REGULATING POLICE ROBOTS

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Introduction

Police robots are no longer the stuff of science fiction. Every day, police robots are responding to emergency calls, surveying accident sites, and conducting patrols. Robots are being used to locate missing persons and reach barricaded suspects. They are collecting evidence, identifying scofflaws, and, in rare instances, deploying force. Vendors are developing these tools, and agencies are adopting them, at an astonishing pace.

Robots promise to improve policing in various ways, but they also carry real risks. The widespread adoption of highly mobile robots equipped with cameras, sensors, and analytics will hasten the proliferation of police surveillance, with attendant risks to individual privacy. Algorithmic bias and disparities in where robots are deployed may fuel inequality in a field already afflicted deeply by systemic problems of racial injustice. The advent of force-equipped robots raises profound ethical questions and will require a systematic rethinking around use-of-force rules.

As these issues come to the fore, sound policymaking is needed — and urgently.

In this paper, we seek to chart a course forward for the regulation of police robots. We begin in Part I by surveying the landscape of police robots. We first focus on how police robots are designed — their form, capabilities, and the extent to which they can perform tasks without human intervention. We then turn our attention to how these robots are used, focusing on four core policing functions: first response, use of force, enforcement of laws, and proactive policing.

Part II evaluates the potential benefits and risks of police robots. Police robots have distinct advantages — they can be controlled remotely, keeping officers out of harm's way, for example. Robots can maneuver to areas that would be difficult for humans to reach. But the risks of police robots are real as well. We survey these risks, ranging from incursions upon privacy to the possibility of exacerbating disparities in whom the law is enforced against.

Part III turns to regulation. After surveying the current (anemic) regulatory landscape, we turn to an intriguing possibility — that current laws regulating officer conduct could be extended to police robots. We then sketch out a broader regulatory framework, proposing a series of robust safeguards which would do much to mitigate the risks of police robots. We conclude with a discussion of remedies, considering the unique challenges which police robots will pose for the courts.

I. Surveying Police Robots

We begin with a survey of the vast and varied market for police robots. In Section I.A, we consider the way that police robots are designed. Police robots take a number of different forms, from aerial drones to submersible robots which swim underwater. They also come equipped with a range of features and capabilities, including a variety of cameras and sensors, and analytics such as facial

recognition. And, importantly, robots vary in the extent to which they can accomplish tasks without human intervention.

Section I.B then turns from how police robots are designed to how they are used. Just as is the case with human officers, the potential functions of police robots are manifold. We examine how police use robots in relation to four paradigmatic policing functions: first response, use of force, law enforcement, and proactive policing.[1]

We note that defining what a police robot is, is no small feat. The definition of "robot" itself is much contested, with some scholars arguing that the "overlap between people, algorithms, computers, robots, and ordinary machines is sufficiently great that there is no good legal definition of a robot."[2] Still, as a general matter robots might be conceived of as "mechanical objects that take the world in, process what they sense, and in turn act upon the world."[3] This is known as the "sense-think-act" paradigm.[4] This capacious definition of robots encompasses devices as varied as teleoperated drones, surgical systems, and self-driving cars.[5] We adopt this definition of robots in this paper so as to capture a broad range of tools, ranging from ground patrol robots to aerial drones.

A. The Design of Police Robots

We begin by surveying how police robots are designed, focusing on three key qualities. First, we discuss the various forms which police robots take, from robots that can be thrown through the air to four-legged robot dogs. Second, we turn to the various capabilities police robots have. Some robots have maneuverable arms which can pick up objects, for example, while others have analytics such as facial recognition. Finally, we consider the role of autonomy — that is, the extent to which police robots can pursue a goal without human intervention.

1. Form

Police robots take a variety of forms, perhaps most easily described by the way they move about. Some robots commonly used by police, such as explosive ordinance disposal ("EOD") robots, maneuver through the use of wheels or treads. Unmanned aerial vehicles, or drones, also have been widely adopted by agencies. And in recent years, four-legged quadruped robots resembling dogs, such as Boston Dynamics's "Spot" robot, have been adopted by some of the largest policing agencies in the country, including the New York City Police Department and the Los Angeles Police Department.

This is just the tip of the iceberg — new forms of robots constantly are emerging. Vendors have developed robots which can be thrown and submersible robots capable of navigating underwater. Swarm robotics involves the use of multiple robots, or "swarms," which typically follow simple

[1] Barry Friedman, *Disaggregating the Policing Function*, 169 U. PENN. L. REV. 925 (2021).
[2] Bryan Casey & Mark A. Lemley, *You Might Be a Robot*, 105 CORNELL L. REV. 287 (2020).
[3] Ryan Calo, *Robotics and the Lessons of Cyberlaw,* 108 CALIF. L. REV. 513, 529 (2015).
[4] *Id.*
[5] *Id.*; Ric Simmons, *Terry in the Age of Automated Police Officers,* 50 SETON HALL L. REV. 909, 913 (2020).

rules but through their interaction accomplish complex tasks — not unlike swarms of bees or fish.[6] Some have proposed the use of such robot swarms for search and rescue missions.[7] "Humanoid" robots resembling human beings are now being produced. Apptronik hopes that its recently-unveilled "Apollo" humanoid robot will be able to perform thousands of tasks and could be sold for less than the price of the average car.[8]

2. Capabilities

Police robots also have a wide range of capabilities. Many robots can be equipped with accessories, or "payloads," such as maneuverable arms capable of picking up objects and opening doors.[9] Robots often come with an array of cameras and sensors, including pan-tilt-zoom cameras, thermal cameras, microphones, and radar sensors.[10] Equipping police robots with weaponry is rare but not unprecedented — Dallas police attached explosives to an EOD robot to kill an active shooter in 2016, and police abroad have used robots equipped with munitions such as pepper spray, tear gas, and paintballs.[11]

In addition to these hardware features, police robots also have various software analytics. Some robots have been equipped with facial recognition, which can be used to detect and identify individuals.[12] Automated license plate recognition — which captures the license plate and other information about passing vehicles — is another feature found on some police robots.[13] And some robots use software to detect certain predefined events, such as a window left open or a person in a restricted area.[14]

3. Autonomy

Finally, police robots vary in the extent to which they can pursue a goal without human intervention, or their "autonomy." Autonomy exists along a spectrum. Many robots, such as EOD robots, largely are teleoperated — that is, controlled remotely.[15] Some of these robots feature

[6] Melanie Schranz et al., *Swarm Robotic Behaviors and Current Applications*, 7 FRONTIERS IN ROBOTICS & AI 1 (2020).
[7] Ross D. Arnold et al., *Search and Rescue with Anonymous Flying Robots Through Behavior-Based Cooperative Intelligence*, 3 J. OF INT'L HUMANITARIAN ACTION 1 (2018).
[8] Will Knight, *Humanoid Robots Are Coming of Age*, WIRED (May 25, 2023), https://www.wired.com/story/fast-forward-humanoid-robots-are-coming-of-age/; Ashley Strickland, *Meet Apollo, the 'iPhone' of Humanoid Robots,* CNN (Aug. 23, 2023), https://www.cnn.com/2023/08/23/world/apptronik-apollo-humanoid-robot-scn/index.html.
[9] *Impact People-Centric Environments with the Spot Arm*, BOSTON DYNAMICS, https://bostondynamics.com/products/spot/arm/.
[10] *Spot Cam+IR*, BOSTON DYNAMICS, https://bostondynamics.com/wp-content/uploads/2023/05/spot-cam-plus-ir.pdf; *K5 Overview*, KNIGHTSCOPE, https://www.knightscope.com/products/k5#Overview.
[11] *See* Elizabeth E. Joh, *Policing Police Robots*, 64 UCLA L. REV. 516, 521 (2016); Simmons, *supra* note 5, at 10.
[12] *See* Mike Oitzman, *Prosegur Security Launches New Quadruped Patrol Option*, Robot Report (Sept. 4, 2022), https://www.therobotreport.com/prosegur-security-launches-new-quadruped-patrol-option; Yi Shu Ng, *China's Latest Robot Police Officer Can Recognise Faces*, Mashable (Feb. 20, 2017), https://mashable.com/article/china-police-robot.
[13] *See K5*, Knightscope, https://www.knightscope.com/products/k5 (last visited Aug. 31, 2023).
[14] Simmons, *supra* note 5, at 10; KNIGHTSCOPE, *supra* note 10.
[15] BOSTON DYNAMICS, supra note 10.

"assisted teleoperation," meaning that the robot can intervene to some extent with a given task.[16] For example, a robot might automatically avoid collisions if a user steers it towards an obstacle. Teleoperated robots also might provide "action support," in which the robot assists with some aspects of a task, such as gripping or picking up an object.[17]

Other robots perform tasks autonomously but with "shared" or "supervisory" control.[18] For example, a human operator might direct a robot to proceed to a given location but monitor the robot's progress and override it or set new objectives as they see fit. Still other robots use a scheme of "executive control," in which the operator gives the robot a high-level goal which the robot implements.[19] For example, some robots can be configured to conduct autonomous patrols without any human supervision.[20]

There are some complications when it comes to defining autonomy. For one, a given robot might perform different tasks falling along various points on this spectrum — for example, a robot might be teleoperated in some cases, navigate with human supervision in others, and conduct patrols unsupervised in still others.[21] And there are many different ways to conceptualize autonomy — there is a debate in the literature as to autonomy's definition, the extent to which the level of a robot's automation matters for regulatory purposes, and whether the concept of autonomy is apt in the first place.[22]

B. The Roles of the Robot Cop

Although the role of police in society may seem self-evident, upon closer examination it is anything but. Each day, officers are confronted with a variety of problems, from wild animals and disabled vehicles to issues such as drug addiction and mental illness. On a given shift, an officer might be called upon to patrol the roadways, mediate a family dispute, and investigate a noise complaint. The functions which police perform, and their consequent implications for civil rights and civil liberties, are manifold.

So too for police robots. Given their broad range of capabilities, it makes little sense to evaluate police robots in the abstract. Just as with policing, it is only by disaggregating and examining the discrete functions which police robots might perform that we can fully assess their potential benefits, harms, and mitigations. Drawing upon a framework which disaggregates the policing function, this section considers how robots are used in relation to four paradigmatic policing functions: first response, use of force, law enforcement, and proactive policing.[23]

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[16] Jenay M. Beer et al., *Toward a Framework for Levels of Robot Autonomy in Human-Robot Interaction*, 3 J. OF HUM.-ROBOT INTERACTION 74 (2014).
[17] *Id.*
[18] *Id.*
[19] *Id.*
[20] *See K5*, supra note 13.
[21] BOSTON DYNAMICS, supra note 10.
[22] Simmons, *supra* note 5; Beer, *supra* note 16; Carolin Kemper & Michael Kolain, *K9 Police Robots – Strolling Drones, RoboDogs, or Lethal Weapons?* 35 n.173 (WeRobot 2022 Conf., Working Paper, 2022); Casey, *supra* note 2, at 247; Calo, *supra* note 4.
[23] Friedman, *supra* note 1.

1. First Response

Police have been described as "society's only 24-hour general purpose responder."[24] It is the police who are called upon to respond to a variety of problems, from vehicle breakdowns to disorderly conduct and substance abuse.[25] As Albert Reiss explained, "the public considers it the duty of the police to respond to its calls and crises."[26] It is unsurprising, then, that agencies increasingly are exploring the use of robots to assist in first response.

