

AUTOMATED SEIZURES: POLICE STOPS OF SELF-DRIVING CARS

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When the police suspect a driver is breaking the law, the Fourth Amendment allows them to stop the car. This means compelling the driver to bring the car to a halt. Sometimes a car stop will lead to further investigation, searches, and even arrests. What will these stops look like when people no longer drive their cars and police officers no longer pursue them by driving their own? Autonomous cars are not yet commonplace, but soon they will be. Yet little attention has been paid to how autonomous cars will change policing. The issue matters enormously because today the police spend a lot of time stopping cars. For instance, the most common contact most adults in the United States have with the police takes the form of a traffic stop. Vehicles equipped with artificial intelligence and connected both to the internet and one another may be subject to automated stops. The issue is already being discussed as a theoretical possibility and as a desirable policing tool. This essay considers the law and policy issues that will arise when car seizures become remote and automated.

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INTRODUCTION

An employee leaves his workplace and discovers that his car is missing from its parking spot. When he calls the local police department, the employee grants them permission for a takeover of his vehicle. The police locate the vehicle, take control over it, and order it driven to the nearest police station, with the suspected thief locked inside.¹

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¹ See Anouk Vleugels, *Police Can Remotely Drive Your Stolen Tesla into Custody*, NEXT

* * *

A woman attempts to flee a tense police encounter in her autonomous car. Decades earlier, the police might have used a Precision Intervention Technique to stop her.² This maneuver stops a fleeing car by forcing it to spin out; it poses risks both to the driver and bystanders.³ Instead, the police officer assumes remote control of her car and brings it safely to a halt to the side of the road.

* * *

The police identify an autonomous car whose controls have been overridden by a person intent on using the car as a weapon by driving it into a crowd of pedestrians. The police take remote control of the car, pull it to the side of the road, and thwart the attack.⁴

* * *

In a targeted enforcement program, an urban police department assumes control of cars suspected of being part of a “rolling red-light district.” These autonomous cars are pay-by-the-hour roving motel rooms used for prostitution and illegal drug use. The police move the cars and occupants, first to the side of the road for an initial inspection, then to the police station.⁵

* * *

These are not stories of contemporary policing, but they may well be snapshots of the future. Although autonomous and connected cars⁶ are not widely in use now, we can safely assume that we will see these cars in the next decades.⁷ This technological change will affect everything from truck

WEB (Nov. 19, 2018), <https://thenextweb.com/the-next-police/2018/11/19/police-control-your-self-driving-cars> (describing the scenario and attributing it to the Chief Innovation Officer of the Dutch police, Hans Schönfeld).

² See *Scott v. Harris*, 550 U.S. 372, 375 (2007) (describing a car chase by a county deputy using the Precision Intervention Technique maneuver, “which causes the fleeing vehicle to spin to a stop”); see also *infra* Part I (describing conventional policing techniques).

³ The driver in *Scott* was rendered a quadriplegic as a result. 550 U.S. at 375.

⁴ Cf. Jeremy Straub, *On-Board Computers and Sensors Could Stop the Next Car-Based Attack*, CONVERSATION (Nov. 2, 2017), <https://theconversation.com/on-board-computers-and-sensors-could-stop-the-next-car-based-attack-86088> (proposing that in some circumstances an autonomous car itself could override a driver’s override when a vehicle attack might be underway).

⁵ See *infra* Section II.C (describing the opportunities for illegal activities facilitated by driverless cars).

⁶ While often referred to by journalists and others as self-driving or autonomous cars, these vehicles are more accurately described as being automated (equipped with artificial intelligence to sense the environment and perform the task of driving) and connected (the ability to engage in vehicle-to-vehicle communication (V2V) and vehicle-to-infrastructure communication (V2I)). See STANDING SENATE COMM. ON TRANSP. & COMM’NS, DRIVING CHANGE: TECHNOLOGY AND THE FUTURE OF THE AUTOMATED VEHICLE 21, 23 (2018) (Can.) [hereinafter DRIVING CHANGE], https://senCanada.ca/content/sen/committee/421/TRCM/Reports/COM_RPT_TRCM_Automated_Vehicles_e.pdf. “More advanced automated and connective vehicle (AV and CV) technology is expected to become available in the near future.” *Id.* at 17.

⁷ Some transportation experts have estimated that autonomous cars will be widely available to middle income families by the 2040s or 2050s.

driving to pizza delivery, but it will also change how the police enforce the laws when it comes to drivers. Ultimately, conventional drivers won't exist anymore.⁸

We assume that the police can stop a car when the driver is breaking the law. That offense may be a minor traffic stop—even a pretext—or it may be that the driver is an escaping criminal offender. Whatever the circumstances, Fourth Amendment law grants the police broad authority to compel the driver to stop.⁹

What will traffic stops look like when people no longer drive cars and police officers no longer pursue them? While there is growing interest in the general regulation of autonomous vehicles, there remains little discussion about how policing will change when people are no longer driving their cars.¹⁰ At the same time, the need to develop policies for autonomous cars has already been identified as a concern by police agencies and researchers.¹¹

⁸ The spread of autonomous cars—and conventional drivers—will not happen overnight. There will likely be some areas that adopt autonomous cars before others, and autonomous cars may have to coexist with semi-autonomous cars as well as traditional cars. For instance, there may be autonomous-only traffic lanes. *See, e.g.*, Nick Oliver, Kristina Potočnik & Thomas Calvard, *To Make Self-Driving Cars Safe, We Also Need Better Roads and Infrastructure*, HARV. BUS. REV. (Aug. 14, 2018), <https://hbr.org/2018/08/to-make-self-driving-cars-safe-we-also-need-better-roads-and-infrastructure> (suggesting that we might see “dedicated lanes or zones for self-driving vehicles” in the future). The Department of Transportation has adopted the Society of Automotive Engineers framework automation scale. This is a 0 to 5 scale, with 0 indicating no automation at all in a vehicle. Level 4 assumes that an automated driving system will perform all driving tasks, even if a human driver fails to respond to a request to intervene. Level 5 is reserved for full automation, which means that the “full-time performance by an automated driving system of all aspects of the dynamic driving task under all roadway and environmental conditions that can be managed by a human driver.” *See* U.S. DEP'T OF TRANSP., AUTOMATED VEHICLES 3.0: PREPARING FOR THE FUTURE OF TRANSPORTATION vi (2018) (citing SAE INT'L, TAXONOMY AND DEFINITIONS FOR TERMS RELATED TO DRIVING AUTOMATION SYSTEMS FOR ON-ROAD MOTOR VEHICLES 19 (2018), <https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/320711/preparing-future-transportation-automated-vehicle-30.pdf>).

⁹ For instance, in *Delaware v. Prouse*, the Supreme Court observed that observation of traffic and vehicle safety regulations provided the necessary justification for traffic stops. 440 U.S. 648, 659 (1979) (“Vehicle stops for traffic violations occur countless times each day; and on these occasions, licenses and registration papers are subject to inspection and drivers without them will be ascertained.”).

¹⁰ States have begun to draft and circulate rules for the testing of self-driving cars, but details on how these cars will interact with the police remain vague. For instance, the state of California's Driverless Testing Regulations state that a manufacturer must provide “a copy of a law enforcement interaction plan,” that “shall include” information on “how to communicate with a remote operator of the vehicle who is available at all times that the vehicle is in operation,” and “how to safely remove the vehicle from the roadway.” *See* CAL. CODE REGS. tit. 13, § 227.38(e) (2018), https://www.dmv.ca.gov/portal/wcm/connect/a6ea01e0-072f-4f93-aa6c-e12b844443cc/DriverlessAV_Adopted_Regulatory_Text.pdf?MOD=AJPERES&CVID=. One recent proposed New Jersey bill would establish the modest requirement of a “training program to prepare law enforcement to interact with autonomous vehicles.” Assemb. B. No. 4977, 218th Leg. (N.J. 2019), https://www.njleg.state.nj.us/2018/Bills/A5000/4977_I1.HTM.

¹¹ *See, e.g., Proceedings of the Standing Sen. Comm. on Transp. and Comm'ns* (2017)

More broadly, what will and should happen when police acquire the ability to stop cars remotely? In other words, how should we think about the relationship of the Fourth Amendment to automated seizures? The government's ability to stop a vehicle—even an autonomous one—clearly implicates the Fourth Amendment's prohibition on unreasonable searches and seizures.¹² This Article explores the law and policy issues raised when police seizures of cars become automated. While existing Fourth Amendment law may generally accommodate this technological change, there are good reasons to limit the scope of these new techniques, at least in the short term.

