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### Tightening the OODA Loop: Police Militarization, Race, and Algorithmic Surveillance

Jeffrey L. Vagle

*University of Pennsylvania Carey Law School*

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# TIGHTENING THE OODA LOOP: POLICE MILITARIZATION, RACE, AND ALGORITHMIC SURVEILLANCE

Jeffrey L. Vagle\*

*This Article examines how military automated surveillance and intelligence systems and techniques, when used by civilian police departments to enhance predictive policing programs, have reinforced racial bias in policing. I will focus on two facets of this problem. First, I investigate the role played by advanced military technologies and methods within civilian police departments. These approaches have enabled a new focus on deterrence and crime prevention by creating a system of structural surveillance where decision support relies increasingly upon algorithms and automated data analysis tools and automates de facto penalization and containment based on race. Second, I will explore these militarized systems, and their effects, from an outside-in perspective, paying particular attention to the racial, societal, economic, and geographic factors that play into the public perception of these new policing regimes. I will conclude by proposing potential solutions to this problem that incorporate tests for racial bias to create an alternative system that follows a true community policing model.*

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## INTRODUCTION

As militaries transition from a war footing to a postwar posture, they inevitably shed excess equipment and technology that is outdated, no longer needed, or too expensive to maintain. In the drawdown from the wars in Iraq and Afghanistan, the U.S. military found willing recipients of this material in local and state police departments. In addition to these technology transfers, local police departments have increasingly adopted military tactics, techniques, and procedures (TTPs)—originally conceived and designed for military units in combat operations—for use in their day-to-day policing. This combination has led to the overall militarization of civilian police forces in the United States, putting wartime tools in the hands of peace officers.

This trend toward police militarization has found enthusiastic support from departments adhering to the “broken windows” theory of policing, especially with respect to technologies and TTPs meant for intelligence analysis or surveillance purposes. The locus of this relationship can be found in the information-centric approaches found in broken windows policing and other zero-tolerance, quality-of-life police programs. Since military intelligence has long prized information-centric methods as critical to the goal of actionable intelligence, militarized systems and approaches appear to be a perfect fit to modern policing. This phenomenon may be seen as the natural result of the industrial and post-industrial society’s desire to maximize control and efficiency—across all spheres of life—through careful observation and data analysis. While advances in policing techniques have garnered many societal benefits, they have also established a system of structural surveillance that has entered a renaissance with the help of military technologies. Automated surveillance analysis systems, developed in the wake of 9/11, have given police departments a powerful toolkit to advance algorithmic policing strategies.

But these algorithmic approaches too often target poor and minority communities, inserting a de facto racial component into the system, even when the automated intelligence systems are fed “objective” crime data. For example, in a recent investigation of software used by state and local criminal justice authorities to predict the risk of recidivism of those booked into city and county jails, researchers found that these algorithms were not only wildly inaccurate in their assessments, but were also highly

likely to falsely flag Black defendants as future criminals.<sup>1</sup> Algorithmic “scoring” mechanisms like this are becoming increasingly common tools for criminal courts and law enforcement, which are seeking an information-based advantage in the control of criminal activity. These programs have become so popular, in fact, that Congress is considering mandating their use in federal prisons.<sup>2</sup>

This Article examines how military automated surveillance and intelligence systems, when used by civilian police departments to enhance predictive policing programs, have reinforced racial bias in policing. I will focus on two facets of this problem. First, my research studies the role played by advanced military technologies and methods within civilian police departments. These methods have enabled a new focus on deterrence and crime prevention by creating a system of structural surveillance where decision support relies increasingly upon algorithms and automated data analysis tools, and which automates de facto penalization and containment based on race. Second, I will explore these systems, and their effects, from an outside-in perspective, paying particular attention to racial, societal, economic, and geographic factors that play into the public perception of these policing regimes. I will conclude by proposing potential solutions to this problem that incorporate tests for racial bias to create an alternative system that follows a true community policing model.

## I. THE MILITARIZATION OF POLICE INTELLIGENCE OPERATIONS

The militarization of civilian law enforcement agencies (LEAs) has long been viewed as anathema to the founding principles of the United States and corrosive to civil liberties in a constitutional democracy generally.<sup>3</sup> Paradoxically, contemporary American society has increasingly taken a distinctly militaristic approach to solving its (non-military) political, social, and economic issues, applying war metaphors to programs and policies to emphasize the seriousness of the problem and the approach to it, for example, the “war on drugs” or the “war on poverty.”<sup>4</sup> These mixed signals have been the backdrop to a steady increase in the militarization of U.S. civilian police forces post-World War II, with racial tensions, “broken

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1. See Julia Angwin et al., *Machine Bias: There's Software Used Across the Country to Predict Future Criminals. And it's Biased Against Blacks*, PROPUBLICA (May 23, 2016), <https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing> (last visited June 28, 2016).

2. *Id.*

3. See Phillip T. Wyrick, *Police Militarization: Attitudes Towards the Militarization of the American Police* (May 2013) (unpublished M.A. thesis, East Tennessee State University) (on file with Digital Commons, East Tennessee State University), <http://dc.etsu.edu/etd/1161/>.