In 2018, the city of Chula Vista, California undertook a novel experiment: it began deploying aerial drones from the rooftop of police headquarters to respond to 911 calls and other emergency incidents.[27] These drones stream high-definition video to Chula Vista's real-time operation center, where operators control the drone and give officers in the field information and intelligence.[28] This video can even be streamed to the cellphones of human first responders, giving them "eyes on the scene."[29] Since its inception in 2018, Chula Vista's "Drone as First Responder" or "DFR" program has responded to over 16,000 calls for service.[30]

The concept of deploying drones to respond to 911 calls, although in its relative infancy, is catching on quickly. Agencies across the country are exploring DFR programs, including the New York City Police Department, which recently placed an order for drones from the company Brinc.[31] The ACLU predicts in a recent report on DFR programs that the United States is "on the cusp of an explosion in law enforcement use of drones."[32]

2. Enforcing the law

Enforcement of the laws is, by definition, a core function of law enforcement. This, too, requires disaggregation. Police enforce a range of laws — from terrorism and serious felonies to petty offenses and traffic laws.

The use of drones and robots for law enforcement has exploded in recent years. In China, a "road patrol robot" identifies moving violations and identifies drivers; police in Hong Kong are testing

[24] Friedman, *supra* note 1, at 954.
[25] *Id.*
[26] Friedman, *supra* note 1.
[27] *Drone Program*, CITY OF CHULA VISTA, https://www.chulavistaca.gov/departments/police-department/programs/uas-drone-program.
[28] Don Redmond, *Chula Vista's High-Flying First Responder Reduces Costs and Response Times, Improves De-Escalation Tactics, and Saves Lives*, W. CITY (Nov. 1, 2021), https://www.westerncity.com/article/chula-vistas-high-flying-first-responder-reduces-costs-and-response-times-improves-de.
[29] *Id.*
[30] CITY OF CHULA VISTA, supra note 32.
[31] Sam Biddle, *Startup Pitched Tasing Migrants from Drones, Video Reveals*, THE INTERCEPT (Dec. 13, 2021), https://theintercept.com/2021/12/13/brinc-startup-taser-drones-migrants/; Craig McCarthy, NYPD buys top-of-the-line tactical flying tech, explores drone uage to answer 911 calls even before cops get there, N.Y. POST (Aug. 6, 2023), https://nypost.com/2023/08/06/nypd-exploring-use-of-drones-to-answer-911-calls-as-it-buys-high-tech-tactical-bots/.
[32] Jay Stanley, Eye-in-the-Sky Policing Needs Strict Limits, AM. C.L. UNION (July 26, 2023), https://www.aclu.org/documents/eye-in-the-sky-policing-needs-strict-limits.

a similar system.[33] In England, drones are being used to crack down on illegal dumping; now law enforcement agencies in Ireland and Japan are following suit.[34] Singapore police have used robots to crack down on smoking in prohibited areas, while police in Tunisia used robots to enforce curfews during the pandemic.[35] Here in the United States, police are exploring the use of drones and robots for everything from enforcing drug laws to investigating shoplifters.[36] In some of these cases, robots are operating much the same as traditional cameras, except ones that are mobile and highly maneuverable; in other cases, robots are equipped with special analytic capabilities, such as license plate recognition.

3. Use of force

One of the quintessential functions of the police, and one which attracts much controversy, is the use of force. "The police," it has been said, "are nothing else than a mechanism for the distribution of situationally justified force in society."[37]

To date, the use of robots by police to deploy force has been rare. In 2016, police in Dallas used a robot equipped with explosives to kill an active shooter after negotiations broke down.[38] The same year, the L.A. County Sheriff's Department used a robot to disarm a barricaded hostage-taker.[39] Abroad, police have used robots equipped with "electrically charged riot controlled tool[s]," "pepper spray, tear gas, and paintballs."[40] But the notion that force-equipped robots would become a mainstream policing tool in the United States has seemed speculative at best.

That is now changing. In fits and starts, agencies are pressing the issue of robotic use of force. Recently, police in San Francisco and Oakland — two progressive cities with a history of

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[33] *See* Kristin Houser, *China Deploys Its First Robot Traffic Police*, FUTURISM (Aug. 9 2019), https://futurism.com/first-police-robots-traffic-china; Kwiksure Team, *Intelligent Parking Ticket Robots to Monitor Traffic Violations in Hong Kong Starting in Early September*, KWIKSURE (May 30, 2022), https://kwiksure.com/blog/traffic-ticket-robot-camera-ai-hong-kong/.

[34] Chris Binding, *Drone Pilots Trained to Crack Down on Fly-Tipping in Sunderland from the Air*, SUNDERLAND ECHO (Dec. 9, 2021), https://www.sunderlandecho.com/news/politics/council/drone-pilots-trained-to-crack-down-on-fly-tipping-in-sunderland-from-the-air-3489099; https://dronedj.com/2022/01/31/after-uk-ireland-japan-eye-drones-to-battle-illegal-dumping/.

[35] Emily Adams, *Singapore is Testing Robots to Patrol the Streets for 'Undesirable' Behavior Like Smoking*, USA TODAY (Sept. 7, 2021), https://www.usatoday.com/story/tech/news/2021/09/07/robots-now-patrol-streets-singapore-undesirable-behaviors/5753334001/; Leslie Katz, *Don't Defy Coronavirus Lockdown Rules, or This Robot Will Call You on It*, CNET (Apr. 3, 2020), https://www.cnet.com/science/dont-defy-coronavirus-lockdown-rules-or-this-robot-will-call-you-on-it/.

[36] Corey McPherrin, *Robot Dog Can Track Down Drugs, Detect Explosives*, FOX32 CHI. (Mar. 2, 2023), https://www.fox32chicago.com/news/robot-dog-can-track-down-drugs-detect-explosives; Patrick Sisson, *Welcome to Chula Vista, Where Police Drones Respond to 911 Calls*, MIT TECH. REV. (Feb. 27, 2023), https://www.technologyreview.com/2023/02/27/1069141/welcome-to-chula-vista-where-police-drones-respond-to-911-calls.

[37] Friedman, *supra* note 1, at 956.

[38] Isabelle Taft, *Police Use of Robot to Kill Dallas Suspect Unprecedented, Experts Say*, TEX. TRIB. (July 8, 2016), https://www.texastribune.org/2016/07/08/use-robot-kill-dallas-suspect-first-experts-say/.

[39] Tim Loc, *Robot Helps Sheriff's Deputies Snatch Gun From Armed Suspect*, LAIST (Sept. 15, 2016), https://laist.com/news/lancaster-robot.

[40] Joh, *supra* note 11, at 521; Simmons, *supra* note 5, at 10.

scrutinizing police use of technology — sought authorization to deploy force-equipped robots.[41] In San Francisco, the proposal was approved, before being revoked in response to public backlash.[42] Axon Enterprise announced plans to develop Taser-equipped drones as a means to address mass shootings — although subsequently Axon paused development, the company has made clear that the idea is still on the table.[43] Indeed, Axon recently acquired a company which markets drones with what it euphemistically calls a "sound distraction system" capable of deploying a five-round salvo of 165 decibel shots (for comparison, a shot fired from a handgun measures in at approximately 140 decibels).[44] Ghost Robotics, another vendor, has demonstrated a robot equipped with a firearm.[45] As Elizabeth Joh wrote recently, "[l]ethally armed robots are no longer forbidden as a mainstream policing technology."[46]

4. Proactive policing

Although policing often involves responding to calls for service, much of police work is proactive, not reactive. For example, officers conduct patrols, demonstrating police presence and seeking to deter wrongdoing. Often this work entails enforcing misdemeanors or quality-of-life offenses on the theory that this will head off more serious crime. One approach, known as "hot spot policing," entails heavy patrol and enforcement in small criminogenic areas. Related strategies include focused deterrence (targeting high-risk individuals for increased contact and monitoring) and stop and frisk (detaining and questioning individuals whom police suspect of criminal activity).

Although there exists a wide range of proactive policing approaches, one approach has received much attention in the world of police robots as of late — the use of robots to patrol designated areas and boost police presence.

Agencies across the country are deploying robots to conduct autonomous patrols, as have schools and universities.[47] Recently, the NYPD announced it would deploy a Knightscope K5 robot to

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[41] James Vincent, *San Francisco Reverses Plans to Allow Police Robots to Kill Suspects*, THE VERGE (Dec. 7, 2022), https://www.theverge.com/2022/12/7/23497922/killer-robot-policy-san-francisco-reversed; Nora Mishanec, *Oakland, Calif., Police Reverse Course on Lethal Robot*, GOV'T TECH. (Oct. 20, 2022), https://www.govtech.com/public-safety/oakland-calif-police-reverse-course-on-lethal-robot.

[42] Vincent, *supra* note 46.

[43] BARRY FRIEDMAN ET AL., AXON'S PROJECT ION (2023).

[44] Malia Wollan, How to Tell Gunfire From Fireworks, N.Y. TIMES (Aug. 6, 2019) https://www.nytimes.com/2019/08/06/magazine/how-to-tell-gunfire-from-fireworks.html; *Payload Typhon: Sound Distraction System*, SKY-HERO, https://sky-hero.com/products/payload-typhon/.

[45] *See* Axon, *Axon Announces TASER Drone Development to Address Mass Shootings*, PR NEWSWIRE (June 2, 2022), https://www.prnewswire.com/news-releases/axon-announces-taser-drone-development-to-address-mass-shootings-301559913.html.

[46] Elizabeth Joh, *Police Departments Are Not Going to Give Up on Killer Robots*, SLATE MAG. (Dec. 11, 2022), https://slate.com/technology/2022/12/san-francisco-police-lethal-robots.html.

[47] *See* Katie Flaherty, *A RoboCop, a Park and a Fight: How Expectations About Robots are Clashing With Reality*, NBC NEWS (Oct. 4, 2019), https://www.nbcnews.com/tech/tech-news/robocop-park-fight-how-expectations-about-robots-are-clashing-reality-n1059671; Knightscope, *Florida School Deploys Knightscope Autonomous Security Robot (ASR)*, BUSINESS WIRE (June 8, 2022), https://www.businesswire.com/news/siliconvalley/20220608005438/en/Florida-School-Deploys-Knightscope-Autonomous-Security-Robot-ASR; *Security Robots to Patrol Parking Lots at University of Nevada, Reno in the Next Few Months*, 2NEWS (May 23, 2023).

autonomously patrol Times Square and the Times Square subway station.[48] Aerial drones also are capable of conducting patrols — DJI and DroneDeploy have developed software enabling police to use drones to patrol along pre-set routes.[49]

Patrol robots can be equipped with a variety of cameras and analytics far exceeding the capabilities of human patrol officers. Chinese patrol robots use facial recognition technology to scan for suspects in its database, while robots in South Korea have been designed to detect abnormal activity such as aggressive behavior.[50] In the United States, Cobalt-brand robots can identify situations such as a window left open or the presence of a person in a restricted area, while K5 robots are equipped with thermal imaging cameras.[51]

II. Police Robots: Benefits and Risks

In this Part we turn to the benefits and risks of police robots. As we have seen, agencies have put robots to a variety of innovative uses, from first response to patrol. But the decision whether to deploy police robots should in the first instance be based upon an evaluation of the benefits and risks of these tools, which we discuss in this Part, and the extent to which the risks can be mitigated (which we discuss in the next).