The widespread adoption of autonomous cars will have an enormous impact on policing. Most police-citizen contacts in the United States occur when people are driving their cars.¹³ But the introduction of cars that may need little or no human control and are connected to the internet, to the infrastructure, and to one another will change these practices profoundly. An autonomous car would be a programmable car. Perhaps speed enforcement will be a thing of the past, either because cars will be programmed to stay within the legal speed limit, or because such violations will be automatically enforced with a ticket sent to drivers' electronic dashboards.

But even in this version of the future, police will still seize cars. A person inside the autonomous car may have an outstanding arrest warrant. The police may suspect that the car contains contraband or evidence of a crime. By no longer requiring human control, autonomous cars may even encourage more types of crime to take place within them.¹⁴

(statement of Chief Superintendent Eric Stubbs, Dir. Gen., Nat'l Criminal Operations, Contract and Aboriginal Policing, Royal Can. Mounted Police), <https://sencanada.ca/en/Content/Sen/Committee/421/TRCM/14ev-53207-e> (“An automated vehicle could be used to cause a major threat to police, infrastructure and public safety. This may require police agencies to have the ability to remotely disable an automated vehicle during exigent circumstances in order to save lives.”); *see also* JOHN S. HOLLYWOOD ET AL., RAND CORP., USING FUTURE INTERNET TECHNOLOGIES TO STRENGTHEN CRIMINAL JUSTICE 14 (2015), https://www.rand.org/pubs/research_reports/RR928.html (noting that a “top law enforcement priority was developing policies and procedures for self-driving unmanned and automated vehicles”); RICHARD SILBERGLITT ET AL., RAND CORP., VISIONS OF LAW ENFORCEMENT TECHNOLOGY IN THE PERIOD 2024-2034: REPORT OF THE LAW ENFORCEMENT FUTURING WORKSHOP 38 (2015) (identifying a “need [for] improved technologies—including both tactics and physical systems—for safely defusing or disabling people, groups, and vehicles”).

¹² *Brower v. County of Inyo*, 489 U.S. 593, 596–97 (1989) (“[A] Fourth Amendment seizure [occurs] . . . when there is a governmental termination of freedom of movement through means intentionally applied.”).

¹³ *See, e.g.*, PATRICK A. LANGAN ET AL., U.S. DEP'T OF JUSTICE, CONTACTS BETWEEN POLICE AND THE PUBLIC: FINDINGS FROM THE 1999 NATIONAL SURVEY 1 (2001), <https://www.bjs.gov/index.cfm?ty=pbdetail&iid=659> (reporting that forty-four percent of those who experienced contact with the police were drivers in a motor vehicle stop and that this was the single most common reason for police contact).

¹⁴ *See infra* Section II.C (detailing crimes facilitated by automated cars).

This essay¹⁵ explores the issues that will arise when police seize autonomous cars.¹⁶ First, it discusses the Supreme Court's case law on car seizures and the considerable authority those cases grant to the police. Second, it introduces some of the possible changes that autonomous vehicles will bring to policing. These changes will increase safety for the police and civilians in some ways, but they will also increase the powers of the police. The last part identifies some of the policy and law implications raised when police seizures of cars become remote and automated.

I

CONVENTIONAL CARS, SEARCHES, AND SEIZURES

Cars and their drivers have shaped the core of modern search and seizure law.¹⁷ Cars are tools of criminal escape, spaces for illicit activity, modes of contraband transport, and the object of byzantine state traffic codes that forbid everything from obscured license plates to broken brake lights. The Supreme Court's Fourth Amendment decisions for the past century have permitted ever greater authority for police officers to stop cars and detain and search their occupants.

Consider the ability of the police to conduct searches of cars when they have the necessary probable cause but no warrant. In 1925, federal prohibition agents suspected Leon Carroll of illegal bootlegging. They stopped his Oldsmobile Roadster and tore through its upholstery revealing sixty eight concealed bottles of gin and whiskey.¹⁸ The Supreme Court approved of the warrantless search and thereby created the "automobile exception" to the general warrant requirement, allowing police searches of vehicles for evidence of crime predicated on probable cause alone.¹⁹ Subsequent to the *Carroll* case, the Court has also permitted the so-called "automobile exception" to apply to the warrantless search of a Dodge Mini

¹⁵ This analysis is speculative. Some of the technical details have yet to be developed or realized. And even when they become a reality, police seizures of self-driving cars are likely to be more complicated and less uniform than described here. Technological changes will likely change human behaviors too. The aim of the Article, however, is to raise some broad questions about a policing future that will be quite different than the one we know today.

¹⁶ There are, of course, numerous law and policy issues that will arise when autonomous cars become more common, including whether and how the government will be able to obtain information recorded and collected by the car itself. This Article limits itself to questions raised by automated seizures of cars.

¹⁷ The Supreme Court has observed the centrality of driving in American life. *See, e.g.*, *Delaware v. Prouse*, 440 U.S. 648, 662 (1979) ("Automobile travel is a basic, pervasive, and often necessary mode of transportation to and from one's home, workplace, and leisure activities. . . . Undoubtedly, many find a greater sense of security and privacy in traveling in an automobile than they do in exposing themselves by pedestrian or other modes of travel.").

¹⁸ *Carroll v. United States*, 267 U.S. 132, 136 (1925).

¹⁹ *Id.* at 155–56.

Motor Home lived in by the defendant.²⁰ The Court has allowed a departure from the Fourth Amendment's warrant requirement because cars are highly mobile (and thus capable of escape)²¹ and because they are highly regulated (resulting in a reduced expectation of privacy).²²

The Supreme Court has also expanded the sweep of policing authority over drivers by permitting pretextual policing: using a violation of a minor crime for a stop while likely having a hunch about the commission of another, more serious, crime. When plainclothes police officers stopped James Brown's Pathfinder in 1993,²³ they probably believed that Brown and his passenger Michael Whren were transporting drugs (they were), but instead relied upon Brown's failure to signal when turning as a reason to stop the car.²⁴ Whatever the officers' motivations, the observation of the traffic offense provided the Fourth Amendment basis for the stop.

Being stopped for a minor traffic offense is common. Traffic stops are consistently the most common reason adults in the United States have contact with the police.²⁵ Since 1999, the Bureau of Justice Statistics has regularly conducted a survey of people reporting face-to-face contacts with the police. The police stop about one out of ten drivers²⁶ for traffic law-related enforcement, typically for speeding or some other traffic offense.²⁷ Traffic law enforcement—whether it is the actual reason for the stop or not—makes up the bulk of these police-citizen interactions. Indeed, many of the Supreme Court's most significant Fourth Amendment cases have begun with the enforcement of minor traffic offenses.²⁸

²⁰ *California v. Carney*, 471 U.S. 386, 388, 394 (1985).

²¹ *See Carroll*, 267 U.S. at 153 (“[T]he Fourth Amendment . . . recognize[s] a necessary difference between a search of a . . . structure [where] a proper official warrant readily may be obtained, and a search of a [vehicle], where it is not practicable to secure a warrant because the vehicle can be quickly moved out of the locality or jurisdiction . . .”).

²² *See Carney*, 471 U.S. at 392 (“The public is fully aware that it is accorded less privacy in its automobiles because of this compelling governmental need for regulation.”); *South Dakota v. Opperman*, 428 U.S. 364, 368 (1976) (“Automobiles, unlike homes, are subjected to pervasive and continuing governmental regulation and controls, including periodic inspection and licensing requirements.”).

²³ *Whren v. United States*, 517 U.S. 806, 808–09 (1996) (noting that the officers conducting the stop were from the “plainclothes vice-squad officers”).

²⁴ *Id.* at 809.

²⁵ *See, e.g., ELIZABETH DAVIS, ANTHONY WHYDE & LYNN LANGTON, U.S. DEP’T OF JUSTICE, CONTACTS BETWEEN POLICE AND THE PUBLIC, 2015*, at 1 (2018) (“The most prevalent specific types of [public] contact with the police occurred when drivers were pulled over during a traffic stop . . .”).

²⁶ *See LYNN LANGTON & MATTHEW DUROSE, U.S. DEP’T OF JUSTICE, POLICE BEHAVIOR DURING TRAFFIC AND STREET STOPS, 2011*, at 1, 3 (2013) (using data from the Bureau of Justice Statistics).

²⁷ *See, e.g., LANGAN ET AL., supra* note 13, at 14 (reporting that “speeding” was the most common reason, with 51.2% of drivers stopped for that reason, followed by “some other traffic offense” such as a seat belt violation).

