Experiential Interruptions

Near-future neutral scenario

Autonomous vehicles pave the way for experiential transportation. Your car can double as a theater, a cocktail bar, or a library… for an additional fee. When the car is no longer the product you buy, service is essential and content is still king. If you’re unwilling to pay a premium, you might be stuck watching a movie you’ve already seen while also being inundated with deliberate product placement. Pop-up ads block those scenic mixed reality views during long car trips. Augmented OLED windows malfunction and lag, displaying blue screens and spinning wheels, giving new meaning to the term “car crash.” Getting from one place to another is a trade-off between the journey and the destination.
KEY INSIGHT

The quality of any algorithm has a significant correlation with the size of the dataset on which it is trained. The size of these datasets in autonomous driving is reaching an inflection point as the number of autonomous car users regularly generating real-world driving data approaches critical mass. Beyond this influx of real, raw data, methods of generating synthetic training data are reaching maturity.

EXAMPLES

Approximately 200,000 Tesla vehicles now navigate the roads using autopilot. With the increase in autonomous miles logged, emerging patterns in the data will help solve some of the problematic edge cases in the algorithms (those that occur rarely or only under extreme conditions). The current algorithms have at times struggled to identify stationary objects, in the worst cases resulting in catastrophic crashes. Shortcuts to training the AI systems are beginning to mature. Helm.ai uses a deep teaching methodology that programs the system to understand base rules like object permanence, effectively giving the AI a head start on learning. Massachusetts Institute of Technology created a digital laboratory to translate real-world situations into simulated scenarios using deepfake technology—allowing AI to train quickly and at lower cost in a virtual environment, but on data based on real-life circumstances. Volvo trains AI on edge cases using a virtual environment based on the Unity gaming engine. Rockstar Games received attention for stopping organizations such as OpenAI from using its “Grand Theft Auto” game as a platform for training self-driving cars.

Synthesized data can help us get to the edge cases faster, meaning more progress per mile analyzed, and making the algorithms safer overall. To put edge cases in context, think of how many miles one would have to drive to come across a pedestrian on stilts crossing paths with a cyclist doing a wheelie in a rainstorm? It sounds highly unlikely, but if the algorithm has never been exposed to such a situation, it might make a fatal error—which is why it’s important to expose the algorithm to as many of these atypical cases as possible.
The company with the most training data should best be able to reduce its vehicles’ autonomous-driving error rates, potentially cultivating a powerful brand association with safety—think Volvo in the ’80s or Subaru in the 2010s. With the stigma of autonomous driving as an under-regulated and potentially untrustworthy technology, perceived safety performance may be the most important factor for winning market share. For carmakers, however, autonomous algorithms aren’t necessarily a “winner take all” market, because the developer with the best system could resell or license its software to other players.

As cars with autonomous features become popular, they generate data to help systems improve.

**EMERGING PLAYERS**
- Helm.ai
- Oxbotica
- Nvidia

**DISRUPTIVE IMPACT**

As cars with autonomous features become popular, they generate data to help systems improve.
Autonomous Vehicle Testing Gets Regulated

**KEY INSIGHT**
New rules will govern how autonomous vehicles can be tested. Current legislation around autonomous cars is in flux and has yet to be set at a national level.

**EXAMPLES**
Arizona, California, Florida, and Nevada (along with some federal initiatives) lead in testing autonomous vehicles on public roads, with other states and countries catching up. Since 2012, at least 41 states and Washington, D.C., have considered legislation related to autonomous vehicles. More than 50 self-driving companies are testing their technologies in California. ITU, the specialized United Nations agency for telecom and information communications technology, created a focus group to develop performance standards for autonomous vehicles, including what an “AI driving test” should entail.

**DISRUPTIVE IMPACT**
Creating learner’s permits or driver’s licenses for AI-enabled autos will help socialize the technology and establish expectations for experiences and protocols on the road. For autonomous vehicles to become safer, they must be tested in conditions similar to those where they will be deployed. Because of this dynamic, autonomous car services will likely arrive soonest in areas with existing testing sites. The fragmented regulatory environment, which will remain until federal laws and guidelines are imposed, will result in conditional and situational rules, such as how Cadillac centrally designates sections of road compatible with Super Cruise, its AI-enabled hands-free driving assistance product.

**EMERGING PLAYERS**
- Focus Group on AI for Autonomous and Assisted Driving
- U.S. National Highway Traffic Safety Administration
- National Conference of State Legislators
KEY INSIGHT
As more systems and infrastructure transition to digital formats, and more purely digital systems are built, fewer of these systems will rely on analog or manual fail-safes. When these unprotected digital systems fail, it will lead to increasingly catastrophic outcomes. Electrical systems are historically more sensitive and fragile than their analog counterparts, meaning failures are likely to become harder to assess, repair, and recover from.