Section II.A surveys the benefits of police robots, both in general and in relation to the four police functions discussed in the previous Part. Section II.B then turns to risks, first describing three general categories of risks, then cataloging potential harms ranging from incursions upon privacy to algorithmic bias.

A. Benefits

Generally speaking, police robots have several advantages over human officers. Because robots can be controlled remotely, they can keep officers safe and out of harm's way — this is the principal advantage of using robots for tasks such as bomb disposal, for example. Robots can maneuver to areas which would be difficult or impossible for human officers to reach, such as underwater or inside of a crawlspace. And, unlike human officers, robots are ever-vigilant, never becoming fatigued or distracted.

It is worth exploring the advantages of police robots in relation to specific policing functions. We do so below, focusing on the functions surveyed in the previous Part: first response, enforcing the law, use of force, and proactive policing.

1. First Response

[48] *See NYPD Unveils Robot Police Dogs and Other High-Tech-Crime Fighting Devices in Time Square*, ABC7 L.A. (Apr. 11, 2023), https://abc7.com/nypd-police-dog-robot-new-york-city/13114623/.
[49] Nanci K. Carr, *Programmed to Protect and Serve: The Dawn of Drones and Robots in Law Enforcement*, 86 J. OF AIR L. & COMM. 183, 202 (2021).
[50] Simmons, *supra* note 5, at 5.
[51] Simmons, *supra* note 5, at 5*;* KNIGHTSCOPE, *supra* note 10.

As discussed, many agencies are exploring the use of aerial drones for first response. These tools can be deployed to the scene of an incident, relaying video to operators and human first responders. Proponents of these DFR programs note three principal advantages drones have over human officers in first response.

First, drones potentially could reduce response times dramatically. According to records published by the Chula Vista Police Department, the average response time for serious life-threatening calls for service is 3.9 minutes for its drones, compared to 6.3 minutes for its ground police units.[52] For less urgent calls, the average response time is 6.2 minutes for drones, compared to 10.5 minutes for ground units.[53]

Second, in nearly a quarter of cases, Chula Vista's drone operators were able to clear calls without dispatching ground units to the scene.[54] This helps conserve officer resources — a particularly valuable aspect of DFR programs given that policing agencies often are flooded with calls for service, straining capacity. Just as importantly, DFR programs can decrease unnecessary police contact. Our reliance on police as first responders means that calls for service can lead to force and enforcement, even when this causes harm and does little to resolve the underlying problem.[55] By enabling agencies to clear calls without dispatching an officer to the scene, DFR programs can decrease the likelihood of such force and enforcement.

Third, in cases in which it is necessary to dispatch ground units, drones can enhance situational awareness, potentially increasing the safety of both officers and suspects. In one example from Chula Vista's program, a drone was deployed in response to a report that a man was waving a gun.[56] The drone operator identified that the "gun" was actually a lighter and informed responding officers that the man was not armed.[57]

There is another potential benefit of DFR programs, but one which receives little attention given the current focus on the use of robots for force and enforcement: they could be used to divert calls to non-police responders. Although some calls for service may require a police response, many do not. Some tasks might best be handled by specialists with altogether different skillsets. One could imagine, for example, deploying non-police responders with expertise in substance abuse to respond to calls about drug use.[58]

If drones and robots obviate the need to send people into harm's way, the argument for those responders being the police is vastly diminished. One could imagine, for example, a DFR program in which drone operators assign calls to different responders based on their expertise. For incidents necessitating a law enforcement response, such as thefts or assaults, police would take the lead. Conversely, a call involving a person having a mental health crisis might best be handled by mental health professionals who could view the livestream to observe the subject and assess whether an

[52] W. CITY, *supra* note 28.
[53] *Id.*
[54] *Id.*
[55] Friedman, *supra* note 1.
[56] *See* League of Cal. Cities; W. CITY, *supra* note 28.
[57] *See* League of Cal. Cities; W. CITY, *supra* note 28.
[58] Friedman, *supra* note 1, at 954.

ambulance should be dispatched, whether a social or outreach worker should make contact, whether co-response with police may be required, or whether no intervention is needed at all.

One might even imagine designated centers staffed twenty-four hours a day with mental health, drug addiction, and other specialists trained to handle all such calls in a given region, spanning dozens or hundreds of agencies. The benefits would be two-fold: these experts would be well-situated to determine the appropriate response, and police resources would be freed up to handle other matters more core to the law enforcement mission.

2. Enforcing the law

One touted benefit of using robots to enforce the law is fuller enforcement. To be sure, the notion that what policing needs is more enforcement is contestable, a point we shall explore later. But many policing agencies see great value in using robots to increase enforcement. As one official enthused about the use of drones to catch illegal dumping, "[a] lot of the [violators] are very clever and go to 'hidden places' but our drones can go to those places as well." The addition of computer vision technologies, from automated license plate recognition to geofencing and anomaly detection, can enable police to detect and investigate far more activity than would officers on patrol.

A second potential benefit of automating law enforcement is that it may enable police to spend more time engaged in non-enforcement activities, from holding community meetings to getting to know local residents. To be sure, one might be skeptical that officers will use the time saved to engage in community policing (as opposed to conducting yet more enforcement), and too much automation may reduce opportunities for the positive contacts with the public which help to establish trust and legitimacy.[59]

One might also argue that law enforcement robots could be afforded considerably less discretion than human officers. Study after study shows that human officers disproportionately take enforcement action against people of color and other marginalized groups for a variety of reasons, including implicit bias. In particular, Black Americans are more likely to be stopped, searched, and arrested by police, and are more likely to be arrested for drug offending behavior than whites who engage in the very same behavior.[60]

The robot officer, free of such implicit biases, could, in theory, perform its duties without fear or favor. For example, in the future, robots might be programmed to conduct traffic enforcement, stopping all individuals committing moving violations, or none of them. To be sure, the problem of racial and other disparities in law enforcement is deeply entrenched; should police be given free rein to choose where in a community robots are deployed, such disparities may persist. And it is altogether too rosy to suggest that because robots are not afflicted by implicit bias that they are not

[59] Elizabeth E. Joh, *The Consequences of Automating and Deskilling the Police*, 67 UCLA L. REV. 133 (2019).
[60] HUMAN RIGHTS WATCH, RACE, DRUGS, AND LAW ENFORCEMENT IN THE UNITED STATES (2009), https://www.hrw.org/news/2009/06/19/race-drugs-and-law-enforcement-united-states#; MAGNUS LOFSTROM ET AL., RACIAL DISPARITIES IN LAW ENFORCEMENT STOPS (2021); Alan Feuer, *Black New Yorkers Are Twice as Likely to Be Stopped by the Police, Data Shows*, N.Y. TIMES (Sept. 23, 2020), https://www.nytimes.com/2020/09/23/nyregion/nypd-arrests-race.html#:~:text=Even%20after%20years%20of%20the,decade%2C%20according%20to%20the%20report.

impaired by other biases, a point to which we will return. The point is that, with the right policies in place, law enforcement robots could in theory reduce racial and other disparities in enforcement.

3. Use of force

Although police rarely have used robots to deploy force, this may well change in the coming years. As technology has progressed, more agencies have explored the idea of adding force-equipped robots to their arsenals.

There are several claimed advantages that force-equipped robots have over human officers. First and foremost, force-equipped robots could, in theory, help officers de-escalate in situations in which force might otherwise be used. Proponents argue that when officers have to make a force decision in-person, the fear and stress they experience impairs their judgment; deploying force remotely will enable police to use force more judiciously.[61] And, one would hope, by enabling police to hold their fire, force-equipped robots could buy time for trained negotiators or other specialists to intervene.

There are other ways in which robots might allow police to use less force, or avoid force altogether. The use of robots allows police to hold their fire in "ambiguous situations."[62] And, if force must be used, robots might enable police to use weapons that are less likely to be lethal. For example, the use of a Taser often is not an option for officers confronting an armed subject, since the range of a Taser requires officers to be in relatively close proximity to the person against whom it is used. Officers controlling a robot from a safe distance from a subject may have more options to use Tasers or other less-lethal weapons.[63]

Finally, the ability to deploy force remotely would help to ensure the safety of responding officers.[64] This may prove especially useful in situations where a subject is barricaded or otherwise obstructed, making it difficult for human officers to ascertain their position.

4. Proactive policing

The theory behind patrol robots is that they can dramatically boost police presence, helping to deter crime. Some scholars predict that dozens of robots could be supervised by a single officer, with the ratio of robots to human operators increasing as robots become more autonomous.[65] Vendors claim these tools already are delivering tangible benefits to policing agencies — Knightscope claims that the use of its K5 robots by police in Huntington Park, California resulted in a 10% reduction in calls for service, a 46% reduction in crime reports, a 27% increase in arrests, and a 68% reduction in citations.[66]

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[61] *See* Patrick Tucker, *The Inventor of the Taser and the Body Cam Wants to Put Them on Drones*, DEFENSE ONE (Oct. 13, 2021), https://www.defenseone.com/technology/2021/10/inventor-taser-and-body-cam-wants-put-them-drones/186095/; Simmons, *supra* note 5, at 27.
[62] PETER OLSTHOORN & LAMBÈR ROYAKKERS, RISKS AND ROBOTS – SOME ETHICAL ISSUES 2 (2014).
[63] FRIEDMAN ET AL., *supra* note 48.
[64] *See* Joh, *supra* note 11, at 526.
[65] Simmons, *supra* note 5, at 5, 7; *see also* Joh, *supra* note 11, at 531.
[66] Simmons, *supra* note 5, at 5, 7; *see also* Joh, *supra* note 11, at 526.

These figures should be taken with a large grain of salt — vendor claims about the efficacy of policing tech often are not independently vetted and fail to withstand scrutiny.[67] It is far from clear how exactly the K5 reduced crime reports by nearly half. Indeed, there is only sparse evidence that K5 robots are responsible for the results in Huntington Park: the Chief of Police there admitted that there were not many examples of arrests made because of the K5 (although it has been useful in investigating "robot tipping and vandalism against the robot itself").[68] This is not to say that it is implausible that patrol robots could enhance public safety — it is to say that this must be demonstrated through rigorous independent assessment.

B. Risks

Whatever one thinks of the potential benefits of police robots, it is clear that they pose real risks as well. Vendors are rushing to bring new robots to the market and agencies are rushing to adopt them — and all too often, this is being done without adequate assessment of the harms which might result. In this Part, we turn to the social costs of using police robots.

Many of the risks of police robots, which we catalog below, fall into three general categories. First, there are risks caused when robots work as intended. For example, robots equipped with license plate recognition can be used to track the locations and movements of individuals over time, presenting privacy risks. Second, there are risks caused when robots malfunction. Ground robots can potentially collide into people; drones can fall from the sky. And third, there are risks resulting from how robots perform a given function, and how people interact with robots performing that function. Robots are different; the robot on patrol is not the same as the officer on patrol — as we shall see, police robots create unique dynamics which must be accounted for.