²⁸ *See, e.g., Rodriguez v. United States*, 135 S. Ct. 1609 (2015) (driving on highway shoulder

And the traffic stop has served as the location of some of the most notorious and highly publicized violent encounters against civilians by police in recent years.²⁹ Many of these cases involved traffic stops—ostensibly for speeding, broken taillights, and expired registration tags—that have escalated into more volatile situations. Since January 1, 2015, the *Washington Post* has tracked every fatal shooting by a police officer in the line of duty in the United States.³⁰ According to the *Post*'s records, the police fatally shot more than one hundred people after a traffic stop in 2015 alone.³¹

To no one's surprise, these traffic stops disproportionately affect non-white drivers, and African American male drivers in particular. A 2011 survey by the U.S. Department of Justice found that men were more likely to be subjected to traffic stops than women, and that “[r]elatively more black drivers (thirteen percent) than white (ten percent) and Hispanic (ten percent)” were pulled over.³²

The Supreme Court's decisions about the bounds of permissible action during these stops grant police officers considerable deference and authority. During car stops, the police may order drivers and passengers out of the car,³³ ask wholly unrelated questions about criminal activity,³⁴ conduct dog-sniffs

for two seconds); *Riley v. California*, 573 U.S. 373, 378 (2014) (expired registration tags); *Brendlin v. California*, 551 U.S. 249, 252 (2007) (same); *Illinois v. Caballes*, 543 U.S. 405, 406 (2005) (speeding); *Whren*, 517 U.S. at 808 (turning without signaling and speeding).

²⁹ One such incident involved the fatal shooting of Philando Castile. A Minnesota police officer conducted a traffic stop on the thirty-two-year-old black cafeteria worker. Castile told the officer he had a legal firearm; the officer claimed later that he feared being shot. Castile had by that point been stopped at least forty-six times by the police and had spent “most of this driving life fighting traffic tickets.” See Eyder Peralta & Cheryl Corley, *The Driving Life and Death of Philando Castile*, NPR (July 15, 2016), <https://www.npr.org/sections/thetwo-way/2016/07/15/485835272/the-driving-life-and-death-of-philando-castile>; see also Mark Berman & Wesley Lowery, *Video Footage Shows Minn. Traffic Stop That Ended with Philando Castile's Death*, WASH. POST (June 20, 2017), https://www.washingtonpost.com/news/post-nation/wp/2017/06/20/video-footage-shows-minn-traffic-stop-that-ended-with-philando-castiles-death/?utm_term=.791194682e25 (providing additional detail about the Castile case).

³⁰ Julie Tate et al., *How the Washington Post Is Examining Police Shootings in the United States*, WASH. POST (July 7, 2016), https://www.washingtonpost.com/national/how-the-washington-post-is-examining-police-shootings-in-the-united-states/2016/07/07/d9c52238-43ad-11e6-8856-f26de2537a9d_story.html?utm_term=.588508004816. The database does not track deaths in police custody, fatal shootings by off-duty officers, or non-fatal shootings. *Id.*

³¹ Wesley Lowery, *A Disproportionate Number of Black Victims in Fatal Traffic Stops*, WASH. POST (Dec. 24, 2015), https://www.washingtonpost.com/national/a-disproportionate-number-of-black-victims-in-fatal-traffic-stops/2015/12/24/c29717e2-a344-11e5-9c4e-be37f66848bb_story.html?utm_term=.b562a3507de1.

³² LANGTON & DUROSE, *supra* note 26, at 1, 3.

³³ See *Pennsylvania v. Mimms*, 434 U.S. 106, 111 (1977) (permitting the police to order drivers out of the car); *Maryland v. Wilson*, 519 U.S. 408, 415 (1997) (permitting the police to order passengers out of the car).

³⁴ See *Arizona v. Johnson*, 555 U.S. 323, 333 (2009) (“An officer's inquiries into matters unrelated to the justification for the traffic stop, this Court has made plain, do not convert the encounter into something other than a lawful seizure, so long as those inquiries do not measurably

for contraband,³⁵ and ask for “consent”³⁶ to search the car without any additional legal justification. Drivers subjected to stops for minor offenses also have found their legitimately-held cash and valuables in their cars subjected to civil forfeiture.³⁷

And while the Court’s Fourth Amendment vehicle cases each articulate finely grained, context-specific doctrines for the scope of police authority, its general deference can be summed up by the Court’s observation in a 1985 decision: that traffic stops are “fraught with danger to police officers.”³⁸ That phrase has been quoted dozens of times in the lower courts.³⁹

No less concerning to the Court has been the danger to police and third parties when civilians flee in their cars during high speed chases. These incidents begin when a driver refuses to yield to police orders and drives away erratically and at high speed. The Court has held that the police may use force, even deadly force, to stop such drivers given the “grave public safety risk” involved in these flights. Police actions deemed reasonable under these circumstances have included ramming the driver’s bumper causing him to spin out and crash,⁴⁰ and shooting fifteen times into a driver’s car to stop it.⁴¹

In sum, the police may exercise a great deal of discretion about whether to stop drivers and how to treat them. Police officers may be mistaken in their judgments and even engage in deadly force when lesser force may have been adequate. Drivers, on the other hand, harbor considerably less expectation of freedom and privacy in their cars than they might enjoy elsewhere.

extend the duration of the stop.”).

³⁵ *Illinois v. Caballes*, 543 U.S. 405, 409 (2005) (“[T]he use of a well-trained narcotic-detection dog—one that ‘does not expose noncontraband items that otherwise would remain hidden from public view’ during a lawful traffic stop, generally does not implicate legitimate privacy interests.”) (quoting *United States v. Place*, 462 U.S. 696, 707 (1983)).

³⁶ *See, e.g., Florida v. Jimeno*, 500 U.S. 248, 250–51 (1991) (recognizing searches may be based only upon consent).

³⁷ *See* Michael Sallah et al., *Stop and Seize*, WASH. POST (Sept. 16, 2014), https://www.washingtonpost.com/sf/investigative/2014/09/06/stop-and-seize/?utm_term=.78438e1aac83 (describing the rise of asset forfeiture from motorists). This is likely to change, however, with the Supreme Court’s 2019 decision in *Timbs v. Indiana*, 138 S. Ct. 2650 (2019), in which the Court held that the Fourteenth Amendment incorporates the Eighth Amendment’s Excessive Fines Clause such that it is applicable to the states.

³⁸ *Michigan v. Long*, 463 U.S. 1032, 1047 (1983).

³⁹ A 2019 Westlaw search found over 300 state and federal cases quoting the phrase. *See also* *United States v. Moorefield*, 111 F.3d 10, 13 (3d Cir. 1997) (“The Supreme Court has repeatedly recognized that traffic stops are dangerous encounters that result in assaults and murders of police officers.”).

⁴⁰ *Scott v. Harris*, 550 U.S. 372, 375, 381 (2007). The driver was rendered a quadriplegic as a result. *Id.* at 375. The county deputy involved in the chase decided to use a “Precision Intervention Technique” maneuver, “which causes the fleeing vehicle to spin to a stop.” *Id.*

⁴¹ *Plumhoff v. Rickard*, 572 U.S. 765, 768, 770 (2014). Both Donald Rickard and his passenger Kelly Allen died as a result of the gunshot wounds and injuries from the car crash. *Id.* at 770.

II

POLICE SEIZURES OF SELF-DRIVING CARS

Although the *police* do not now perform remote car seizures, we know of several examples when *private* actors have controlled vehicles at a distance. In 2014, Mary Bolender could not start her Chrysler van to take her daughter to the emergency room.⁴² Bolender's car was one of thousands fitted with a starter interrupt device. Subprime borrowers like Bolender may be given auto loans on the condition that they have a starter interrupt device that allows the remote disabling of their car. The day her car wouldn't start, Bolender owed an outstanding \$389.00 to C.A.G. Acceptance, her lender.

Starter interrupt devices may appear rudimentary, but some cars are increasingly no different than cellphones and other smart devices that require software updates delivered remotely. When Hurricane Irma prompted evacuations in Florida in September 2017, Tesla remotely enabled a software upgrade for its vehicles within the storm's range.⁴³ The upgrade increased the battery capacity of some Model S and X Tesla vehicles, but also prompted concerns about the extent to which Tesla could control cars remotely.⁴⁴ While Tesla extended the battery range of its cars in the case of Hurricane Irma, it could presumably also remotely control a car in other ways, such as disabling it—at government request.

For now, police have engaged in improvised automated stops. In the early morning hours of November 30, 2018, a California Highway patrol officer noticed a Tesla Model 3 driving erratically.⁴⁵ The driver appeared to be asleep; the Tesla appears to have been engaged in Autopilot, a system that enables its vehicles to drive themselves. While one police car stopped traffic from behind the Tesla, another police car pulled in front and began to slow down and eventually stopped.⁴⁶ This improvisation caused the Tesla to stop;

⁴² See Michael Corkery & Jessica Silver-Greenberg, *Miss a Payment? Good Luck Moving That Car*, N.Y. TIMES (Sept. 24, 2014), <https://dealbook.nytimes.com/2014/09/24/miss-a-payment-good-luck-moving-that-car> (describing Bolender's story).

