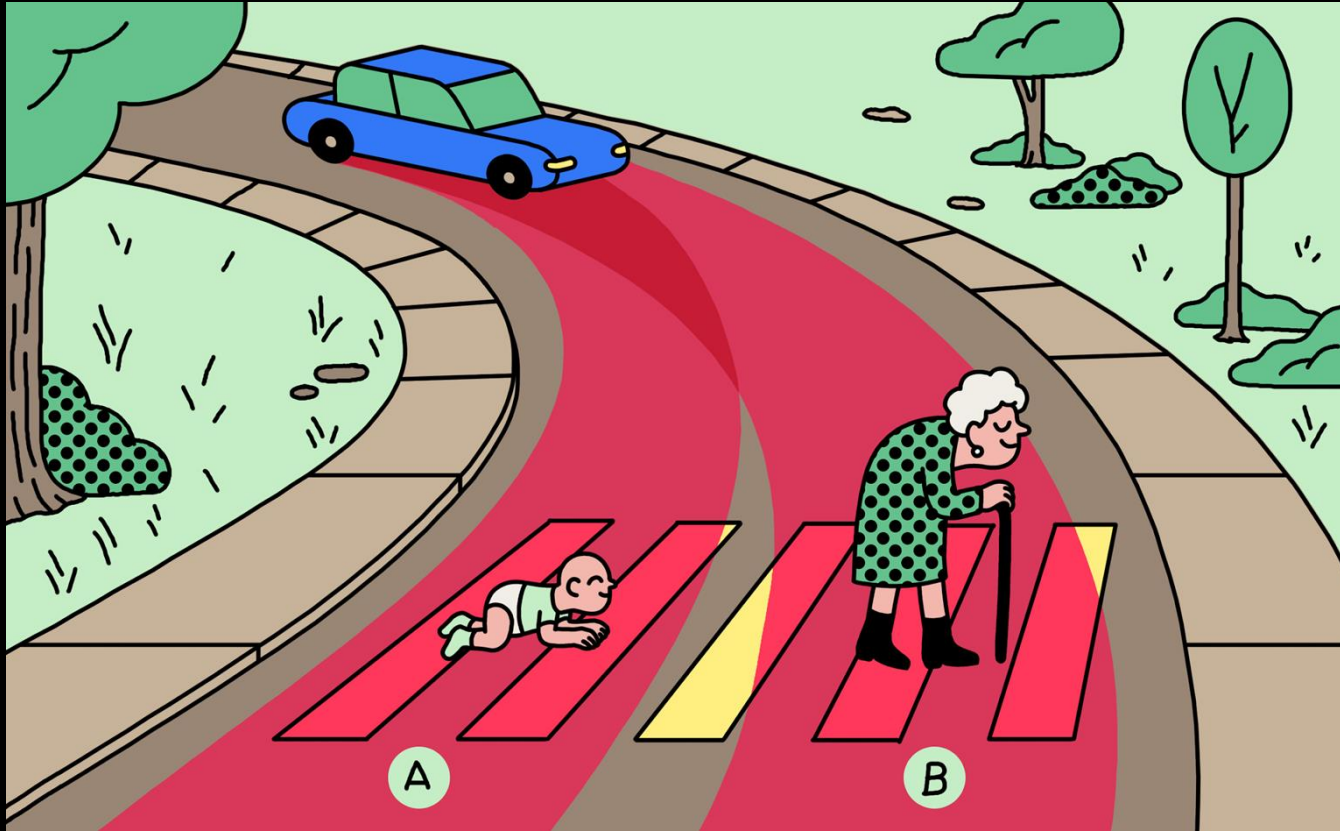
Ethical Dilemmas

A wireframe illustration of a car, showing the front end, wheels, and side profile, rendered in a light gray color against a dark background.