1. Privacy

The prospect of police robots equipped with sophisticated analytics — including, potentially, the ability to identify individuals and their activities and movements — raises profound privacy concerns. Commentators warn of a future in which agencies deploy hundreds of robot or drone officers on constant patrol, capturing the activity not only of wrongdoers, but anyone who crosses their paths.[69] According to one scholar, future patrol robots might obtain GPS data, access nearby CCTV footage, scan for concealed weapons, and use thermal imaging, license plate recognition, and facial recognition to identify potential suspects.[70]

Some might respond that the robot on patrol would capture only people's activities out in public, and therefore constitutes only a *de minimis* incursion upon individual privacy. This is a point worthy of closer examination.

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[67] BARRY FRIEDMAN ET AL., RING & NEIGHBORS PUBLIC SAFETY SERVICE: A CIVIL RIGHTS & CIVIL LIBERTIES AUDIT 25 (2021).
[68] *See* Cyrus Farivar, *Security Robots Expand Across U.S.,Wwith Few Tangible Results*, NBC NEWS (June 27, 2021), https://www.nbcnews.com/business/business-news/security-robots-expand-across-u-s-few-tangible-results-n1272421.
[69] Simmons, *supra* note 5, at 10-11, 31.
[70] Melanie Reid, *Rethinking the Fourth Amendment in the Age of Supercomputers, Artificial Intelligence, and Robots*, 119 W. VA. L. REV. 100, 108 (2017).

Modern technologies, including robots, are enabling vast collection and aggregation of data about our activities and movements. Of course, police always have had the ability to tail and observe suspects out in public. But today's world of digital tracking is different in kind. Technologies such as automated license plate recognition — already integrated into some police robots — enable police to create a detailed and permanent record of individuals' movements over time. The mobile nature of robots (and the variety of sensors with which they are equipped) means that, unlike stationary surveillance devices, they can follow and track individuals as they go about their daily lives. Armed with this data, police could ascertain a variety of intimate information about individuals, from where they receive medical treatment or attend religious services to their participation in a support group or private organization.

And some proposed use cases for police robots might give even the most ardent privacy skeptics pause. Some scholars have even suggested that, in the future, police robots may come equipped with millimeter wave scanners capable of seeing under people's clothing and identifying what they carry in their pockets.[71] Drones are equipped with increasingly powerful zoom capabilities, potentially enabling police to see, through a window or door, far into a home's interior.[72]

All of this tracking can have powerful chilling effects — without privacy, we may be deterred from exercising our most essential rights and liberties. Any discussion of police robots must address these profound privacy risks.

2. Increased use of force

Proponents of force-equipped robots argue that these tools would decrease police use of force overall, but there is cause to be concerned that the opposite may prove true. The use of weaponized robots could lead to the dehumanization of subjects — that is, operators may be more prone to use force when a subject appears as a figure on a computer screen rather than a person in a face-to-face encounter.[73] Through the mediation of technology, officers may become detached from suspects — "the targeted 'things' on the screen do not seem to implicate [the operator] in a moral relationship."[74] Or, as one military drone pilot put it, his job was "like a video game. It can get a little bloodthirsty. But it's fucking cool."[75]

Compounding this issue is the fact that force-equipped robots can enable multiple decisionmakers, monitoring at a distance, to participate in the decision to use force. Potentially, this diffusion of responsibility could reduce officers' sense of personal moral culpability for their decisions.[76] On the other hand, in a more controlled environment in which multiple officers jointly make force decisions, cooler heads may well prevail. More study of this issue is needed.

Either way, what is near-certain is that use-of-force policies will need changed and officers retrained in a world of force-equipped robots. Many use-of-force policies track the Fourth

[71] *See* Simmons, *supra* note 5, at 7.
[72] U.S. v. Taborda, 635 F.2d 131 (2nd Cir. 1980).
[73] *See* OLSTHOORN & LAMBÈR ROYAKKERS, *supra* note 68, at 4.
[74] Tyler Wall & Torin Monahan, *Surveillance and Violence From Afar: The Politics of Drones and Liminal Security-Scapes*, 15 THEORETICAL CRIMINOLOGY 239, 246 (2011).
[75] OLSTHOORN & LAMBÈR ROYAKKERS, *supra* note 68, at 5.
[76] *See Id.* at 4; Alaa Hijazi et al., *Psychological Dimensions of Drone Warfare*, 38 CURRENT PSYCH. 1285, 1291 (2019).

Amendment requirement that police use of force be "reasonable." Agency policies and training assume, understandably, that officers making force decisions are at the scene and may fear for their safety.[77] The ability to deploy force remotely unsettles this assumption, necessitating new policies and training.

3. Overenforcement

As we discussed earlier, police robots, with their powerful cameras and analytic capabilities, might increase enforcement activity vastly.

But more enforcement can come at a cost. In some cases, overenforcement can prove counterproductive or even harmful — license suspensions resulting from fines and fees enforcement can have a major impact on families who rely on their vehicles for work or education; this has led some courts to find the practice unconstitutional.[78] Police enforcement of low-level offenses and immigration laws can diminish trust in law enforcement, undermining public safety.

Indeed, we may well need to reconsider altogether our approach to enforcing the criminal laws: if robots bring us a step closer to perfect enforcement, we must begin to think through exactly which laws we want perfectly enforced. Legislators, in enacting the various penal codes which police enforce, could not have foreseen that their laws would be enforced perfectly. But an age of near-perfect enforcement is in the offing. Policymakers will soon need to decide which categories of laws should be perfectly enforced — we may well want, for example, perfect enforcement of laws preventing commercial vehicles from blocking bus lanes, but not of laws prohibiting jaywalking. For laws which should not be perfectly enforced, new strategies might be devised, which we detail in Part III.C.

4. Disparate impact

As with many other aspects of policing, the harms of police technology are not borne equally across society. It has been well-documented that policing technologies are deployed disproportionately in communities of color and lower socioeconomic status.[79] Some experts warn, therefore, that drones and other robots are likely to be deployed disproportionately in these communities unless there are policies and safeguards to counteract this.[80]

There also is the risk that although robots are not afflicted by implicit bias, their decisions could be affected by other biases. Unrepresentative or skewed data can result in algorithmic biases which reflect human ones. For example, suppose that some future robot was tasked with enforcing traffic laws, focusing on those neighborhoods where it predicted violations were most likely to occur. Neutral though this task may seem, were the robot to base its predictions on existing enforcement

[77] Joh, *supra* note 11.
[78] *Victory: Thurston County Superior Court Rules Washington Driver's License Suspension Law Unconstitutional for Individuals Who Cannot Afford to Pay Fines for Moving Violations*, AM. C.L. UNION WA. (May 3, 2021), https://www.aclu-wa.org/news/victory-thurston-county-superior-court-rules-washington-driver%E2%80%99s-license-suspension-law; Richard A. Oppel Jr., *Being Poor Can Mean Losing a Driver's License. Not Anymore in Tennessee*, N.Y. TIMES (July 4, 2018), https://www.nytimes.com/2018/07/04/us/drivers-license-tennessee.html.
[79] BARRY FRIEDMAN ET AL., supra note 48, n.29.
[80] *Id.* n.30.

data, its conclusion may reflect less where traffic violations are actually most frequent and more where human officers have chosen to focus their enforcement efforts.[81] This is not to suggest that robots cannot reduce disparities in law enforcement overall, only that we must be clear-eyed about the extent to which technology can overcome human biases, and so we must guard against their digital reproduction.

5. Operational issues

There are a great number of operational issues which might arise from the use of police robots. Robots can malfunction, and control and signal problems might occur. Outside of law enforcement, there have been "cases in which drones have fallen from the sky and struck people in the head, collided with cyclists, and even sliced the tips of noses off."[82] And the potential for police robots to be hacked is a serious concern, especially in the context of force-equipped robots.

Compounding these issues is the fact that robots are unpredictable by design. As Ryan Calo explains, what a robot does in the world is the consequence of code interacting with other code (sometimes from different developers), as well as inputs such as the operator's instructions and the data being collected.[83] It can be difficult or impossible to predict exactly how a robot will behave. The nature of emergent systems — systems are not instructed in how to perform each task, but rather are given goals and are trained to accomplish them — contributes to this unpredictability.[84] We explore the challenges that this aspect of robots poses for police liability later. For now, it is enough to note that police robots might sometimes behave in unexpected ways which may cause harm.

6. Interaction issues

When police interact with citizens through robots, the form of the robot matters.[85] Some quadruped robots are built to resemble dogs, and even have a dog's name — the NYPD's "Digidog," is one example.[86] Law enforcement use of dogs has a deeply negative connotation in some Black communities — from the long historical use of dogs in hunting slaves, to Bull Connor's use of dogs against protestors in Birmingham, to use of police canines today.[87]

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[81] Andrew G. Ferguson, *Policing Predictive Policing*, 94 Wash. U. L. Rev. 1109 (2017).
[82] Carr, *supra* note 54, at 204.
[83] Calo, *supra* note 4.
[84] *Id.*
[85] Kemper & Kolain, *supra* note 22, at 27.
[86] Karen Matthews, *Robotic Police Dog 'Digidog' Rejoins NYPD*, PBS (Apr. 12, 2023), https://www.pbs.org/newshour/nation/robotic-police-dog-digidog-rejoins-nypd.
[87] *See, e.g.*, Tyler D. Perry, *Police still use attack dogs against Black Americans*, WASH. POST (Sept. 20, 2020), www.washingtonpost.com/outlook/2020/09/02/police-still-use-attack-dogs-against-black-americans/; *Why do so many Black Americans Have a Fear of Dogs?*, EVOLVED TCHR. (Apr. 22, 2021), www.evolvedteacher.com/blog/why-do-so-many-black-americans-have-a-fear-of-dogs; *Mauled: When Police Dogs Attack*, MARSHALL PROJECT www.themarshallproject.org/2020/10/15/mauled-when-police-dogs-are-weapons; Shontel Stewart, *Man's Best Friend? How Dogs Have Been Used to Oppress African Americans*, 25 MICH. J. RACE & L. 183 (2020); L. Kevin Chapman et al., *Fear factors: Cross validation of specific phobia domains in a community-based sample of African American adults*, 25 J. ANXIETY DISORD. 539 (2011).

Other roots take on a military guise. One robot developed for the Massachusetts State Police resembles a tank with a ballistic shield. This can reinforce a "military culture" within policing agencies, distorting law enforcement's view of its mission — an issue which has received renewed attention since the shooting of Michael Brown in Ferguson, Missouri in 2014.[88] And the prospect of police commanding swarms of dozens or even hundreds of robots raises serious questions about the emotional and dignitary harms attendant to police "shows of force," especially to the extent that certain communities or groups are disproportionately impacted by such tactics.[89]

In short, the form and appearance of a robot can have an impact on how both police and citizens interact with it, with potential consequences for public acceptance and trust.[90]

7. Agency capacity and sophistication

Finally, we note one variable which will make it more or less likely that the harms described above will come to pass: the capacity and sophistication of the agencies deploying robots.

Consider the example of Chula Vista's DFR program. This program has been held out as a model for other agencies to follow, but in many ways Chula Vista is exceptional. Prior to launching its program, the Chula Vista Police Department engaged in extensive public engagement, holding town halls, publicly posting and seeking feedback on its DFR policy, and pledging to make a range of data about the program available on a data dashboard.