⁴³ See Tiffany Hsu, *Tesla Boosts Car Battery Power During Irma, Raising Questions of Control*, N.Y. TIMES (Sept. 11, 2017), <https://www.nytimes.com/2017/09/11/business/tesla-battery-irma-upgrade.html> (describing an episode in which Tesla remotely delivered a software update during a hurricane that extended the cars' driving range).

⁴⁴ For example, Matt Tait, senior cybersecurity fellow at the Robert S. Strauss Center for International Security and Law at the University of Texas at Austin, expressed skepticism about Tesla's remote update: "Need a lot of confidence in your code to push that update." Matt Tait (@pwnallthethings), TWITTER (Sept. 10, 2017 (9:48 PM), <https://twitter.com/pwnallthethings/status/906741235238555649>).

⁴⁵ See Ira Boudway, *Someday Your Self-Driving Car Will Pull Over for Police*, BLOOMBERG (Feb. 20, 2019), <https://www.bloomberg.com/news/features/2019-02-20/someday-your-self-driving-car-will-pull-over-for-police> (describing the incident).

⁴⁶ Dami Lee, *Police May Have Used Tesla's Autopilot Feature to Stop Driver Asleep at the Wheel*, VERGE (Dec. 3, 2018), <https://www.theverge.com/2018/12/3/18124017/chp-tesla-autopilot-police-redwood-city-drunk-driver>.

the driver was later arrested.⁴⁷ Automated seizures would render jury-rigged solutions like this one in California unnecessary.

* * *

Autonomous and connected cars have the potential to transform the interactions between the police and civilians. While the future will develop in unexpected ways, we can anticipate some of these changes based on what is currently in development. This Part explores what some of those changes might entail. Though created by the private sector, autonomous cars also introduce new police technologies and therefore expand law enforcement strategies. And because they are “smart” machines capable of remote control, autonomous cars may limit or eliminate some traditional car seizures. At the same time, certain car seizures may become *more* prevalent if they are inexpensive and uncomplicated. Finally, autonomous cars might introduce new places for crime as the functions of cars change.

A. Automated Stops

What will remote police seizures of cars look like? While there are no cars that the police can today stop by the remote means discussed here, we can identify some possible versions of automated stops by looking through white papers and patent applications.⁴⁸

Imagine, for instance, that the police could “deputize” the surrounding “smart infrastructure”⁴⁹ (e.g., roads and traffic lights outfitted with sensors and connected to the internet).⁵⁰ In the past decade, the RAND Corporation has convened workshops to identify what future technology challenges police might face. Among the important trends its staff identified were “increased automation and augmentation of law enforcement functions” that will enhance the powers of the police.⁵¹ These changes included autonomous cars capable of remote control by the police, perhaps by temporarily controlling the nearby “smart” street lights and roads.

⁴⁷ See Press Release, CHP - Redwood City, *DUI Driver Falls Asleep at the Wheel*, FACEBOOK (Nov. 30, 2018), https://www.facebook.com/story.php?story_fbid=779090632439590&id=513512755664047.

⁴⁸ This Section provides a sketch of different actions at a very high level of technical generality. It does not, for instance, specify the sort of protocol or technology that would underlie vehicle-to-vehicle or vehicle-to-infrastructure communications.

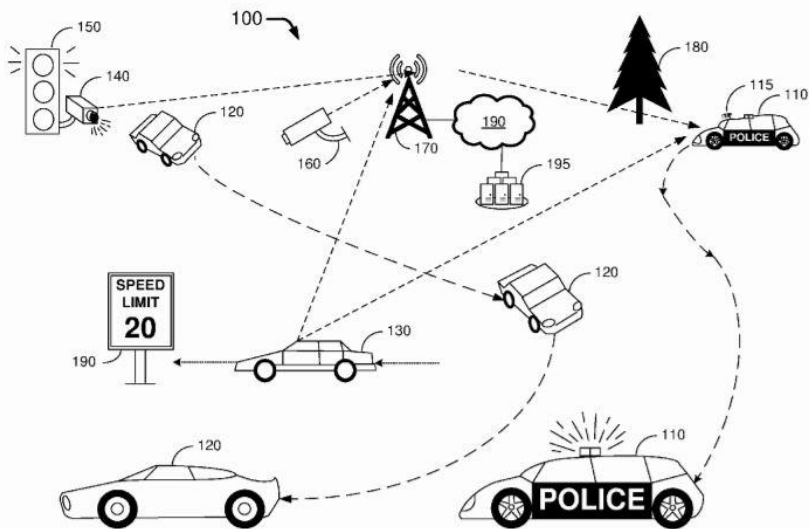
⁴⁹ The Silbergliitt report identified a needed capability “to exploit a range of robotics/autonomy technologies, ranging from ground robots to larger UAS [unmanned aerial systems] to small swarming UAS to self-driving vehicles to ‘smart infrastructure’ that can be ‘deputized’ for [law enforcement] purposes.” See SILBERGLITT ET AL., *supra* note 11, at 43.

⁵⁰ For further discussion of what policing will look like in a future “smart” city, see Elizabeth E. Joh, *Policing the Smart City*, 15 INT’L J. L. CONTEXT 177 (2019).

⁵¹ SILBERGLITT ET AL., *supra* note 11, at 6. “As just one example, the prototype ‘Knightscope’ policing robot is intended by its developers to autonomously patrol areas and detect suspicious activity and persons and vehicles of interest, alerting human officers if it finds something ‘interesting.’” *Id.* (citation omitted).

Alternatively, the police could take direct control of connected autonomous vehicles. A victim of auto theft might grant permission to the police to take control of the stolen car.⁵² The technological means to grant police direct control over private vehicles for legitimate policing purposes would also allow the police to move illegally parked cars or halt the vehicles of fleeing suspects.⁵³

And the “police” here might themselves be automated. A 2019 patent from Ford Global Technologies proposed such a system: An autonomous police vehicle could spot a traffic law violation by an autonomous civilian car (because its human occupant had overridden its ordinary capabilities), pull the car over, and make a determination about to how to resolve the violation.⁵⁴



The patent proposes an “autonomous police vehicle [that] may be trained or otherwise programmed using machine learning tools (e.g., deep neural networks) to find good hiding spots to catch violators of traffic laws.”⁵⁵ Although autonomous cars will likely be programmed to obey local traffic laws, the patent addresses those times when a human driver decides

⁵² See Vleugels, *supra* note 1.

⁵³ See, e.g., HOLLYWOOD ET AL., *supra* note 11, at 4 (noting “that if [a] vehicle is unmanned but capable of autonomous movement and in an undesirable location . . . an officer could direct the vehicle to move to a new location (with the vehicle’s intelligent agent’s recognizing ‘officer’ and ‘directions to move’) and automatically notify its owner and occupants”).

⁵⁴ Autonomous Police Vehicle, U.S. Patent No. 10,269,242 B2 col. 1–2 (filed July 12, 2016).

⁵⁵ *Id.* col. 2 l. 13–16.

to override the autonomous controls.⁵⁶ Ford's patent envisions a series of *communications entirely among machines*⁵⁷: an infrastructure that reports traffic law violations to an autonomous police vehicle which then responds by halting a private autonomous vehicle.

Nor would the enforcement end at the stop. The autonomous police vehicle might demand that the stopped car identify itself (through wireless transmission of its registration and insurance information⁵⁸) and its occupants (for individual identification, outstanding warrants, etc.). The police vehicle could then send a second transmission about whether the stop would end with a warning, citation, or further investigation.⁵⁹ Much of this would take place, presumably, with little human interaction.⁶⁰

In other cases, remote takeovers by the police may be unnecessary. Some autonomous and connected cars will be programmed to stop at the side of the road in the presence of a police car's lights and sirens. In its *Emergency Response Guide and Law Enforcement Interaction Protocol*, Waymo explains that its cars are designed both to identify police or emergency vehicles, and then to yield to them "as appropriate . . . no matter which direction they are headed."⁶¹ When a Waymo vehicle senses that a police or emergency vehicle is flashing its lights directly behind it, it is "designed to pull over and stop when it finds a safe place to do so."⁶²

Automated car stops will almost certainly be safer ones, both for the police and for civilians. Police shootings of drivers in mistaken circumstances (such as misidentifying objects as weapons) should decrease if cars can be remotely seized. Dangers to police officers themselves would decrease, too, if cars could be stopped, identified, and assessed at a distance. The large number of drivers and innocent bystanders killed in police

⁵⁶ *Id.* col. 1 l. 15–18.

⁵⁷ *See e.g., id.* col. 6 l. 25–37 ("For instance, [the police] communication device may be configured to wirelessly receive data directly from surveillance camera, roadside sensor, and/or vehicle."). *Cf.* Trevor Paglen, *Invisible Images (Your Pictures Are Looking at You)*, NEW INQUIRY (Dec. 8, 2016), <https://thenewinquiry.com/invisible-images-your-pictures-are-looking-at-you> ("The overwhelming majority of images are now made by machines for other machines, with humans rarely in the loop. The advent of machine-to-machine seeing has been barely noticed at large, and poorly understood by those . . . who've begun to notice the tectonic shift invisibly taking place before our very eyes.").