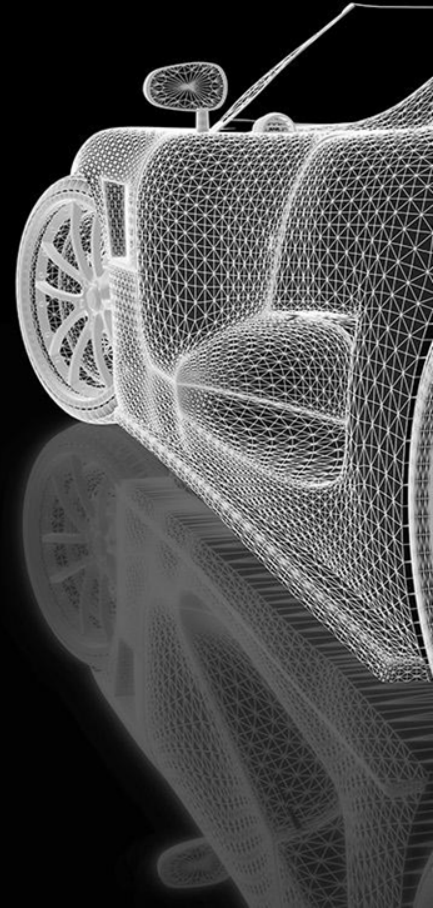
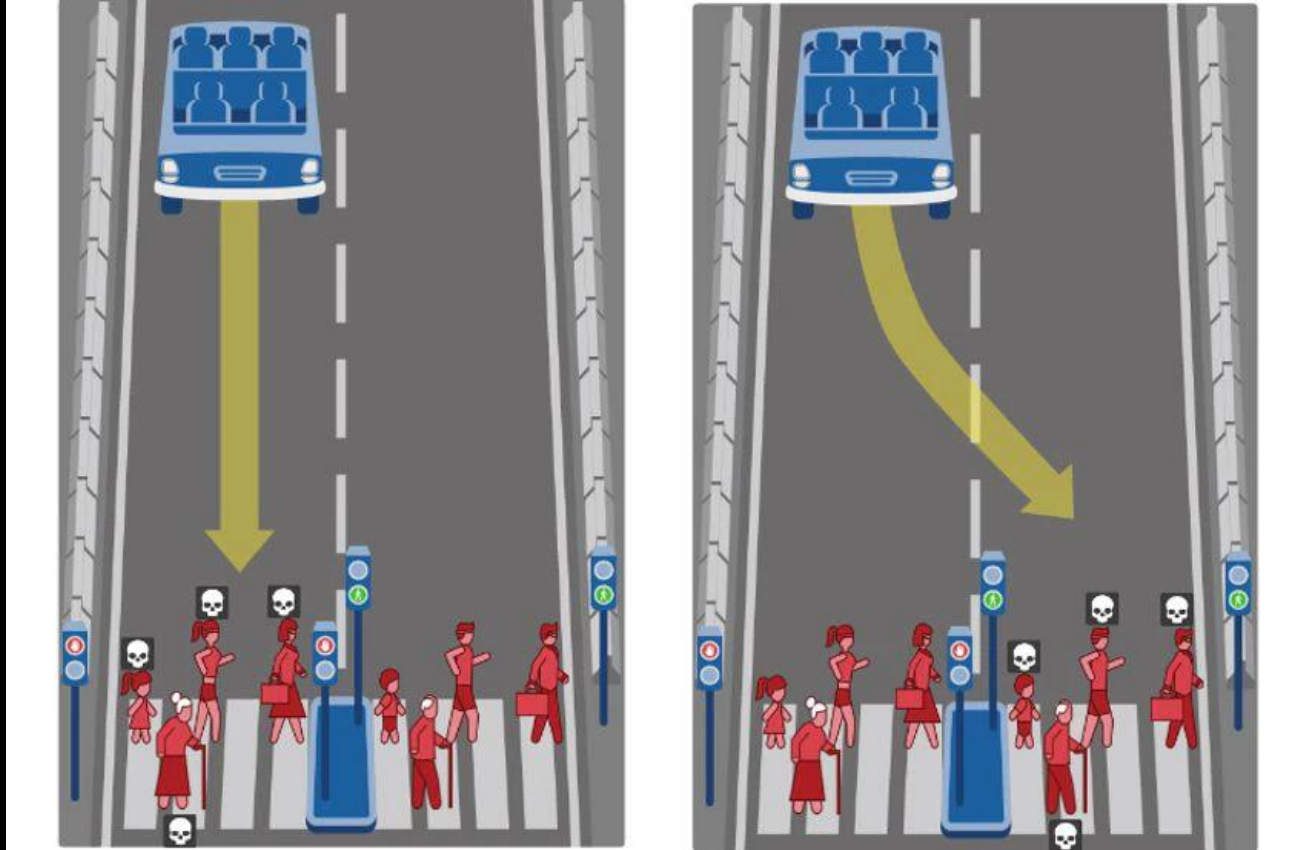
AV's SE program should make selections prioritizing People over Pets