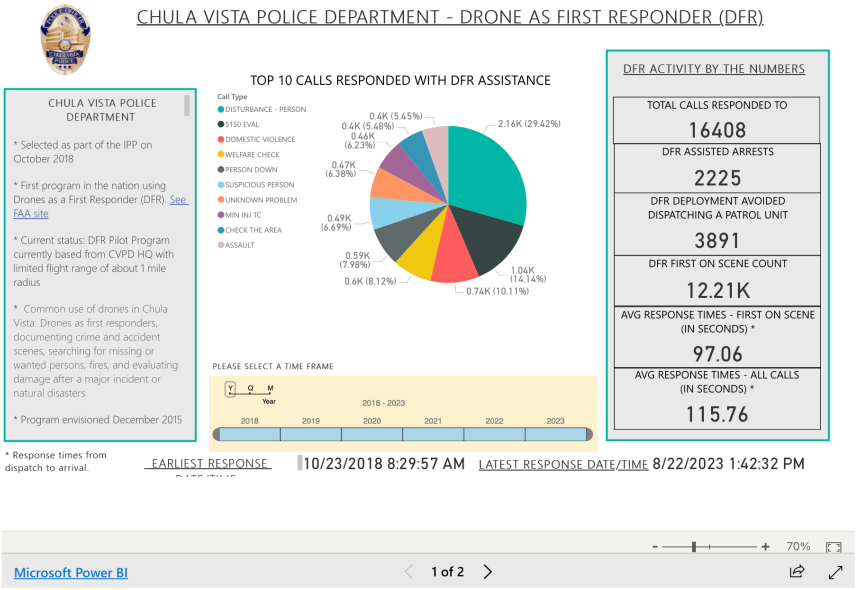

Fig. 1 – Excerpt from Chula Vista Police Department's DFR Dashboard

[88] John Gruhl & Michael Combs, *Police Drones: Coming to a Neighborhood Near You*, 20 NAT'L POL. SCI. REV. 56 (2019); BARRY FRIEDMAN ET AL., POLICE MILITARIZATION: A 1033 PROGRAM ANALYSIS (2021); Kristin Bergtora Sandvik, *The Political and Moral Economies of Dual Technology Transfers: Arming Police Drones*, in DRONES & UNMANNED AERIAL SYS. 48-49 (2015).

[89] ALI Principles of the Law, Policing, ch.2.

[90] Kemper & Kolain, *supra* note 22.

These efforts to engage with the public and to ensure transparency are exceedingly rare among agencies seeking to launch new technological initiatives. Many agencies will lack the ability, or will, to take these steps. Likewise, while Chula Vista's drone operators receive ongoing training in various locations and settings, it is unclear whether other agencies — especially smaller ones — will have sufficient resources to maintain such a regimen.[91] In assessing the risks of police robots, we must be cognizant that agencies will take different approaches to these tools, and some may not be equipped to deploy them responsibly.

III. Regulating Police Robots

This Part turns to regulation. We begin in Section III.A by surveying the current regulatory landscape which, as we shall see, does far too little to address the risks of police robots. Section III.B then turns to an intriguing possibility — that current laws regulating officer conduct could be extended to police robots. In Section III.C, we look beyond existing regulation and set forth a series of robust safeguards designed to help maximize the benefits of police robots while minimizing their risks. Finally, Section III.D concludes with a discussion of remedies, considering the various unique challenges which police robots will pose for the courts.

A. The regulatory state of play

In general, there is far too little regulation of policing technologies. There are a panoply of reasons why this is so — from anti-regulatory pressures from police unions and organizations to a lack of information and expertise on the part of lawmakers.[92] Vendors, too, play a key role — competition between tech vendors has created a race to the bottom in which ever more intrusive products are brought to the market with little to no public engagement.[93]

It is perhaps unsurprising, then, that when it comes to regulation of police ground robots, there is relatively little to speak of. Efforts to regulate are underway nationwide — legislation has been proposed in New York prohibiting the use of robotic force, while a California bill would prohibit police from using weaponized robots absent local democratic authorization.[94] A proposed bill in Rhode Island would generally prohibit law enforcement use of robots outside of narrow circumstances.[95]

Regulation of police aerial drones is further along, although it still leaves much to be desired. To start with, Federal Aviation Administration ("FAA") regulations currently prohibit the weaponization of drones.[96] FAA regulations also generally require operators to have a visual line of sight to the drone at all times, although 225 agencies have obtained beyond visual line of sight ("BVLOS") waivers, and the FAA is likely to legalize BVLOS in the coming years.[97]

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[91] Maria Ponomarenko, The Small Agency Problem in American Policing, 98 N.Y.U. L. REV. (forthcoming 2023).
[92] Barry Friedman et al., *Policing Police Tech: A Soft Law Solution*, 37 BERKELEY TECH. L.J. 101 (2022).
[93] *Id.*
[94] N.Y. Senate Bill 3097; N.Y. Assembly Bill 6954; C.A. Assembly Bill 79.
[95] R.I. House Bill 6071; Senate Bill 409.
[96] FAA Reauthorization Act, H.R. 302, 115th Cong § 363 (2018).
[97] Sisson, *supra* note 41.

Twenty states have enacted laws regulating police drones, nearly all of them having some form of requirement that police obtain a warrant in order to use drones for the collection of evidence.[98] Only seven states have addressed the weaponization of drones (although, as noted above, weaponization currently is prohibited by FAA regulations), and only two have addressed the use of facial recognition on drones.[99]

In short, at present there is little regulation of police ground robots to speak of, and many states have yet to regulate police drones. The states that do regulate drones have focused on areas such as warrant requirements, but there are still significant gaps in many jurisdictions — for example, around data retention and the use of computer vision technologies such as license plate and facial recognition.

B. Regulatory parity

Before turning to specific regulations, we pause here to discuss the sources of robot regulation. Presently, there is a body of law — itself inadequate — which governs the conduct of human officers. Some have suggested that in many areas of AI regulation, what is needed are not new laws on the books, but the application and enforcement of existing laws to emerging technologies.[100]

Whether police robots should be treated exceptionally under the law — that is, whether they should play by a different set of rules than human officers — is a difficult question.

On the one hand, extending existing rules to robots could prove impactful and could be done with relative ease. A simple bill might specify the types of rules to be extended to police robots, helping to fill a regulatory void. For example, before conducting a search of a home, police officers must obtain a warrant and follow other procedural requirements. Lawmakers could enact a bill requiring police to follow the exact same requirements when conducting a search with a robot.

On the other hand, lawmakers must be wary of the human analogue trap — uncritically treating robots identically to their human counterparts in ways that could undermine public safety. As one scholar writes, "assumptions baked into many of our laws can implicitly or explicitly impose all variety of strange obligations on robots, based on the false premise that they share the same relevant characteristics as human beings."[101]

To give an example of where human analogies break down, consider the rule that police are empowered to stop an individual upon reasonable suspicion of criminal wrongdoing and conduct a protective "frisk" — that is, a brief pat-down search of a suspect's outer garments.[102] As Ric Simmons notes, since the rationale for the rule is the protection of officer safety, it is difficult to see why demanding regulatory parity here would make sense, given that robots can be operated

[98] AK, FL, ID, IL, IN, IA, KY, ME, MN, MT, NV, NC, ND, OR, TN, TX, UT, VT, VA, WI.
[99] IL, KY, ME, MN, ND, UT, and VA (weaponization); IL, MN (facial recognition).
[100] MICROSOFT, GOVERNING AI: A BLUEPRINT FOR THE FUTURE (2023).
[101] Casey & Lemley, *supra* note 2, at 331.
[102] Simmons, *supra* note 5.

from a distance.[103] Similarly, while police may be justified in using force against a subject who fires a weapon at human officers, this hardly justifies the use of force against someone who fires a weapon at a police robot.

i. Three questions

In assessing whether we want regulatory parity, we must first examine the nature of the rules which govern police. Some rules constrain police, such as rules which require warrants, prohibit coercive interrogations, or require cause to perform a stop. Other rules empower police. Some such rules are set forth expressly in enacted law and judicial decisions — the rule empowering police to conduct protective frisks being an example of the latter. Other powers, such as the power to conduct patrols or question witnesses, might be thought of as inherent to the initial grant of authority police are given to enforce the laws. Often constraining and empowering rules are bound up together — police, for example, are empowered to detain an individual, subject to constraints on how long the detention may last.

By examining the rationales for constraining and empowering rules, we can begin to sketch out the questions which must be answered to determine whether existing laws should be extended to police robots. On the one hand, constraining rules exist to address harms resulting from certain police practices — harms substantial enough to warrant constraining the usual latitude afforded police. Generally, the rationale for these rules will apply with equal force in the robot context. After all, the harm of coercive interrogations or arbitrary searches is not lessened because the interrogator or the searcher is a robot instead of a human.

The rationales for empowering rules are different. First, we want to empower police to perform certain activities we consider to be appropriate police functions — for example, detaining and arresting criminals. Second, we want to afford police sufficient latitude to perform these functions in light of the nature of the job — police put themselves in harm's way and must make split-second decisions under stress and fear of harm. This rationale animates many empowering rules, from rules authorizing police to conduct protective searches to legal doctrines shielding police from liability.

For these empowering rules, the human-robot analogy quickly breaks down. That society considers certain activities to be appropriate police functions does not mean it considers them to be appropriate activities for police robots. This much is clear from the attention and scrutiny received by agencies who have sought to task robots with quintessential police functions such as patrol and use of force. Likewise, the second rationale for empowering rules — that officers must be given latitude given the dangers inherent to the work of policing — has far less force in the context of remotely-operated robots.

Thus, in determining whether the rules governing a particular area of policing should apply to police robots, three questions must be asked. First, do we want robots to be performing this function in the first place? After all, what might be considered routine and accepted activities for human officers may be highly controversial activities for a robot to perform. Second, is there a reason why robots should be afforded the same latitude as is afforded human officers? The degree

[103] *Id.*

of latitude may need reevaluated when officers are kept out of harm's way. Third and finally, are the harms that existing regulation seeks to address present in the context of police robots? If so, there is a strong argument to be made in favor of regulatory parity.

ii. Some examples

Consider the rule that police may conduct stops — that is, temporarily detain individuals. Although this is not a use for police robots at present, some believe that we are not far from an era of robotic police stops.[104] When that time comes, we should begin by asking: do we want robots to be conducting stops at all? There are sound reasons to be skeptical of giving robots this power — as some scholars have noted, "[a] central theme of procedural justice and police legitimacy . . . is trust."[105] A variety of factors, including a robot's appearance, level of automation, and mode of communication could undermine trust in police robots, and thus undermine procedural justice in the context of robotic police stops.[106] We may well conclude that robots ought not to conduct stops at all, or that they only should conduct stops under the supervision of a human officer.

If we conclude that police robots should be permitted to conduct stops, then we must ask whether the robot officer should be afforded the same degree of latitude as the human one. The answer here may be no. For example, police conducting a stop are empowered to perform a protective frisk if they so choose.[107] But the reason for permitting officers to do so is to ensure their safety; there is little apparent reason to extend this latitude to the robot officer.