⁵⁸ *See id.* col. 10 (discussing how the autonomous police vehicle could wirelessly communicate with other vehicles).

⁵⁹ *See* '242 Patent col. 10 l. 47–51.

⁶⁰ *See id.* col. 1 l. 56–59. ("Routine police tasks, such as issuing tickets for speeding or failure to stop at a stop sign, can be automated so that human police officers can perform tasks that cannot be automated.").

⁶¹ WAYMO, WAYMO FULLY SELF-DRIVING CHRYSLER PACIFICA: EMERGENCY RESPONSE GUIDE AND LAW ENFORCEMENT INTERACTION PROTOCOL 11 (2018), <https://storage.googleapis.com/sdc-prod/v1/safety-report/waymo-emergency-response-guide-law%20enforcement-interaction-plan.pdf>.

⁶² *Id.*

chases—more than 13,000 in thirty-eight years—would decrease dramatically if technology rendered high speed chases nearly impossible.⁶³ Safety to bystanders could also be increased if police could conduct automated seizures of cars used in ramming attacks, instead of shooting at them.⁶⁴

B. Automated Enforcement: Mass Tickets and Mass Stops

Autonomous, programmable, and connected cars will likely reduce some kinds of enforcement that are now common. Cars programmed to stay within legal limits will not speed, run red lights, or fail to signal before turning—among the most common reason for traffic stops—and thus will not be subjected to police attention for those violations.⁶⁵ But this does not necessarily mean that there will be less policing activity. People will likely be able to override the controls of an autonomous and connected car,⁶⁶ and may violate traffic laws as a consequence. And autonomous cars will still be

⁶³ The new organization FairWarning analyzed NHTSA records and counted at least 13,100 people who had been killed in police pursuits from 1979 to 2017. This number includes more than 2700 innocent bystanders. In 2017, African Americans accounted for thirty-six percent of the deaths of people whose race was recorded. See Thomas Frank, *Deaths Mount from High-Speed Police Pursuits, Despite Calls to Restrict Them*, FAIRWARNING (Feb. 21, 2019), <https://www.fairwarning.org/2019/02/police-pursuits-deaths>.

⁶⁴ After several decades in which many major urban police departments have barred or restricted their officers from shooting at moving cars, some are reconsidering these policies in order to stop the use of cars in terrorist attacks. See Peter Hermann, *Police in D.C., New York Revise Shooting Policies in Response to Vehicle Ramming Attacks*, WASH. POST (May 1, 2018), https://www.washingtonpost.com/local/public-safety/police-in-dc-new-york-revise-shooting-policies-in-response-to-vehicle-ramming-attacks/2018/05/01/9561d1ee-418b-11e8-ad8f-27a8c409298b_story.html?utm_term=.9ee859d07d71 (responding to concerns about the use of cars as weapons in Toronto, Nice, Berlin, and Manhattan). Much of the shift on the part of many—though not all police departments—on permitting their officers to shoot at moving cars can be traced to the NYPD’s ban on shooting at moving vehicles in 1972 following the fatal shooting of an eleven-year-old African-American boy. See, e.g., Jon Swaine et al., *Moving Targets*, GUARDIAN (Sept. 1, 2015), <https://www.theguardian.com/us-news/2015/sep/01/moving-targets-police-shootings-vehicles-the-counted> (describing NYPD adoption of TOP-237, which prohibits shooting at moving vehicles, among other restrictions).

⁶⁵ The president of the autonomous vehicle company Cruise described their product this way: “In the near future, you’ll see these cars on the road, and they’ll look like regular cars, but they’re actually some of the most technically advanced robots on the planet. They don’t need drivers, and there might not be anyone inside at all.” Kyle Vogt, *How We Built the First Real Self-Driving Car (Really)*, MEDIUM (Sept. 11, 2017), <https://medium.com/kylevogt/how-we-built-the-first-real-self-driving-car-really-bd17b0dbda55>. He also observed, “[t]hey’ve been designed to emulate human driving behavior but with the human mistakes omitted. They don’t drink and drive, they don’t text while driving, and they don’t get tired.” *Id.*

⁶⁶ This might occur because of human modification, or because the law requires it. See, e.g., Richard Blumenthal (@SenBlumenthal), TWITTER (Apr. 3, 2018, 12:51 PM), <https://twitter.com/SenBlumenthal/status/981257797269688321> (calling for manual override of an autonomous vehicle for safety purposes as a “top priority”).

places for criminal activity, and perhaps new forms of criminal activity.⁶⁷

For these reasons, the police will still need to conduct car stops, but their patterns of enforcement might look very different than they do today. Car stops are now subject to a high degree of police officer discretion.⁶⁸ Not every driver breaking the law is subject to police attention. When police do conduct car stops, those enforcement patterns are not evenly distributed among the population. And as multiple studies, lawsuits, and even the federal government's own recordkeeping attests, non-white drivers tend to be stopped in disproportionate numbers.⁶⁹

The police today lack the ability to conduct “total enforcement”;⁷⁰ they lack the means for perfect surveillance⁷¹ and the capacity for enough human officers to enforce the law in every possible instance.⁷² In addition to technological and staffing limitations, police departments fall short of total enforcement because of other factors like local expectations about enforcement and budgetary considerations.⁷³

But autonomous and connected vehicles would transcend many of these limitations. The ability to 1) detect violations automatically; 2) stop cars remotely; and 3) issue traffic-related enforcement decisions remotely would represent a vast expansion of police capabilities. Why would this increase police power? The “natural” brakes on law enforcement today—especially the reliance on human resources—would be lifted.⁷⁴ In theory, then, the police could begin to enforce traffic laws remotely, cheaply, and at a much

⁶⁷ See *infra* Section II.C.

⁶⁸ See *supra* Part I.

⁶⁹ A recent data analysis by the *Los Angeles Times* is illustrative. In 2015, the Los Angeles Police Department doubled the size of its Metropolitan Division and created special units dedicated to crime “hot spots.” See Cindy Chang & Ben Poston, ‘Stop-and-Frisk in a Car’: Elite LAPD Unit Disproportionately Stopped Black Drivers, *Data Show*, L.A. TIMES (Jan. 24, 2019), <https://www.latimes.com/local/lanow/la-me-lapd-traffic-stops-20190124-story.html>. Since its expansion, the Unit—which employs pretextual stops to look for guns or drugs—stopped African-American drivers thirteen times more often than white drivers. *Id.*

⁷⁰ See Joseph Goldstein, *Police Discretion Not to Invoke the Criminal Process: Low-Visibility Decisions in the Administration of Justice*, 69 YALE L.J. 543, 554–62 (1960) (explaining the difference between total, full, and actual enforcement).

⁷¹ Cf. Richard M. Re, *Imagining Perfect Surveillance*, 64 U.C.L.A. L. REV. DISCOURSE 264, 267 (2016) (“What would the world look like if three emerging features of governmental surveillance—data aggregation, individualized data streams, and digital automation—were realized to a perfect degree? [We would see] a technology capable of efficiently, unerringly, and immediately reporting the perpetrator of virtually every crime.”).

⁷² See, e.g., Goldstein, *supra* note 70, at 561 (noting that limitations in police personnel, as well as time and investigative devices, prevent police from even achieving full enforcement).

⁷³ Elizabeth E. Joh, *Discretionless Policing: Technology and the Fourth Amendment*, 95 CALIF. L. REV. 199, 206–07 (2007) (describing limitations on enforcement).

⁷⁴ Cf. *United States v. Jones*, 565 U.S. 400, 429 (2012) (Alito, J., concurring) (“In the pre-computer age, the greatest protections of privacy were neither constitutional nor statutory, but practical. Traditional surveillance for any extended period of time was difficult and costly and therefore rarely undertaken.”).

larger scale.⁷⁵

C. Crimes Facilitated by Autonomous Cars

How will autonomous and connected cars change cities and our habits? Fewer human drivers will mean fewer voluntary traffic infractions. Less human decisionmaking will mean fewer avoidable accidents.⁷⁶ Parking spaces may become less necessary, as might car ownership itself, if autonomous and connected cars encourage the growth of the existing rideshare economy. Autonomous cars will thus increase access to places for non-drivers, especially the disabled and the elderly.⁷⁷ These new forms of driving will also promote innovations in commuting and goods delivery. Freed from driving, people may come to think of autonomous cars as places to work, have sex, and watch movies.⁷⁸

But driverless cars will present novel opportunities for criminal activity as well. Criminal activity usually associated with homes and motels—like illicit drug sales and prostitution—could readily move to autonomous

⁷⁵ Enforcement incentives exist because traffic offenses can be an important source of local revenue. See, e.g., Jamie Lovegrove, *As Traffic Ticket Revenue Falls, SC Police Seek Stable Funding for Training Academy*, POST & COURIER (Jan. 27, 2019), https://www.postandcourier.com/politics/as-traffic-ticket-revenue-falls-sc-police-seek-stable-funding/article_c4d79068-19d9-11e9-a9cd-47ae8fc5b8e3.html (observing that decline in revenue from traffic tickets has hurt police training academy, which is primarily funded from traffic fines and fees). Local governments that have relied upon traffic tickets as an important source of revenue will have to turn elsewhere. See Gareth Cook, *Policing with No Tickets*, N.Y. TIMES MAG. (Nov. 8, 2017), <https://www.nytimes.com/interactive/2017/11/08/magazine/tech-design-autonomous-future-cars-100-percent-augmented-reality-policing.html> (discussing the implications of self-driving cars for police tickets and other police activity).