EXAMPLES
Many car locks today depend on electricity and become inoperable when the car battery dies. Tesla’s Model 3 has a mechanical system for the front doors, but not the rear doors. Such vulnerabilities can cause life-threatening scenarios: A failed car battery locked the doors of an Ohio man’s Cadillac and trapped him in the car for 13 hours, and, in another case, a Texas man and his dog died in his Corvette as a result of the same problem. Both vehicles had manual door release mechanisms as a fallback for when electrics failed, but neither person could find the release. To make matters more tragic, one of the victims had the vehicle owner’s manual yet was still unable to activate the manual release mechanism. These problems will be exacerbated when cars no longer come with physical user manuals or when firmware updates change a car so drastically that the original physical manual is no longer accurate.

DISRUPTIVE IMPACT
There is hardly a more apt application of the phrase “They don’t make ‘em like they used to” than the auto industry. As vehicles become more automated, manufacturers must design for the appropriate level of redundancy and for a population of people with limited understanding of how the underlying systems work.

EMERGING PLAYERS
- Cadillac
- Corvette
- Tesla
- Range Rover

How do you open a door that is frozen shut—and has no handles?

3RD YEAR ON THE LIST
Analog Fallbacks
When Humans Attack Cars

Near-future pessimistic scenario

Every year, more than 200,000 people die in a car accident. That's about one person every three minutes in the United States. Millions more are hospitalized because of car-related injuries. And now there's a twist: armed with rocks, guns, pocket knives, and in one instance, a PVC pipe, humans have started attacking cars.

The reason: big tech companies must adjust their self-driving technology to real-world communities that aren't interested in being test subjects. Google’s Waymo division, which has been testing vans near Phoenix since 2017, has had several run-ins with locals: they’ve slashed car tires, pelted vehicles with rocks, and tried to run vans off the road. Residents have safety concerns, especially in the wake of a 2018 collision involving a pedestrian and a self-driving Uber car just a few miles away in nearby Tempe. But the real issue here isn't safety. It's that we all struggle to cope with technological change, especially when it disrupts the foundations of everyday life.
As the role of car ownership shifts in society, public roads will transform. Streets and sidewalks are increasingly becoming mixed-use spaces as a greater variety of transportation methods become popular and prevalent. The pandemic-related need for outdoor dining and commerce has accelerated the redistribution of street space away from car travel and parking.

Examples
Strava Metro is using the data from runners and cyclists to help urban planners design safer streets. The National Association of City Transportation Officials released evolving guidelines for street space design and pandemic recovery strategies. They include various street use cases, including protests, voting, outdoor dining, and markets. Slow streets are designed to limit traffic in certain residential areas.

Disruptive Impact
Intelligent load balancing and redistribution of transportation real estate could significantly increase the throughput of existing transportation infrastructure. Increased quality, quantity, and diversity of traffic data will enable cities to redistribute how much attention and space is designated for car travel and storage versus use by pedestrians, cyclists, and others.

Emerging Players
- Strava Metro
- Open Streets Project
- National Association of City Transportation Officials

Road design will accommodate more uses than ever before.
China’s ambition to dominate the global car industry is buoyed by its manufacturing sector, work in AI, and vast troves of driving data.

Examples

Although we don’t see their vehicles in the West, there are more than 70 Chinese car manufacturers, and together they produce more cars than any other country. For decades, the Chinese government has been paving the way for joint ventures: Many cars in Beijing with foreign badges were actually made by domestic auto manufacturers. An electric vehicle boom is underway, and China’s newest cars are full of high-tech gadgetry including wrap-around digital dashboards and seats that swivel so passengers can enjoy a meal together when in self-driving mode.

Disruptive Impact

China is creating a new mobility ecosystem that includes electric vehicles, apps, communications systems, AI, and data—and it intends to ship its products to the West. Baidu’s Apollo is one example of an open-source self-driving system that could become an industry standard. Its partners include Daimler, BMW, and Ford.

Emerging Players

- Apollo Committee
- Baidu
- Volvo
- Ford
- Geely Group
- Dongfeng Motor
- Tencent
- Great Wall Motors

China’s Byton hopes to rival the world’s most prestigious auto manufacturers.
New Cityscape Designs

**Key Insight**

Autonomous vehicles, collaborative drones and robots, and AI are leading to changes in how cities are designed.

**Examples**

Saudi Arabia is developing futuristic new megacities. A linear city called The Line will stretch from the Red Sea to the mountains of northwest Saudi Arabia and consolidate urban centers into a 106-mile-long stretch of land. The entire city will be arranged along a multilevel spine, which will include local and high-speed transit, a service layer, and a pedestrian layer. The goal is to preserve the area’s wilderness, encourage mobility, and test renewable energies at scale. The Qiddiya giga-project is a $500 billion bet on a megacity contained within a 130 square mile site outside of Riyadh, the KSA’s capital. If these projects are successful, they will have advanced technologies and urban ecosystems that rival any major city.

**Disruptive Impact**

With climate change accelerating, these projects are an approach to redesigning how we live. We may have little choice, as sea levels rise and extreme weather events force us indoors or even underground.

**Emerging Players**

- Bjarke Ingels Group
- Arquitectonica
- Rockwell Group
- NEOM CEO Nadhmi Al-Nasr