Finally, we must evaluate whether the harms that existing regulation seeks to address are present in the context of robotic stops. For example, in order to prevent arbitrary and unwarranted detentions, police may conduct stops only upon reasonable suspicion of criminal activity.[108] Officers, moreover, are limited in the amount of time they may stop a person; this is meant to address the harm of unreasonably lengthy detentions.[109] These harms exist in the police robot context as well, justifying regulatory parity — the harms of unwarranted or unreasonably lengthy detention are not lessened on account of the detainer being a robot as opposed to a human. To be sure, we are likely a ways off before robots are capable of conducting stops of this nature; but if and when that time comes, there is a strong argument to be made for extending existing protections.

To give another example, consider a scenario in which police search a home, resulting in an arrest. Once again, we should start by asking whether we want robots to be conducting searches of the home in the first place. The answer might be that it depends. Given the show of force attendant to the deployment of police robots, we may well conclude that robotic searches should be limited to cases in which there is a particular reason it would be advantageous — for example, searching a home in which a suspect may have set traps.

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[104] *Id.*
[105] Kemper & Kolain, *supra* note 22.
[106] Kemper & Kolain, *supra* note 22.
[107] Terry v. Ohio, 392 U.S. 1 (1968).
[108] *Id.*
[109] Rodriguez v. United States, 575 U.S. 348 (2015).

Next, we should ask whether police robots should be afforded the same latitude as human ones. Consider the rule that in the event of an arrest, police are empowered to conduct a protective sweep of the home.[110] Part of the rationale for giving police this latitude is the protection of officer safety — a rationale with far less force in the context of robotic searches. But protective sweeps also serve to protect others who may be present in the home. Perhaps the rule needs modification in the robot context, permitting protective sweeps only if officers have reason to believe that others are present.

Finally, we must evaluate whether the harms that existing regulation seeks to address are present in the police robot context. For example, in the event of an arrest, existing rules require police to read to the arrestee *Miranda* rights — this is intended to prevent undue police coercion.[111] Here, we may want regulatory parity — the danger of coercion is no less when an arrest is effected by a robot (indeed, conceivably this danger might be heightened). Again, we note that we are looking into the future — while today's police robots can be used to assist in arrests, they currently are not conducting arrests independently (although today's robots can be used for protective sweeps).

In short, extending existing rules to robots might prove impactful and could be done with relative ease, if lawmakers know the right questions to ask.

But a caveat is in order: extending existing rules to robots, while a step in the right direction, would not go far enough. For one, police are vastly underregulated along a number of dimensions. There are, moreover, harms unique to police robots which would not be addressed adequately through existing rules governing officer conduct. Parity is not enough; what ultimately is needed is a broader regulatory framework — the topic to which we now turn.

C. What regulation might look like

In this section, we set forth a vision for what regulation of policing robots might look like. It is not intended to be comprehensive — rather, our purpose is to propose a series of robust safeguards which, if implemented, would do much to mitigate some of the most serious risks of police robots.

i. Transparency

Transparency is the foundation of democratic governance. Without adequate information, the public cannot have informed opinions, and legislatures cannot make informed decisions. Yet policing agencies often fail to disclose basic information about their use of technology — from how much data is retained to which offenses the technology is used to investigate.

Lawmakers should require agencies deploying robots to adopt transparency portals or data dashboards — online pages disclosing aggregated information about the use of these tools. Chula Vista's dashboard for its DFR program discloses, among other things, the number and types of calls responded to and the average response time; the agency also publishes flight history maps.[112] The nature of the data disclosed should depend on the particular function the robot is performing

[110] Maryland v. Buie, 494 U.S. 325 (1990).
[111] Miranda v. Arizona, 384 U.S. 436 (1966).
[112] CITY OF CHULA VISTA, supra note 32.

— a dashboard for law enforcement robots, for example, might indicate the number of citations issued broken down by offense type, as well as data reflecting the general locations where the robot has taken enforcement action.

A particular area of focus should be transparency around the data reflecting whether police robots are accomplishing their stated goals. At present, a lack of data regarding efficacy has allowed vendors to make unsubstantiated claims about their products — for example, Knightscope's claim that the use of K5 robots in Huntington Park reduced crime reports by 46 percent. Social scientists should determine the types of data needed for a robust assessment of efficacy, and this data should be collected and disclosed by agencies.

ii. Legislative authorization

All too often, policing agencies deploy new technologies with little in the way of legislative oversight. When, for example, the NYPD acquired K5 and Spot robots, it did so without any authorization or appropriations by the New York City Council (as the NYPD paid for the robots with funds derived from civil asset forfeiture). Likewise, when police in Asheville introduced their DFR program, they did so with "no clear opportunities for public engagement" or "mentions of the drone program launch on any local public safety committee agenda."[113]

It is a foundational principle of American governance that executive agencies must have legislative authorization for their activities.[114] Whether to deploy technologies that could abridge individual rights and liberties is a substantial policy question for the people's elected representatives to decide.

As straightforward as this principle may seem, we note three complications. First, it may well be the case that certain types of police robots (or uses for robots), but not others, will require authorization. When police activity has been subject to legal challenge on the ground that it is unauthorized, courts have taken different approaches. In some cases, courts have held that police exceeded their authority; in other cases, courts have found the challenged activity to be within the scope of the initial grant of authority charging police with enforcing the laws and preserving the peace.[115] Although it is not fully apparent what leads courts to decide the question in one way or the other, factors such as the impact of the practice on civil rights and civil liberties and whether the practice has widespread acceptance may be relevant factors.[116] Thus, courts may well conclude that the use of EOD robots for bomb disposal does not require democratic authorization, but the use of force-equipped robots does.

Second, there is the question of where regulation should take place. One approach might be to enact state-level regulation which in turn requires local policing agencies to obtain approval from their local legislative body prior to the deployment. For example, California Assembly Bill 79

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[113] Laura Hackett, *Asheville police say drones help with officer shortage downtown, but program operates with lack of transparency and community input*, BLUE RIDGE PUB. RADIO (Aug. 3, 2023), *https://www.bpr.org/bpr-news/2023-08-03/asheville-police-say-drones-help-with-officer-shortage-downtown-but-program-operates-with-lack-of-transparency-and-community-input*.

[114] Barry Friedman & Maria Ponomarenko, Democratic Policing, 90 N.Y.U. L. REV. 1827 (2015).

[115] Barry Friedman, *Lawless Surveillance*, 97 N.Y.U. L. REV. 1143, 1185-87 (2022).

[116] Id. at *1186.*

would require local democratic authorization prior to the deployment of force-equipped robots.[117] The downside to this approach is that legislation is difficult to enact — the legislative process often is slow and cumbersome; requiring authorization at two different tiers of government may prove too onerous. Conceivably, regulation could take place at the state level with discrete issues reserved for local governments — for example, decisions about where in a community police robots are deployed.

Third, it is important to recognize that statutory definitions of robot will become obsolete as technology advances.[118] The field is evolving quickly, and for that reason the nature of these tools and how they might be used is in constant flux. There is a sense, however, in which the obsolescence of these statutory definitions may come to be seen as a virtue. This may seem at first counterintuitive, given the focus on "future-proofing" regulation of technologies used in the private sector.

But, as we have noted, police are situated differently than the private sector — they are executive agencies, and the legitimacy of their activities — including the decision to deploy robots — is contingent on their having received democratic authorization to do so.[119] The question of whether to authorize police to deploy a particular type of robot, for how long, for what purposes, and on what terms, is for democratically-accountable bodies such as city councils to decide. With this principle in mind, lawmakers should pursue narrow definitions of police robots and authorize only those robots so defined. When technology inevitably progresses and police seek to acquire new types of robots whose capabilities unsettle assumptions upon which existing authorizations are based, the solution is for police to seek new authorizations, returning the issue to policymakers who are held accountable to the public. Narrowly-tailored definitions and authorizations of police robots will help to ensure that this occurs.

iii. Diversion to non-police agencies

As we saw in our discussion of DFR programs, one of the great advantages of robots is that they enable responders to make an initial assessment about a situation without putting themselves in harm's way. And, as we have said, if robots obviate the need to send people into harm's way, the argument for those responders being the police is vastly diminished.

Lawmakers should use the advent of DFR programs as an opportunity to start diverting certain types of calls to non-police responders. Legislation might require such diversion in some situations — for example, calls relating to drug use or mental health issues — once a drone has responded and operators establish there is no imminent public safety threat. Diversion should be used as a key metric by which to measure the efficacy of DFR programs, and data reflecting this should be collected and published by agencies.

iv. Video recording

[117] A.B. 79 (Cal. 2023).
[118] Casey & Lemley, *supra* note 2.
[119] Friedman & Ponomarenko,, *supra* note 120.

Given that police robots often are equipped with video cameras, one question which has arisen is whether they should be permitted, prohibited, or required to record video during deployments. The debate is not unlike the one surrounding body-worn cameras when their use became widespread — proponents argued that the cameras were a crucial tool for police accountability, while opponents noted the potential risks of expanded police surveillance.

There is good reason to be concerned about police robots becoming a tool for police surveillance — even when surveillance is not their stated purpose. As the ACLU argues in a recent report about DFR programs, "[t]he more that drones are crisscrossing a community, the more of everyday life they have the potential to record."[120] The report concludes that drones should not record while en route to an emergency.[121] Still, there is a strong case to be made for such recording — aside from the fact that recording can serve as a deterrent to misuse, it may be prudent to have a video record given the potential for operational issues such as collisions which may cause injuries or property damage.

One approach might be to require operators to record video during the entirety of deployments, but to delete the data after a specified retention period unless it relates directly to an investigation. There also should be strict rules around the use of computer vision technologies to detect individuals or conduct — a point to which we will return in a moment. And, as with body-worn cameras, there should be policies requiring the public release of certain videos, such as videos capturing the use of force by officers.

v. Data regulation

Relatedly, there are important questions which must be answered around how data collected by robots is stored, retained, and used.

As patrol robots have evolved, they have begun to incorporate previously discrete surveillance technologies — from thermal imaging to license plate and facial recognition. These robots are not mere cameras on wheels. The sophisticated analytics used by patrol robots, potentially enabling the identification of individuals and their activities and movements, give rise to serious privacy concerns.

What should be clear from all of this is that there must be guardrails around data. Access to data should be predicated on compliance with procedural requirements set forth in statute. These requirements should vary depending on the nature of the data accessed.

Telemetry, GPS, and other device-related data not connected to any individual might be subject to the fewest restrictions. Any data necessary to operate the robot itself should not be subject to onerous requirements provided the robot is being used for a legitimate law enforcement purpose. Minimally-processed video data (e.g., raw video, or video merely compressed or resized) should also have relatively few restrictions, but should be subject to retention periods as discussed above.

[120] Stanley, *supra* note 32.
[121] Stanley, *supra* note 32.

The calculus changes with the addition of analytics, such as license plate recognition, which enable police to identify and track individuals. The guiding principle should be that as more data is accumulated about a given individual, the procedural requirements for accessing that data should become more stringent. For example, when police seek to use robotically-collected data to track the locations and movements of an individual over time, a warrant should be required to access that data.