1. Utilitarianism (save many People)
2. People
3. Pets

A child **VS** An elderly

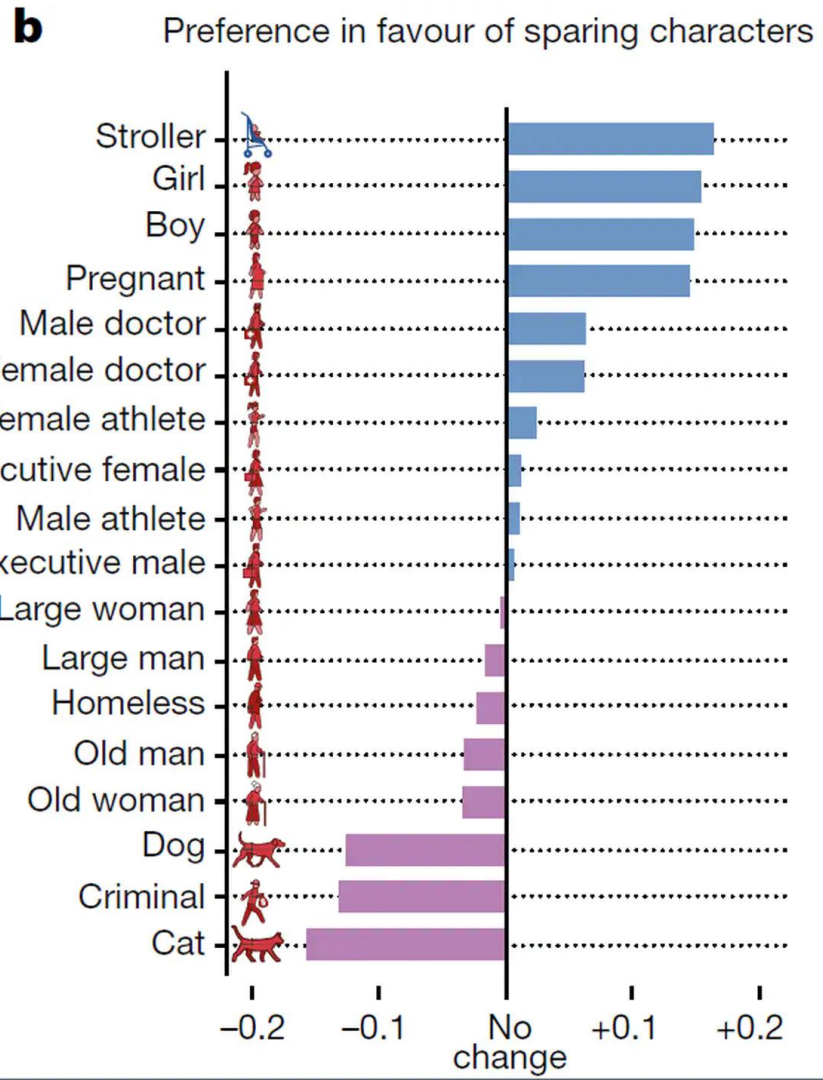


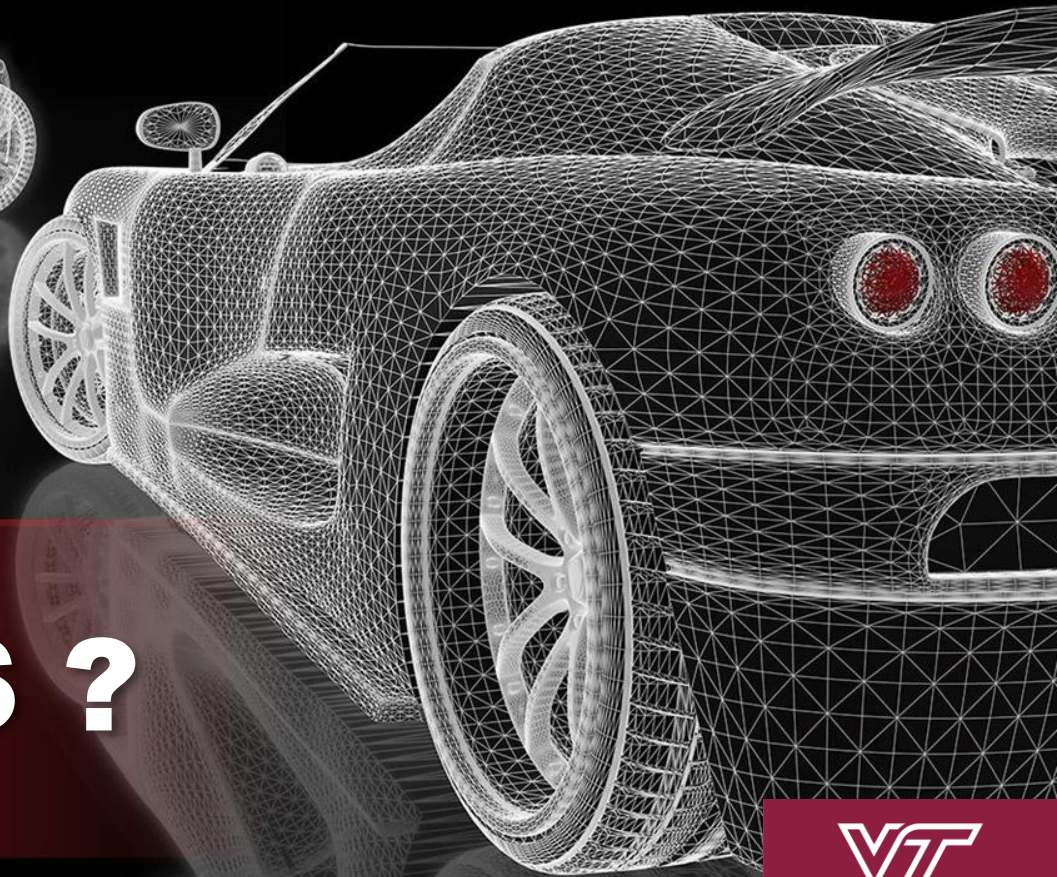
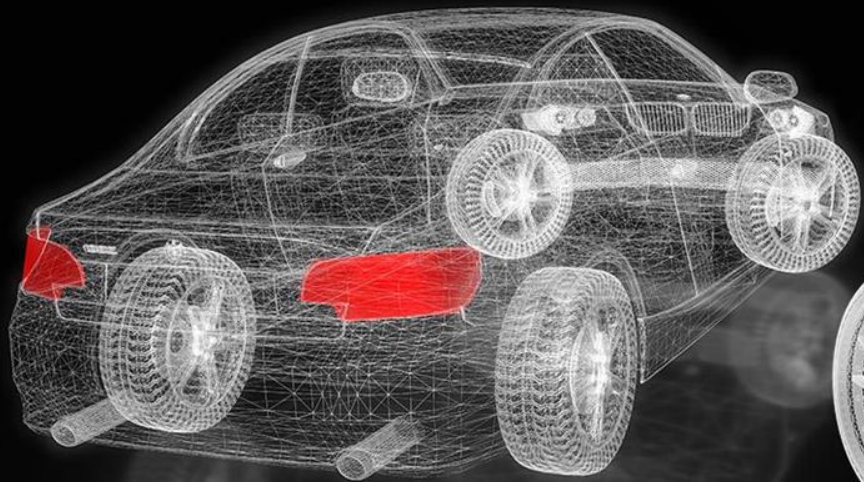
Many VS Many



Preferences varies

- Should the SE solutions be designed based on the cultural aspects?
- Do we need different implementations for different countries?





QUESTIONS ?