⁷⁶ The decrease in fatal road accidents will also lead to fewer organs available for organ donation. See, e.g., Ian Adams & Anne Hobson, *Self-Driving Cars Will Make Organ Shortages Even Worse*, SLATE (Dec. 30, 2016, 5:56 AM), <https://slate.com/technology/2016/12/self-driving-cars-will-exacerbate-organ-shortages.html> (“Even if self-driving cars only realize a fraction of their projected safety benefits, a decline in the number of available organs could begin as soon as the first wave of autonomous and semiautonomous vehicles hits the road—threatening to compound our nation’s already serious shortages [for donatable organs].”).

⁷⁷ See Paul Stenquist, *In Self-Driving Cars, a Potential Lifeline for the Disabled*, N.Y. TIMES (Nov. 7, 2014), <https://www.nytimes.com/2014/11/09/automobiles/in-self-driving-cars-a-potential-lifeline-for-the-disabled.html> (“The self-driving car, embraced as a stress-reducing convenience for harried drivers and a potential advance in road safety, could also prove to be a life-changing breakthrough for many people with disabilities, granting them a new measure of independence.”); see also DRIVING CHANGE, *supra* note 6, at 31–32 (noting that autonomous vehicles could foster “social inclusion” for “those who have never been able to drive and to those who are no longer able to drive”).

⁷⁸ These answers come from a (non-scientific) survey conducted by the Auto Insurance Center. See *What Would You Do in a Self-Driving Car?*, AUTO INS. CTR., <https://www.autoinsurancecenter.com/what-would-you-do-in-a-self-driving-car.htm> (last visited June 4, 2019) (noting that other popular responses included reading a book, speaking with friends and family on the phone, and eating).

vehicles.⁷⁹ Grouped together, these autonomous vehicles might form a “Red Light District ‘on the move.’”⁸⁰ More broadly, autonomous vehicles may become substitutes for homes themselves, particularly in dense cities where residential housing is scarce and expensive.⁸¹ Living in cars may become more common and less stigmatized if autonomous cars were to provide cheap, comfortable, and safe living quarters on the move. That would mean that many of the policing activities that take place at and around traditional homes would move to autonomous vehicles, at the expense of privacy expectations usually enjoyed when those activities are conducted in traditional homes.⁸²

Even without people inside of them, autonomous vehicles may become attractive modes of contraband delivery. Like autonomous drones, such vehicles might increase participation in black market activity, especially if the responsible parties are difficult to identify and trace. Even if autonomous cars stream and collect data, we should expect that those engaged in criminal activity will engage in countermeasures to thwart identification and apprehension, just as they do today.

Finally, autonomous cars may increase opportunities for mass terrorist attacks. An autonomous car, or perhaps even a caravan of cars laden with explosives, could be programmed to drive into public spaces pedestrians frequent. Such scenarios would provide the most compelling arguments to provide the police with the means to remotely assume control of autonomous cars.

III

POLICY IMPLICATIONS FOR AUTOMATED SEIZURES

Automated car seizures will be different than the stops we see today.

⁷⁹ See, e.g., Jamie Lauren Keiles, *Your Autonomous Dealer*, N.Y. TIMES MAG. (Nov. 8, 2017), <https://www.nytimes.com/interactive/2017/11/08/magazine/tech-design-autonomous-future-cars-100-percent-augmented-reality-policing.html> (“With no human body attached to the cargo, suppliers will seek to move harder drugs, in bigger quantities, potentially unleashing a new set of problems.”). Even these distinctions may become blurred. One proposed design envisions an autonomous vehicle that picks up travelers, doubling as a hotel suite, and takes them to their destination. Once there, the “Autonomous Travel Suite” would dock into a stationary “parent suite” that looks like a traditional hotel. See Megan Barber, *Self-Driving Car Is Actually a Tiny Hotel Suite on Wheels*, CURBED (Aug. 20, 2018, 2:45 PM), <https://www.curbed.com/2018/8/20/17760422/self-driving-car-autonomous-travel-hotel-room> (describing the Autonomous Travel Suite design developed by Aprilli Design Studio).

⁸⁰ See Scott A. Cohen & Debbie Hopkins, *Autonomous Vehicles and the Future of Urban Tourism*, 74 ANNALS TOURISM RES. 33, 40 (2019).

⁸¹ See, e.g., Daniel Horowitz, *Self-Driving Homes Could Be the Future of Affordable Housing*, ARCHITECTS NEWSPAPER (Sept. 12, 2018), <https://archpaper.com/2018/09/self-driving-homes> (discussing how self-driving homes could combine housing and transportation, thus decreasing living expenses).

⁸² See *infra* Part III.

The previous Part discussed some of the possible changes we will see when the police want to stop autonomous and connected vehicles. This Part discusses three law and policy issues that arise from those changes. First, automated stops should be discussed as a civil rights issue since conventional car stops are so often fraught with questions about racial discrimination and unnecessary police uses of force. Second, the ability of the police to conduct mass stops for every possible violation raises the question of whether such stops satisfy the Fourth Amendment's requirement of reasonableness. Third, we should recognize autonomous cars less as vehicles than as mobile computers connected to the internet, and to other cars, and to the infrastructure: A framework that renders them vulnerable to malicious use that may be hard to distinguish from legitimate police activity.

A. *Automated Enforcement's End to Pretext*

The disproportionate racial impacts of pretextual policing are well known. And there have been many highly publicized instances where such traffic stops have gone badly wrong. These racially disparate impacts mirror those that can be found throughout police-civilian encounters in the United States. Technological change may have a significant impact here. The introduction of autonomous cars will not only change the powers of the police; it will also alter the public's experience of policing. In other words, the proliferation of autonomous cars should also be understood as a civil rights issue.⁸³

Let's start with the observation that African Americans have disproportionately high contacts with the police.⁸⁴ Whether those relatively high numbers of contacts stem from police bias, entrenched social and structural problems, or both, the result is the same. Larger numbers of police encounters mean greater risks of police violence,⁸⁵ whether justified or unjustified. That police violence can be deadly. The police fatally shoot

⁸³ See Cook, *supra* note 75 (discussing how autonomous cars would make it more difficult for police to conduct pretextual traffic stops).

⁸⁴ For instance, 27.2% of the estimated 8,162,849 arrests made in 2017 were of African Americans. *2017 Crime in the United States: Table 43: Arrests by Race and Ethnicity, 2017*, FBI: UCR, <https://ucr.fbi.gov/crime-in-the-u.s/2017/crime-in-the-u.s.-2017/tables/table-43> (last visited June 9, 2019). African Americans represent about 13.4% of the U.S. population. *U.S. Census Bureau QuickFacts: United States*, U.S. CENSUS BUREAU (July 1, 2018), <https://www.census.gov/quickfacts/fact/table/US/PST045218>.

⁸⁵ See Sendhil Mullainathan, *Police Killings of Blacks: Here Is What the Data Say*, N.Y. TIMES (Oct. 16, 2015), <https://www.nytimes.com/2015/10/18/upshot/police-killings-of-blacks-what-the-data-says.html> ("The officer might be poorly trained, might act with malice or simply make a mistake, and civilians might do something that is perceived as a threat. . . . [H]aving more encounters with police officers, even with officers entirely free of racial bias, can create a greater risk of a fatal shooting.").

hundreds of civilians every year.⁸⁶ The *Washington Post*'s police shooting database, for example, reports that 992 people were shot and killed by the police in 2018.⁸⁷

The police use deadly force in traffic stops for many reasons. Police may resort to deadly force to counter actual violence by civilians. Or, police violence may happen as the result of *perceived*—even mistaken—threats by civilians. And these police perceptions can be influenced by factors as disparate as conscious or unconscious bias, officer training, officer seniority, and even fatigue.