Special rules are necessary for the use of robots in and around the home. A warrant should be required to operate a robot within one's home without consent, and outside of one's home in certain circumstances — for example, when a robot is used in conjunction with thermal imaging or sensors capable of detecting odors such as drugs or explosives.[122] For drones, existing Fourth Amendment caselaw on police overflights may prove insufficient — given the zooming capabilities of many modern drones, which can enable police to observe well into the interior of a home, lawmakers may well conclude that a warrant should be required to conduct such surveillance.[123]

Finally, data should be subject to reasonable retention limits. After the retention period has elapsed, data should be permanently deleted or logically deleted — that is, rendered inaccessible and unsearchable unless the procedural requirements for accessing that category of data have been met.

vi. Autonomous weapons

On the question of use of force, a strong line must be drawn at autonomous weapons. The development of lethal autonomous weapon, or "LAWs," in the military context raises the specter of such weapons one day being deployed by domestic police.

The notion of LAWs being deployed by policing agencies should be considered a non-starter. There is, of course, the very real risk of malfunctions resulting in innocent lives being lost. Moreover, policing in the United States is plagued by deep accountability deficits, which would be deepened still by the advent of LAWs. Consider, for example, the doctrine of qualified immunity, which shields police from liability for violating individuals' rights unless such rights are clearly established. The factual and legal novelty of the scenarios which would be presented by police deployment of LAWs would all but guarantee that serious harms would go unaccounted for.

vii. Use of force, generally

Moving beyond LAWs, there is a strong case to be made that police robots should not ever be weaponized to any extent. As discussed above, the unique dynamics of robotic force could lead to dehumanization and increased use of force overall. In 2022, Axon Enterprise's AI Ethics Board rejected the company's proposal to develop Taser-equipped robots citing entrenched structural problems in American policing, including the lack of effective oversight and the various ways in

[122] Kyllo v. United States, 533 U.S. 27 (2021); Florida v. Jardines, 569 U.S. 1 (2013); Rebecca Martinez, *Duke Lab Develops Robotic Nose That Can Detect Drugs*, WUNC (Nov. 29, 2018), https://www.wunc.org/science-technology/2018-11-29/duke-lab-develops-robotic-nose-that-can-detect-drugs-explosives.
[123] Cf. United States v. Taborda, 635 F.2d 131 (2d Cir. 1980).

which police are shielded from liability for wrongdoing.[124] Citing concerns about the potential for misuse and other ethical issues, Boston Dynamics, along with five other leading robot vendors, pledged not to weaponize its robots and to review "customers' intended applications to avoid potential weaponization."[125]

But there may be great pressure in the coming years to weaponize robots. As Elizabeth Joh observes: "Once the first crimes are committed by robots armed with lethal force, police in the United States will almost certainly balk at any prohibitions on lethally armed police robots." The argument may be largely a rhetorical one — police concern over force asymmetry would make sense only to the extent that a force-equipped robot could disable another force-equipped robot — but it is an argument which may prove persuasive to some. Moreover, changes in public attitudes — consider, for example, a scenario in which police were barred from using a force-equipped robot which if deployed could have saved many lives — could create a rush to de-regulate, leaving things worse off than were we to implement smart regulation from the outset.

As with many debates over policing technologies, different jurisdictions will come to very different conclusions about whether to permit force-equipped robots. Policing regulation is fragmented — absent federal action, we will likely see states and localities experiment with a variety of approaches. Some jurisdictions have already considered force-equipped robots and rejected them. Other jurisdictions might authorize robotic force in narrow circumstances — for example, in response to a barricaded active shooter. Still others might embrace robotic force more whole-heartedly.

No matter the approach, regulation in this area should be guided by the principle that robotic use of force standards must be far more stringent than those applicable to human officers. First, because the operator of a robot is not in harm's way, there should be strong de-escalation requirements. Second, lawmakers might consider authorizing robotic force only in those situations in which it would enable the substitution of less-lethal force for lethal force. Third, new use-of-force guidelines will need developed, and operators should be locked out of deploying a weapon until a supervisor has approved the use of force and certified compliance with those guidelines. And fourth, all uses of force should be subject to independent and public after-action reviews.

This is emphatically not to say that police should deploy force-equipped robots. But it is a recognition of the fact that we likely have not seen the last instance of robotic use of force. Without rigorous standards guiding the development of policy around this issue, policing agencies will play by their own rules. This must be avoided.

viii. Rules around enforcement

As noted above, one consequence of robots enforcing the laws is that we may enter an age of perfect or near-perfect enforcement. This will require lawmakers to consider which types of laws should be perfectly enforced, in view of the potential harms of overenforcement.

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[124] FRIEDMAN ET AL., *supra* note 48.

[125] General Purpose Robots Should Not Be Weaponized, BOSTON DYNAMICS, https://bostondynamics.com/news/general-purpose-robots-should-not-be-weaponized/.

A middle-ground between perfect enforcement and no enforcement would be enforcement with a specified amount of leeway. For example, automated traffic enforcement systems can be configured to issue a ticket only when a vehicle exceeds the speed limit by ten miles per hour. For robots, thresholds could be set to distinguish, for example, petty littering from serious illegal dumping; a robot could be configured to ticket a parked vehicle in a no-standing zone, but only after fifteen minutes, or only for repeat offenders.

Better enforcement might also occasion a reassessment of what penalties should be levied for violations. On one view, we might want to keep existing penalties intact because certain conduct is worthy of a strong sanction. But it also is possible that in enacting some criminal codes, lawmakers sought to achieve a particular level of deterrence, which is being upset by technological advances. That is, penalties force scofflaws to internalize costs, with the level of deterrence determined by the amount of the penalty and the likelihood of enforcement. To maintain existing levels of deterrence in light of increased enforcement, the amount of the penalty may need changed.

ix. Deployment decisions

Although a potential benefit of police robots is their lack of discretion, police still may have discretion in choosing where to deploy the robots. Policing technologies often are deployed disproportionately in communities of color and lower socioeconomic status. It is perhaps telling, for example, that two early deployments of the NYPD's Digidog robot were in a Bronx neighborhood and a Manhattan housing project, both of which received much public scrutiny. How best to address this issue is a challenging question; the problem is in essence an efficiency-equity trade-off, with police claiming they need to deploy the technology in the most troubled areas and opponents arguing that their already overpoliced communities are being unfairly and disproportionately impacted.

This important policy tradeoff should be addressed in regulation crafted by democratically-elected lawmakers, not left to the discretion of policing agencies. As previously mentioned, this regulation might take place at the local level, with the policymakers most familiar with the region and its problems. But at a minimum, state-level legislation should require agencies to be transparent about where they are deploying policing technologies so that informed debate can follow. Remarkably, many agencies refuse to disclose even the general locations of their surveillance technology. That should change.

x. Vendors

Vendors, too, should be regulated along a number of dimensions. Safety thresholds should be established and vendors should be required to institute "Know Your Customer" programs, vetting agency customers before agreeing to sell to them. Companies should have the means to disable or claw back robots from agencies using them in an inappropriate manner. There should be clear regulatory guidance regarding the efficacy claims vendors are permitted to make about their products, and causes of action against vendors for false claims should be established. And, although it is beyond the scope of this paper, what may ultimately be needed is a licensing regime

for police robots, administered by a government agency capable of thoroughly testing and vetting products before they come to market.

D. Remedies

When things go wrong with police robots — as they inevitably will, at least on occasion — the question then becomes how the resulting harms will be redressed. This is a complex question which turns on a great number of variables, including the type of agency (state/federal), the type of conduct at issue (e.g., negligence, intentional torts, constitutional torts), the cause of action, and so forth. Our goal here is not to unpack all of these intricacies, but to consider how the advent of police robots adds another layer of complexity to this question and how this might be addressed.

We begin with a discussion of qualified immunity, a doctrine which immunizes police from liability unless they have violated a "clearly established" statutory or constitutional right.[126] Qualified immunity is enormously consequential in litigation involving police and will undoubtedly affect the extent to which victims can recover for harms caused by police robots. Next, we turn to the question of whether police or vendors should be held liable for harms caused by police robots. Finally, we address the likelihood that even with strong safeguards in place, police robots will still cause harms which will not be redressed sufficiently in the courts. We propose a novel solution: a mechanism for compensating victims of police robots outside of the legal system.

1. Immunities

Police are seen by many as a necessary institution in society, yet one which sometimes causes harm. Thus, the courts have developed the doctrine of qualified immunity, which shields officials, including police, from liability unless they have violated a "clearly established" statutory or constitutional right.[127] The purpose of this immunity, the Supreme Court has said, is to balance the need to protect the rights of citizens with the need to encourage "vigorous exercise of official authority" and to afford officials who must exercise discretion "breathing room" to make reasonable but mistaken judgments about the law.[128]

The Supreme Court has set forth a two-step test for resolving qualified immunity claims. First, a court must determine whether the facts alleged by the plaintiff make out a violation of their statutory or constitutional rights.[129] Second, the court must determine "whether the right at issue was 'clearly established' at the time of the defendant's alleged misconduct."[130] Qualified immunity, the Court has said, "provides ample protection to all but the plainly incompetent or those who knowingly violate the law."[131]

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[126] *See* Harlow v. Fitzgerald, 457 U.S. 800 (1982).
[127] *See id.*
[128] *See id.* at 807; Ashcroft v. al-Kidd, 131 S. Ct. 2074, 2085 (2011).
[129] Pearson v. Callahan, 555 U.S. 223, 230-31 (2009).
[130] Id. at 816.
[131] Malley v. Briggs, 475 U.S. 335, 341 (1986).

In practice, qualified immunity precludes recovery unless the right in question has been established by precedent on nearly identical facts. Consider, for example, the case in which a plaintiff sought compensation for injuries caused by a police dog.[132] Although a previous case had established that police may not release a police dog on a subject who is lying down, this was deemed insufficient to "clearly establish" that police could not release a police dog on the plaintiff, who had been sitting with his arms raised.[133]

Qualified immunity raises serious doubts about whether individuals harmed by police robots will be able to recover compensation. As police robots evolve, they continually will present unique facts and legal questions which courts have not addressed. Each new analytic, capability, or use case might present another reason why previous precedents are deemed insufficient to "clearly establish" the plaintiff's rights.

One consequence of this is that litigation involving police robots may come to focus on the vendors that develop these tools. As detailed further below, suits might allege that police robots have been designed unreasonably, failing to account for foreseeable risks of harm. And should courts accept such claims (and should vendors not themselves be immunized through future legislation), litigation could have a significant impact on certain segments of the police robot industry, perhaps even rendering them non-viable for a time.

2. Assigning liability

Assuming that a victim of police robots clears the hurdle of qualified immunity, there is still the question of whether police are truly at fault, as opposed to the manufacturer of the robot. This is a particularly thorny question. As we discussed, robots are "unpredictable by design," especially to the extent that they are not instructed in how to perform each task, but rather are given goals and training to accomplish those goals.[134] If a robot's behavior is to some extent unpredictable, how should police be held liable for their use?

a. On self-driving cars

Important insights may be drawn from the literature on self-driving cars. First, the nature of a system's autonomy may bear on the question of liability. For example, the driver of a vehicle with technology which merely assists the driver may bear some responsibility for a crash, but in the case of a fully autonomous vehicle which the driver does not control, it is the vendor who generally should be held liable.[135] Another insight is that tort law's focus on fault and moral culpability may be inapposite in the self-driving car context. A regulatory approach in which liability is premised on how safe the product is compared to comparable products — a "robotic reasonableness test" — may be more fitting.[136]

[132] Baxter v. Bracey, 751 Fed. Appx. 869 (6th Cir. 2018).
[133] *See id.* at 872.
[134] *Id.*
[135] Mark Geistfeld, *A Roadmap for Autonomous Vehicles: State Tort Liability, Automobile Insurance, and Federal Safety Regulation*, 105 CALIF. L. REV. 1611 (2017).
[136] Casey & Lemley, *supra* note 2.

