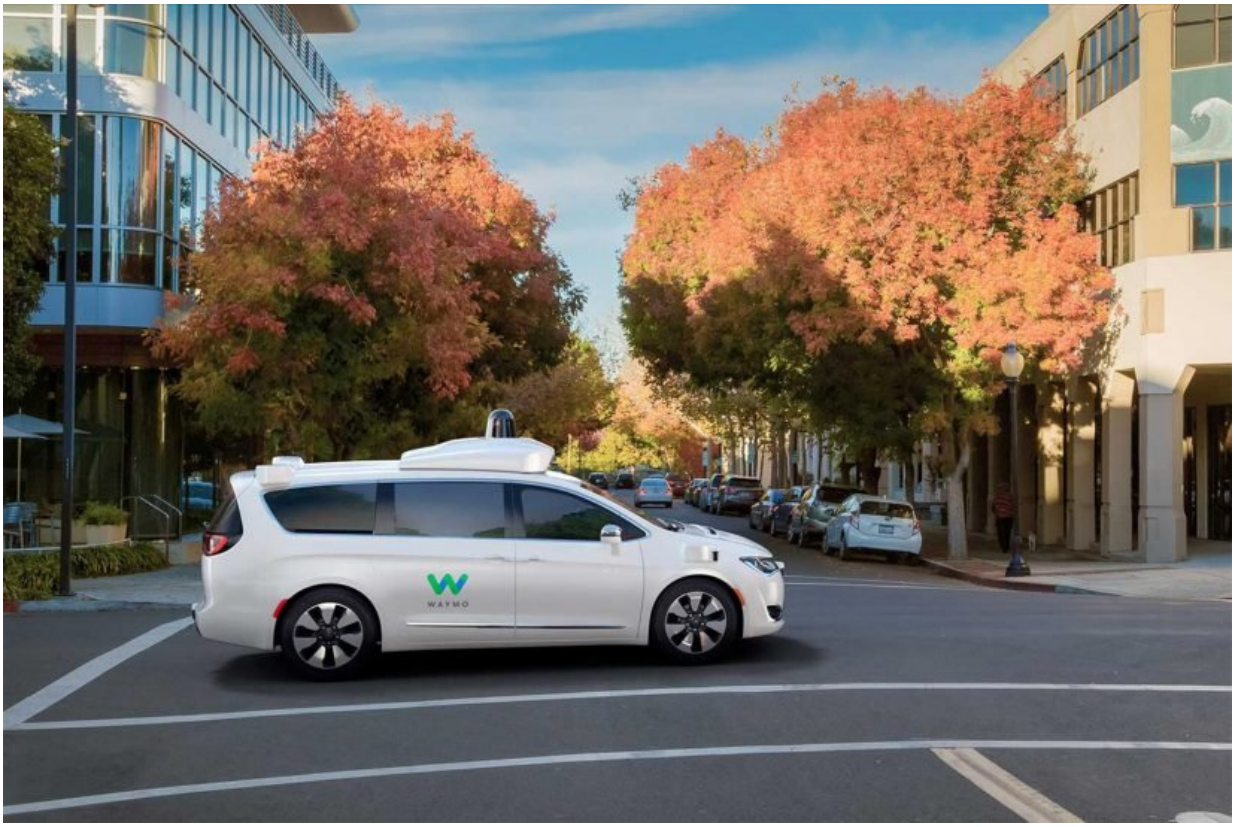
Driverless cars are ready to hit the road—but are we ready for driverless cars?

January 3 2018, by Ian Chaffee



A fully self-driving Chrysler Pacifica hybrid minivan hits the road. Credit: Waymo

We may continue to wait for those flying cars promised in science fiction, but who needs them when the car can drive itself?

Congress is trying to fast-track legislation that speeds the removal of federal regulatory hurdles for driverless cars. The California Department of Motor Vehicles recently revised its own regulations to allow for the testing of almost entirely autonomous vehicles on California's streets starting in June.

"Legislation is aptly being developed while the technology is still in its infancy," said Jeffrey Miller, an associate professor of engineering education at the USC Viterbi School of Engineering who focuses on autonomous vehicles. "Although there are some regulations, the auto manufacturers are really going to determine the future of the technology rather than the lawmakers, which is an interesting twist from previous technological advancements like this."

The auto industry may be ready, but are we?

Computing life-and-death decisions

The immediate benefit couldn't be greater. About 36,000 Americans die in automobile accidents every year, the second leading cause of external injury, according to the Centers for Disease Control and Prevention.

"Some people argue that, given the number of deaths in automobile accidents every year, it behooves us to implement collision avoidance algorithms immediately. But there are some unintended ethical and legal consequences that need to be considered," said Ali Abbas, director of USC's Neely Center for Ethical Leadership and Decision Making.

"When a machine is programmed to operate in a certain way, it is premeditated. The programmer knows exactly how the machine will act in a given situation and the types of trade-offs it will make. Who will be deciding these trade-offs?"

Abbas, who specializes in risk analysis and the ethics of artificial intelligence, says this could cause a slippery slope of bad outcomes caused by good intentions, bad intentions and misrepresentation on the parts of the human passengers that take advantage of this technology.

"These types of algorithms will also rely on the amount of information your car knows about you when you or your party are in it. So how much information should be fed into the algorithm? And how much information should your car know about you? The actions it makes will depend on this knowledge. And what if a person misrepresents this information to the vehicle to create more protection for their party? Will they be held accountable in the event of an accident?"

Hacking a 2-ton, 65 mph computer

Assuming that a self-driving car will do what it is programmed to do might still be assuming too much.

The industry, legislators and drivers-turned-passengers must also consider the cybersecurity precautions to be taken when so much of an autonomous vehicle's automation relies on computer systems.

Security researchers have repeatedly demonstrated over the last several years that a car's electronic instrumentation can be wirelessly hijacked.

Making them even more attractive to cyberattacker is the level of complexity of the software that will be installed in these vehicles, and the severity of the damage that can be done to the victim, according to Clifford Neuman, director of the Center for Computer Systems Security at USC Viterbi.

"We've seen the steering and braking of individual vehicles taken over on the news," Neuman said.

"The software update process that will be inevitably provided for vehicles will make them vulnerable. What is needed is for the developers of these systems is to provide much more attention to their software architecture to ensure that basic safety constraints are embedded deep in the system and cannot be subverted."

What impacts on cities and infrastructure?

When driverless cars do get here, the potential ripple effects could be endless. Completely autonomous vehicles would create an impact not just on obvious pieces of local infrastructure like roads and traffic lights, but many different parts of what would be newly developed "smart cities," says Bhaskar Krishnamachari, director of the Center for Cyber-Physical Systems and the Internet of Things at USC Viterbi.

"Much of the traffic infrastructure we have in cities today, such as traffic lights, static visual signs indicating driving rules and speed limits, etc., were designed for human drivers," he said.

"City, state and federal transportation departments will need to invest soon in deploying new infrastructure based on wireless communications for more efficient interaction with autonomous cars. With adoption of autonomous vehicles, we are also likely to see reduced ownership of vehicles, and a greater move toward renting and sharing.

"Increased use of carpooling could be a boon by reducing traffic congestion and energy usage for vehicles further."

Provided by University of Southern California

roadbut.html