Whether pulling a vehicle over to the side of the road to remotely issue a ticket or seizing control over a car to “drive” it to the police department, remote seizures have the potential to reduce greatly the frequency of violence during police stops. Numerous police shootings have occurred where sudden and uncertain movements by car occupants are misperceived by police officers as attempts to harm them.⁸⁸ A remote police seizure decreases the chances of deadly violence during a car stop by removing the human police officer.⁸⁹ Of course, there will still be face-to-face police-civilian encounters

⁸⁶ Civilians also fatally shoot police officers, but the numbers are much lower. *See, e.g., Law Enforcement Officers Killed and Assaulted: FBI Releases Police Line-of-Duty Death Statistics for 2017*, FBI (May 10, 2018), <https://www.fbi.gov/news/stories/2017-leoka-line-of-duty-death-statistics-released-051018> (reporting forty-six officers “feloniously killed” in 2017, with forty-two of those officers having been killed with firearms).

⁸⁷ *Fatal Force: 992 People Have Been Shot and Killed by Police in 2018*, WASH. POST, https://www.washingtonpost.com/graphics/2018/national/police-shootings-2018/?utm_term=.f74f325831b6 (last updated Mar. 31, 2019). The FBI and CDC also collect data on shootings, but that information is widely seen as incomplete. *See id.* (“The FBI and the Centers for Disease Control and Prevention log fatal shootings by police, but officials acknowledge that their data is incomplete. Since 2015, The Post has documented more than twice as many fatal shootings by police as recorded on average annually.”).

⁸⁸ *See, e.g., Oliver Laughland & Ryan Felton, University Police Officer Charged with Murder for Shooting of Samuel DuBose*, GUARDIAN (July 30, 2015, 12:25 AM), <https://www.theguardian.com/us-news/2015/jul/29/cincinnati-police-shooting-samuel-dubose> (describing the fatal shooting of an unarmed black driver during a traffic stop during an alleged “altercation”); Rachel Southmayd & Andrew Dys, *York County Deputy Who Shot Unarmed Elderly Driver Won't Face Charges*, CHARLOTTE OBSERVER (Aug. 14, 2014, 9:35 PM), <https://www.charlotteobserver.com/news/local/crime/article9151289.html> (describing how police mistook a walking cane for a weapon during a traffic stop).

⁸⁹ If autonomous cars were to follow the traffic laws and abide by the vehicle codes, we should also expect another effect: a significant reduction in the incursion of fines and fees that often have racially disproportionate effects. Fines and fees for violations of traffic laws (and other minor offenses) can lead to endless cycles resulting in more fines, the issuance of arrest warrants, jail time, and lost wages and jobs. In this way too autonomous cars might (eventually) promise to address another civil rights issue. For instance, according to the 2015 Department of Justice’s report on the Ferguson, Missouri police department, “Ferguson’s law enforcement practices are shaped by the City’s focus on revenue rather than by public safety needs. . . . Further, Ferguson’s police and municipal court practices both reflect and exacerbate existing racial bias, including racial stereotypes.” CIVIL RIGHTS DIV., U.S. DEP’T OF JUSTICE, INVESTIGATION OF THE FERGUSON POLICE DEPARTMENT 2 (2015), https://www.justice.gov/sites/default/files/opa/press-releases/attachments/2015/03/04/ferguson_police_department_report_1.pdf. *See generally* ACLU,

when autonomous cars are commonplace. The police may need to conduct further investigation of the occupants within the car. And the use of force, even deadly force, by the police will not disappear. But reducing the chances for mistaken threats and unnecessary violence through remote seizures will certainly have an impact.

To be sure, even if autonomous cars reduce police violence, they will raise other questions about individual liberties. Autonomous cars will record, store, and transmit continuous streams of data that will be valuable to the police and private actors. Cars may be designed to alert police directly if suspected criminal activity within the car has been detected.⁹⁰ Future cases will have to resolve whether or not information obtained by the police from cars will require a warrant, and whether cars may permissibly “snitch” on their occupants.

And counterintuitively, autonomous vehicles may actually exacerbate uneven enforcement on the roads in the short-term.⁹¹ Even when autonomous cars become more widely available, they will be widely adopted by high- and middle-income families first. It will take longer for autonomous vehicles to become available for purchase by low-income families. This means that in the short term we will see a mixed-mode of transportation with high numbers of autonomous and conventional cars.⁹² And the lower-income drivers, behind the wheel of twentieth century technology, will be subjected to traditional policing.

Ultimately, though, autonomous cars provide a means for us to think about a future of law enforcement with a greatly reduced role for subjective police discretion. While there may be other costs to consider—including the desirability of mass enforcement—the end of highly discretionary policing on the roads may be an attractive possibility.⁹³

IN FOR A PENNY: THE RISE OF AMERICA’S NEW DEBTORS’ PRISONS (2010), https://www.aclu.org/sites/default/files/field_document/InForAPenny_web.pdf (criticizing heavy use of legal and financial obligation debts to imprison the poor for failing to pay debts related to minor offenses like traffic tickets, focusing on five states); ALICIA BANNON ET AL., BRENNAN CTR. FOR JUSTICE, CRIMINAL JUSTICE DEBT: A BARRIER TO REENTRY (2010), <https://www.brennancenter.org/sites/default/files/legacy/Fees%20and%20Fines%20FINAL.pdf> (documenting laws and practices in fifteen states that pile on fines and fees to minor offenses that can lead to endless cycles of debt and imprisonment).

⁹⁰ The Chinese company Huawei recently submitted a patent for an autonomous car that could detect whether a person behind the wheel was drunk and directly contact the police. Jack Healy, *Huawei Driverless Cars Will Call Police on Drunk or Sleepy Drivers*, CAR KEYS (Jan. 25, 2019), <https://www.carkeys.co.uk/news/huawei-driverless-cars-will-call-police-on-drunk-or-sleepy-drivers>. The assumption is that being drunk under these conditions would still be an offense.

⁹¹ Thanks to Megan Thorne Stevenson for this point.

⁹² See DRIVING CHANGE, *supra* note 6, at 28 (“Todd Litman, Executive Director of the Victoria Transport Policy Institute explained that it will likely be in the 2040s or 2050s when middle-income families can afford [autonomous vehicles] that can operate in all conditions, and even longer before low-income families can afford such vehicles.”).

⁹³ See, e.g., Joh, *supra* note 73, at 221 (observing that automated enforcement programs, made

B. *New Limits on Reasonableness*

If the police can stop one car for a speeding violation, what if they stop every single car suspected of a traffic violation? The only limitation on this enforcement pattern thus far has been technological, not legal.⁹⁴ Automated detection and stops would simply repeat in the dozens or hundreds or thousands what the police are already allowed to do singly.

Car stops today, even when brief, are burdens on drivers, but these burdens are not distributed evenly. The police choose to stop only a limited number of the cars they could stop not because of the Fourth Amendment, but because of practical limitations. No police department has enough officers to enforce the law in every possible instance. Automated detections of traffic law violations and remote seizures by police could expand considerably the enforcement reach of the police. In such a world, the police could in fact detect and stop every car in possible violation of the law.

Little in current Fourth Amendment law would seem to curb the possibilities of mass enforcement. The police may now stop a car for any minor traffic offense, even if the enforcement of that offense isn't the actual reason for the stop.⁹⁵ In other words, so long as the necessary probable cause to stop a car exists, that objective basis satisfies the Fourth Amendment's requirements of reasonableness.⁹⁶

Indeed, the Fourth Amendment even permits programs of mass seizures. Under the "special needs" exception to the Fourth Amendment, the police may conduct checkpoints that temporarily seize all drivers passing through, even if the police lack individualized suspicion for any particular vehicle.⁹⁷ If innocent persons may be lawfully stopped under the auspices of a lawful checkpoint, then presumably all cars that are actually in violation of some law could be stopped by the police without violating the Fourth

possible by vehicle-to-vehicle and vehicle-to-infrastructure communication, "could eliminate or drastically reduce the number of police-conducted traffic stops").

⁹⁴ See *Whren v. United States*, 517 U.S. 806, 810 (1996) (stating that a traffic stop "is reasonable [if] the police have probable cause to believe that a traffic violation has occurred"); see also *supra* notes 70–75 and accompanying text (discussing the various practical and technological limitations on police enforcement, as well as the potential impact of autonomous vehicles on those limitations).

⁹⁵ See *Whren*, 517 U.S. at 813 ("We [reject] any argument that the constitutional reasonableness of traffic stops depends on the actual motivations of the individual officers involved.").

⁹⁶ See, e.g., *id.* at 819 ("For the run-of-the-mine case, . . . there is no realistic alternative to the traditional common-law rule that probable cause justifies a search and seizure.").