A third, intriguing, proposal is to adapt the doctrine of *res ipsa loquitur* — a rule under which negligence may be inferred from the nature of an accident — to the robots context.[137] Courts might "look to the events surrounding the accident to infer whether the robot's code was faulty or not," using the data captured by the robot.[138] When one is harmed by a robot and there is no evidence that they themselves acted negligently, this would allow plaintiffs to make a prima facie case against vendors.[139] Vendors then could produce exculpatory evidence rebutting the inference.[140]

These frameworks are useful in thinking through liability rules for police robots, but here we note two complications. First, the relationship between vendor, operator, and victim is different in the policing context than in the self-driving car context. The harm from police robots often will arise from intentional conduct aimed at the victim — for example, an instruction to deploy force — bringing questions of the operator's ends and means into play.

Second, a key premise of self-driving cars is that, in general, they are safer than human drivers. This does not necessarily hold in the policing context. Self-driving cars make judgments about, for example, the location of objects in space, and as to these and similar tasks they outperform humans. But a great deal of police work involves making judgments about human nature — whether a person is acting suspiciously, whether they pose an imminent threat, whether they are engaged in deception, and so on — and there is no evidence robots outperform humans on this front. And so, while automating a patrol route may well be justified, automating higher-order policing activity is not (at least at present). Accordingly, what we should seek to do is create strong incentives to ensure police do not over-automate their jobs and always exercise close supervision over robots. Perhaps here, unlike in the self-driving car context, higher levels of automation should occasion more liability for operators, not less.

b. Three types of robotic harms

One approach to this dilemma might be to distinguish between three different types of harms resulting from police robots.

First, harm might arise when a police robot works as designed, but the ends to which police put the robot was harmful. For example, suppose that police used robotic force maliciously against a suspect, in violation of applicable policy and Fourth Amendment requirements. Here, police are orchestrating the harmful conduct and should be held liable. We might treat, therefore, the robot as the officer's agent, acting on their behalf and exposing them to liability for harm caused.[141]

Yet in some cases, a particular harm, although one directed by police, may be so foreseeable that we might consider a claim against the vendor for their failure to implement a reasonable alternative design.[142] For example, suppose that a pattern of harmful use of a force-equipped robot emerged, and the vendor should have foreseen that future injury would occur absent the development of a

[137] *See* Bryan Casey, *Robot Ipsa Loquitur*, 108 GEO. L.J. 225 (2019).
[138] *See id.* at 273.
[139] *See id.* at 275–76.
[140] *Id.*
[141] Calo, *supra* note 4.
[142]Geistfeld, *supra* note 141.

lockout mechanism, which the vendor failed to develop. Holding the vendor liable for failing to develop a safety mechanism will help create appropriate incentives to develop such mechanisms in the future, much in the same way that a firearm vendor may be held liable for failing to incorporate safety features.[143]

A second harm, which we touched upon briefly in Part II.B, arises when police give their robot an appropriate task, but the robot malfunctions. For example, consider a scenario in which police direct a robot to conduct a patrol and the robot collides into a bystander, injuring her. This scenario is more closely analogous to self-driving cars, and we might apply some of the frameworks developed in that context — for example, a presumption against vendors absent evidence of negligence by the victim.

But in some such cases, we still might hold police liable — for example, if police direct a robot to perform a task for which it was not designed. Or if police deploy a robot in circumstances in which there is a great risk of danger to bystanders were a malfunction to occur. The NYPD's deployment of a nearly 400-pound autonomous patrol robot in the Times Square Subway Station — a densely crowded station with narrow platforms and deeply recessed tracks into which people may fall — comes to mind.[144]

A third harm results when police put their robot to an appropriate task and the robot succeeds in accomplishing that task, but in an unpredictable way which causes harm. For example, consider a scenario in which police ask a robot to stop a bank robbery, and the robot does so by blowing up the bank. Or, more realistically, if the robot successfully chases and detains the robber but in a dangerous way which causes injury to bystanders.

Here, perhaps both police and vendor should be liable. The vendor, as discussed, has responsibility for ensuring the safety of its products. But the failure to closely supervise the robot created a foreseeable risk of harm, resulting in the victim's injury. Again, we should seek to deter police from seeking to automate higher-order policing functions and should give them appropriate incentives to closely monitor and direct police robots. When police do otherwise, resulting in harm, they should perhaps be held liable — higher levels of autonomy increasing, not decreasing, the operator's liability.

3. The design-to-deployment disjunction

Even with sound policies in place, there is still a very real risk that police robots will cause harms which will not be redressed sufficiently in the courts. Indeed, this is a persistent problem afflicting policing technologies — even carefully designed safeguards sometimes fail to prevent harms and victims are left without recourse. Often this is due to the particular social and legal contexts in which technologies are deployed.

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[143] David Elman & Samantha Bonanno, Failure to Implement Safety Technologies Raises Design Defect Claim, AM. BAR ASS'N (Apr. 6, 2021), https://www.americanbar.org/groups/litigation/committees/mass-torts/practice/2021/failure-to-implement-safety-tchnologies-raises-design-defect-claim/.

[144] Mayor Adams Makes Public Safety Announcement With NYPD Commissioner Sewell, NYC.GOV (Apr. 11, 2023), https://www.nyc.gov/office-of-the-mayor/news/246-23/transcript-mayor-adams-makes-public-safety-announcement-nypd-commissioner-sewell.

We have already discussed one example of this: qualified immunity shields officials from liability unless they have violated a "clearly established" statutory or constitutional right. Therefore, even if police cause harm through their use of robots, the novel facts that such scenarios would present might immunize police from liability and leave victims without recourse. Relatedly, laws which provide remedies against police for their misconduct may provide far less deterrence than might be assumed. In practice, police indemnification ensures that officers rarely will be held financially liable, upturning an assumption upon which many civil rights laws are based.[145]

Likewise, clear policies and standards around new policing technologies are essential, but they are no panacea. Training, experience, and culture will all play a key role in determining whether these tools are deployed responsibly.[146] As discussed, there is wide variation among policing agencies with respect to capacity and sophistication — that certain agencies use robots with appropriate restraint does not ensure that others will.[147] There is, moreover, a real question regarding the institutional competence of the courts to adjudicate claims arising from new police technologies.[148]

No matter how heavily they are regulated, police robots will have the potential to cause harm. The accountability gaps described above might suggest that we need an alternative, or at least supplemental, system which could compensate victims for the harms caused by police robots — both physical harms and harms to constitutional rights — while incentivizing vendors and agencies to mitigate such harms as they arise.

We might look outside of the world of policing technology for guidance. In fact, there is another class of technology which can produce enormous safety benefits, but which can cause serious harm. This is so despite tremendous regulatory scrutiny — more so than the vast majority of products coming to market. And efforts to redress these harms through the legal system have proven problematic, necessitating a separate system of redress. Here, we are talking of vaccines.

Vaccines are a highly valuable and life-saving technology. Millions of Americans are vaccinated each year with no serious issue. Yet, in rare cases, vaccines can cause serious injury or even death.

In the 1980s, Congress created the "National Vaccine Injury Compensation Program," or "VICP."[149] The VICP is described as a "no-fault alternative to the legal system for resolving vaccine injuries" and is paid for by a tax on vaccines.[150] Individuals may file a petition with the U.S. Court of Federal Claims which determines an individual's eligibility for compensation after assessment by the Department of Health and Human Services and Department of Justice.[151]

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[145] Joanna C. Swartz, *Police Indemnification*, 89 N.Y.U. L. REV. 885 (2014).
[146] Hoang Pham, How Police Avoided Liability for Tasing a 17-Year-Old Girl Having a Seizure, STAN. CTR. FOR RACIAL JUST. (Nov. 14, 2022), https://law.stanford.edu/2022/11/14/how-police-avoided-liability-for-tasing-a-17-year-old-girl-having-a-seizure/.
[147] FRIEDMAN ET AL., *supra* note 48.
[148] *See* Paul W. Grimm et al., *Artificial Intelligence as Evidencce*, 19 Northwestern J. of Tech. & Intellectual Prop. at 64 (2021).
[149] *See National Vaccine Injury Compensation Program*, HEALTH RES. & SERVS. ADMIN., https://www.hrsa.gov/vaccine-compensation (last visited Aug. 30, 2023).
[150] *See id.*
[151] *See id.*

In the same vein, a fund could be created to compensate those harmed by police robots, paid for by the vendors and purchasers of these tools. Like the VICP, claims could be adjudicated by a legislative court, with doctrines such as qualified immunity being inapplicable as the claim is being made against the fund. In order to give both vendors and agencies sufficient incentive to mitigate harm, the amount of the tax could be fixed product-by-product by regulators, taking into account statutory criteria such as the product's feature set, implementation of safety mechanisms, and the value of past successful claims made against that vendor or class of robot. This would incentivize vendors to implement stricter safeguards proactively, counteracting market pressures and hopefully motivating vendors to vet more carefully to whom they sell their products.

An alternative to a compensation fund might be a form of government-administered insurance, such as the Federal Deposit Insurance Corporation, which supplies deposit insurance to banks (another heavily regulated industry).[152] Premiums could again be based on the nature of the technology, the safeguards implemented, and past claims against the vendor or class of robot.

Either way, participation in such a scheme could be mandatory; alternatively, vendors could be induced to participate through the creation of a safe harbor for participating vendors. This system also could offset recoveries to account for any legal claim a victim successfully pursues in litigation against police or a vendor so as to prevent double-recovery.

To be sure, this would not solve all of the problems of police robots, nor would it obviate the need for regulation in legislatures and litigation in the courts. But if implemented well, it would go a long way towards redressing the harms which inevitably will occur with police robots' widespread adoption.

Conclusion

What we have sketched out in this Article is a roadmap for the regulation of police robots. And, as we hopefully have made clear, the need for such regulation is urgent.

As we have previously written, that policymaking is failing to keep pace with advances in police technology has achieved the status of cliché.[153] States still are struggling to enact regulation of automated license plate readers — a technology first deployed in the 1980s.[154] We must not repeat the same mistake here.

Policing touches all of our lives, and so too will police robots. The consequences of allowing these tools to be deployed and become entrenched in our society, without democratic oversight and sound regulation, are too great to abide. The time for regulation is now.

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[152] *See About*, FED. DEPOSIT INS. CORP., https://www.fdic.gov/about (last visited Aug. 30, 2023).
[153] Friedman et al., *supra* note 98.
[154] Marcia Wendorf, *Automated License Plate Readers: Are We Sacrificing Privacy for Security?*, INTERESTING ENGINEERING (Jan. 1, 2020), https://interestingengineering.com/innovation/automated-license-plate-readers-are-we-sacrificing-privacy-for-security.