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Auto-nomously yours

The future of cars is not in your hands...

On December 18, 2018, Silicon Valley startup, Nuro, debuted the first fleet of driverless robo-delivery vehicles operating on public roads. Nuro beat a host of rivals to this important autonomous vehicle (AV) first. Far larger rivals Waymo (Google), General Motors, Apple and Uber are nursing collective bruised egos.

While Nuro's bespoke electric R1 models will initially only serve clients of a single Scottsdale, Arizona, grocery store, this debut is still a very big deal. It may ultimately out-

and academia for driverless vehicle advancements in semi-controlled environments.

Advancements a decade ago hinged on two key (figurative) building blocks. The first was the adoption of the aerospace practice of "fly-by-wire." Instead of pilots operating old-school mechanical or hydraulic sticks and pedals, the controls operated by pilots in 21st-century jets were more akin to a digital rheostat. Today's airline pilots' actions send an electronic signal to the tail rudder motor instructing it to deviate left or right. In cars, parallel advancements translated to steer-by-wire, brake-by-wire and throttle-by-wire.

Great, so "by-wire" driverless car prototypes could now follow robo-friendly digital commands, but how does the car know where it should go? That was the second main building block recruited: LIDAR (Light Detection And Ranging).

Somewhat akin to a 3D ultrasound scanner, a vehicle-mounted LIDAR broadcasts very short pulses of laser light 360 degrees around the vehicle, and from the laser light that's reflected back, LIDAR plots its environment in that instant. Even early LIDAR versions in 2007 generated a million data points per second.

Google/Waymo and others spent the last decade (and billions of dollars) programming driving algorithms from LIDAR's instantaneous feedback. Importantly, Waymo's testing provided early-on conclusive evidence of the futility of handing vehicle control back to a human driver when an emergency arose. We humans took too long to re-orient from texting on our smartphones.

So, the most advanced AV algorithms make all the navigating calls, even in emergencies. Proponents, regulators and their lawyers are confident that today's best robo algorithms are statistically safer than human drivers. Given that 94% of modern road collisions are attributed to human error, there

is wide scope for road safety improvement. Even greater safety is envisioned when AVs communicate with one another in real-time.

Zero fatalities, zero emissions and zero congestion are the laudable goals of our future vehicle fleet—so says General Motors. To get there we'll rely progressively on shared/hailed rides in public-access driverless electric vehicles. It's estimated that future urban centres could meet transportation needs with just 15% of the current number of cars. That would mean far less traffic, and far less need for parking.

Approaching any one of these laudable "zero" goals would be a disruptor of the status quo. A possible congestion "solution" that reduces cars to an eighth of today's numbers would affect auto sales (obviously!). And a far greater proportion of those car sales than today's would be to fleets, rather than individuals.

Having all three "zero goals" confront the auto industry over the same decades is unprecedented. A mash-up of auto company winners and losers and new entrants is all but assured. Four of the five brands mentioned above in this article are not known car companies.

Vehicle manufacturers are not the only ones who should expect disruption. "Driver" is the number one job description in the developed world, whether it be of taxi, truck, courier, Tuk-Tuk etc. That job-loss pain will be real (stay tuned in Paris). The workforce will ultimately adapt to driverless cars—just as it did to ATMs, self-operated elevators, e-mail and Amazon.

The stakes in this transformation couldn't be higher for not only Detroit and Silicon Valley, but also Asia and Europe. Both China and the US are emerging as powerhouses in AV technology. In a parallel universe, these two titans would collaborate for the greater good. Don't hold your breath in ours.

On a more positive note, whole new industries will unfold that serve the wants and needs of millions of commuters who will be freed from mentally attending to their daily driving chores. Perhaps we'll be role-playing in our virtual reality headsets, or power napping? Ironically, I'd use the time freed-up for SIM auto racing. ●

The autonomous (and cute!) Nuro R1



shine Michigan's 1913 Ford Model T production line in significance to human mobility.

Today's AVs are traceable back to research-and-development work by the US military. Driverless military vehicles preclude driver casualties in hostile settings. In 2006 and 2007, the US military offered millions of dollars in DARPA (Defense Advanced Research Projects Agency) prizes to industry