⁹⁷ See, e.g., *Illinois v. Lidster*, 540 U.S. 419, 421 (2004) (upholding car information checkpoint that stopped every car passing through without individualized suspicion as reasonable); *Mich. Dep't of State Police v. Sitz*, 496 U.S. 444, 447 (1990) (upholding sobriety checkpoint that stopped every car passing through without individualized suspicion as reasonable); cf. *United States v. Paetsch*, 782 F.3d 1162, 1176 (10th Cir. 2015) (upholding simultaneous stop of twenty cars at an intersection to find escaping suspect as reasonable).

Amendment.

That analysis could and perhaps should change. The inability of the Fourth Amendment to curb the expanded power of the police through automated car stops calls for a rethinking of “reasonableness” when the time comes. A single car may be seized if there is probable cause to believe that the driver has broken the law. Many “run-of-the-mine” cases will also satisfy that standard.⁹⁸ But will stopping *every* possible car that may be breaking the law also satisfy the “traditional common-law rule that probable cause justifies a search and seizure”?⁹⁹ In other words, do and should ordinary probable cause standards support mass automated seizures?

These automated seizures will alter the balance between the intrusions into our Fourth Amendment interests and the government’s law enforcement needs. In recent years, the Supreme Court has shown a willingness to craft new rules when technology has altered that balance in other contexts.¹⁰⁰ After *Riley v. California*, the police may no longer premise warrantless searches of cellphones based on the search incident to arrest exception.¹⁰¹ After *Carpenter v. United States*, the police may no longer rely upon the third party exception to the Fourth Amendment to obtain historical cell site location information.¹⁰² In these cases, the Court has recognized that new technologies require new Fourth Amendment rules. The arrival of mass car stops may provide another similar opportunity.

C. *Malicious or Lawful Seizures?*

The ability to seize and maneuver cars remotely won’t be within the exclusive powers of the police and car manufacturers. The future of connected and autonomous vehicles will likely encounter what “smart” devices already experience today: software-driven malfunctions, and more importantly, vulnerabilities that lead to remote interference by third parties.¹⁰³ Researchers have already begun to test possible software

⁹⁸ *Whren*, 517 U.S. at 819.

⁹⁹ *See id.*

¹⁰⁰ Orin Kerr has described this recalibration as the equilibrium adjustment theory of the Fourth Amendment. *See* Orin S. Kerr, *An Equilibrium-Adjustment Theory of the Fourth Amendment*, 125 HARV. L. REV. 476, 480 (2011) (“Equilibrium-adjustment is a judicial response to changing technology and social practice. When new tools and new practices threaten to expand or contract police power in a significant way, courts adjust the level of Fourth Amendment protection to try to restore the prior equilibrium.”).

¹⁰¹ 573 U.S. 373, 393 (2014) (“Modern cell phones, as a category, implicate privacy concerns far beyond those implicated by the search of a cigarette pack, a wallet, or a purse.”).

¹⁰² 138 S. Ct. 2206, 2218 (2018) (“[H]e has effectively been tailed every moment of every day for five years, and the police may—in the Government’s view—call upon the results of that surveillance without regard to . . . the Fourth Amendment. Only the few without cell phones could escape this tireless and absolute surveillance.”).

¹⁰³ *See, e.g.,* Jesus Diaz, *Alexa Can Be Hacked—by Chirping Birds*, FAST COMPANY (Sept. 28, 2018), <https://www.fastcompany.com/90240975/alexa-can-be-hacked-by-chirping-birds>

vulnerabilities in self-driving cars that will subject them to unexpected and sometimes dangerous remote interference. Exploiting software vulnerabilities, security researchers have shown that they can remotely activate a moving car's brakes¹⁰⁴ and cut a car's transmission.¹⁰⁵

Just as with personal digital assistants like Alexa or Siri, autonomous cars rely upon artificial intelligence. In this way, autonomous cars are less "driverless cars" than they are robots equipped with artificial intelligence.¹⁰⁶ And any artificial intelligence is a dual-use technology capable of helpful or malicious ends.¹⁰⁷ With transportation, (artificially intelligent) autonomous cars will introduce new modes of mobility, but they can also be subject to remote interference that poses harm to a car's occupants or to innocent third parties. (These instances of hacking will themselves, of course, be crimes.)

But in the context of policing, it may not always be clear that the remote seizure of a car is a legitimate police enforcement action or a spoof attempt to disguise a third party's malicious motive. These third parties might be those seeking ransom, pranksters, or even corrupt government officials.¹⁰⁸ Just as people have shown themselves to be duped online by seemingly legitimate contacts by the police, the I.R.S., and immigration authorities,¹⁰⁹

(describing German researchers' success in hiding inaudible commands in audio files sent to digital personal assistants); Lily Hay Newman, *Medical Devices Are the Next Security Nightmare*, WIRED (Mar. 2, 2017, 10:30 AM), <https://www.wired.com/2017/03/medical-devices-next-security-nightmare> (describing security vulnerabilities of pacemakers, insulin pumps, and other internet-connected medical devices); Amy B. Wang, *'I'm In Your Baby's Room': A Hacker Took Over a Baby Monitor and Broadcast Threats, Parents Say*, WASH. POST (Dec. 20, 2018), <https://www.washingtonpost.com/technology/2018/12/20/nest-cam-baby-monitor-hacked-kidnap-threat-came-device-parents-say> (describing the hacking of a WiFi-enabled baby monitor).

¹⁰⁴ Andy Greenberg, *Tesla Responds to Chinese Hack with a Major Security Upgrade*, WIRED (Sept. 27, 2016, 7:00 AM), <https://www.wired.com/2016/09/tesla-responds-chinese-hack-major-security-upgrade> (discussing both the potential hack and Tesla's response).

¹⁰⁵ Andy Greenberg, *Hackers Remotely Kill a Jeep on the Highway—With Me in It*, WIRED (July 21, 2015, 6:00 AM), <https://www.wired.com/2015/07/hackers-remotely-kill-jeep-highway> (discussing how the researcher-hackers were also able to control the car's climate control system, radio, and windshield wipers); see also *Motor Vehicles Increasingly Vulnerable to Remote Exploits*, FBI (Mar. 17, 2016), <https://www.ic3.gov/media/2016/160317.aspx> (noting that researchers have been able to accomplish engine shutdown, brake disabling, steering control, and manipulation of the door locks, turn signals, tachometer, radio, HVAC, and GPS).

¹⁰⁶ See MILES BRUNDAGE ET AL., *THE MALICIOUS USE OF ARTIFICIAL INTELLIGENCE: FORECASTING, PREVENTION, AND MITIGATION* 39 (2018) ("Driverless cars are robots, and they also are increasingly being used in uncontrolled environments (that is, outside of test facilities), though large-scale deployment of fully autonomous driverless cars awaits the resolution of technical and policy changes.").

¹⁰⁷ See *id.* at 16 ("AI systems and the knowledge of how to design them can be put toward both civilian and military uses, and more broadly, toward beneficial and harmful ends.").

¹⁰⁸ See HOLLYWOOD ET AL., *supra* note 11, at 6 (expressing concerns not just about hackers but also about "corrupt government officials").

¹⁰⁹ Cf. Sara Mervosh, *ICE ran a Fake University in Michigan to Catch Immigration Fraud*, N.Y. TIMES (Jan. 31, 2019), <https://www.nytimes.com/2019/01/31/us/farmington-university-arrests-ice.html> (describing a fake university run by Homeland Security undercover agents to

it may similarly be difficult at some point in the future to distinguish a legitimate remote seizure from an illegitimate one.

The security vulnerabilities of autonomous cars are, in the first instance, a problem for computer scientists. But legislators too will have to address a capability that both police and malicious third parties might possess.¹¹⁰ In the absence of regulation mandating strong security measures and regulatory mandatory updates for autonomous car manufacturers, law enforcement agencies should consider delaying requests for the ability to stop cars remotely.

CONCLUSION

Any analysis of law and technology in the future will likely be imperfect. With autonomous cars, there will be issues that we will not have foreseen, and behaviors on the part of law-abiding individuals, those engaged in criminal activity, and the police that we cannot anticipate. What we can predict with some confidence, however, is that the police and the public will interact *differently* when there is little human involvement in driving. Some car seizures will end, others will be conducted by machine, and still others will increase in number because of new criminal opportunities. These changes promise to increase safety for both the police and civilians alike. Indeed, automated seizures may be an unrecognized civil rights solution. And because so much of the Fourth Amendment is premised upon human drivers and human police officers, that means that a future of automated car stops will pose novel and difficult questions of law and policy that we should begin to address now.

identify immigration fraud).

¹¹⁰ In 2017, Senator Edward Markey introduced the SPY Car Act of 2017, which would have required that “[a]ll entry points to the electronic systems of each motor vehicle manufactured for sale in the United States shall be equipped with reasonable measures to protect against hacking attacks.” SPY Car Act of 2017, S. 680, 115th Cong. § 30129(a)(2)(A) (2017).