Week 5: Smart cars

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# Smart Cars

The most powerful artificial intelligence applications use machines to enhance human capabilities rather than replace them (Heer, 2019; Boire, 2017). For instance, a person can write a more profound business case than a machine; however, the same machine will have fewer misspellings and grammatical errors. This dichotomy exists because humans specialize in contextualizing thought versus automation use patterns to make predictions (Schleer et al. 2019). Smart vehicles are an area of research that seeks to fuse this symbiotic relationship. As this partnership flourishing, it will continue creating advancements across safety, optimization, and convenience systems.

# Practical Applications of Intelligence

Machine learning can enhance every aspect of the drive, from extending the physical parts’ lifespan to increasing the driver’s overall satisfaction. Figure 1 contains a non-exhaustive taxonomy subset of these situations, such as reducing wear and tear and object detection. While building the taxonomy, the critical placement consideration was focusing on that aspect’s core use cases. Many items, such as Voice Assistance (VA), could arguably live under the Safety pillar. However, safety systems could exist in the same capacity even though more traditional input interfaces.

Figure 1: Taxonomy of Use-Cases

## Safety Control Systems

Annually, 32,000 Americans die from automotive accidents, and another 2 million are injured (CDC, 2016). These statistics are unacceptably high and require innovations that increase all participants’ safety on the road (see Figure 2). Artificial intelligence can assist these scenarios by collecting sensor data and then predicting risks and opportunities. However, numerous open problems exist across the safety domain. These challenges should not discourage investments in these areas as they are essential to address.

Figure 2: Taxonomy of Participants and Example Challenges

For example, several manufacturers, like Suburu and Lexus, include audible collision alerts during lane changes or reversing. While these capabilities exist today, they are often incomplete models due to the high volume of edge cases, such as children fetching a ball from the street. Even after detecting the example child, several open problems span ethical and philosophical debate. Lex (2017) asks *if avoiding the pedestrian requires killing the driver— what calculus dictates that autonomous decision*? These situations might play-out in fractions of a second, limiting the value of human intuition. Since concrete answers do not exist, machines must resort to static guardrails (e.g., slamming on the breaks or swerving) that can risk a multi-vehicle accident.

## Convenience Systems

## Optimization Systems