4. See Peter B. Kraska & Victor E. Kappeler, *Militarizing American Police: The Rise and Normalization of Paramilitary Units*, 44 SOC. PROBS. 1, 1 (1997) (“This attention to medicalization neglects other social problems metaphors, particularly the metaphor of war (e.g., the War on Poverty, the war on drugs).”).

windows policing,” the “war on drugs,” and the “global war on terror” acting as the primary catalysts of this phenomenon.<sup>5</sup> The most visible aspect of police militarization can be seen in the increased deployment within LEAs of weapons, equipment, and training designed for use in combat by militaries.<sup>6</sup> While these manifestations might be the most outwardly obvious signs of this militarization trend, there is a more basic facet of it that LEAs have almost universally adopted: intelligence operations.<sup>7</sup>

#### A. *Military Intelligence and the Development of the OODA Loop*

The importance of intelligence operations to the military is a long accepted principle, since as often quite large and widely distributed organizations, militaries are expected to think and act as if they were a unitary being.<sup>8</sup> The pace, environment, and sheer horror of combat combine to create a state of near chaos — “the realm of uncertainty” —through which militaries are forced to navigate.<sup>9</sup> To mitigate at least some of the disorienting effects of warfare, modern militaries must organize themselves around rational, bureaucratic principles, with robust networks of communication and information management at their core.<sup>10</sup> Military command structures simply cannot function without the timely communication of information on a wide range of broad and narrow topics including terrain, troop strength and movements, civilian considerations, transportation networks, availability of supplies, enemy disposition and morale, weather and light conditions, and more—all in support of the theory that the better prepared and informed army has the advantage.<sup>11</sup> This general concept is

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5. *Id.* at 7-9; Amanda Geller & Jeffrey Fagan, *Pot as Pretext: Marijuana, Race, and the New Disorder in New York City Street Policing*, 7 J. EMPIRICAL LEGAL STUD. 591 (2010); Bernard E. Harcourt & Jens Ludwig, *Broken Windows: New Evidence from New York City and a Five-City Social Experiment*, 73 U. CHI. L. REV. 271 (2006); Jamila Michener, *Neighborhood Disorder and Local Participation: Examining the Political Relevance of “Broken Windows”*, 35 POL. BEHAV. 777 (2013); Steve Herbert, *Policing the Contemporary City: Fixing Broken Windows or Shoring Up Neo-Liberalism?*, 5 THEORETICAL CRIMINOLOGY 445 (2001).

6. Peter B. Kraska & Louis J. Cubellis, *Militarizing Mayberry and Beyond: Making Sense of American Paramilitary Policing*, 14 JUST. Q. 607 (1997).

7. Robert W. Taylor & Amanda L. Russell, *The Failure of Police “Fusion” Centers and the Concept of a National Intelligence Sharing Plan*, 13 POLICE PRAC. & RES. 184 (2012).

8. CARL VON CLAUSEWITZ, ON WAR 37-39 (Michael Howard and Peter Paret trans., 2007).

9. *Id.* at 46.

10. M. D. Feld, *Information and Authority: The Structure of Military Organization*, 24 AM. SOC. REV. 15, 17-19 (1959) (arguing that concept of bureaucratic organization is essential to efficient military operations, where the principles of military command require levels of predictability and control at a level of scalability that precludes ad hoc organization. Because warfare is, by nature, chaotic and corrosive to organization and communication, military organizations attempt to minimize these effects through levels of bureaucratic stability that enable information flow—one of the essential requirements of command.).

11. John A. Allen et al., *A Framework for Supporting Human Military Planning*, 2 ANN. CONF. INT’L TECH ALLIANCE 1, 1-8 (2008) (arguing that the hierarchical bureaucracy of mili-

often referred to as military intelligence, or more succinctly, “intelligence.”<sup>12</sup>

The term intelligence is not well defined, however, as it draws from a wide array of broader issues, such as strategy, command and control, and communications.<sup>13</sup> It is clearly more than an exhaustive cataloging of all available information. Even if this were possible, such a tool would quickly prove useless to militaries as their organizations became mired in irrelevant information, and would be forced to spend valuable time and resources ferreting out the useful bits.<sup>14</sup> Intelligence, therefore, must produce information in a form and quantity that can be used by the organization to make timely decisions regarding plans and operations. This characteristic is often summarized as “actionable” intelligence.<sup>15</sup> The goal of perfectly actionable intelligence is often unattainable, however, and is best thought of in aspirational terms.<sup>16</sup>

The industrialization of the 18th, 19th, and 20th centuries yielded paradigmatic advances in the technology and, subsequently, the conduct of warfare, which in turn brought with it the critical need for more rapidly-made decisions based on fresher, more accurate, and more detailed intelligence.<sup>17</sup> The United States military experience in Vietnam illustrated just how crucial intelligence and communications had become in modern war-

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tary organizations is based around the need to efficiently pass information, intent, plans, and commands up and down the chain of command that is both time sensitive and scalable to large organizations).

12. See MICHAEL I. HANDEL, *Intelligence and the Problem of Strategic Surprise*, in PARADOXES OF STRATEGIC INTELLIGENCE ESSAYS IN HONOR OF MICHAEL I. HANDEL 1, 1-58 (Richard K. Betts & Thomas G. Mahnken, eds., 2003).

13. See Michael Warner, *Wanted: A Definition of “Intelligence,”* 46 STUD. INTELLIGENCE, 1, 15 (2002).

14. See Robert L. Bateman III, *Avoiding Information Overload*, 78 MIL. REV., 53, 53 (1998).

15. Andrew Rathmell, *Towards Postmodern Intelligence*, 17 INTELLIGENCE & NAT’L SECURITY 87, 88-89 (2002).

16. In fact, as military intelligence related incidents involving torture, untruths, and censorship over the past decade have shown us, the remorseless pursuit of perfectly actionable intelligence has led to bloated military contractor budgets, loss of friendly and civilian life, and atrocities. See, e.g., Seymour M. Hersh, *Chain of Command*, NEW YORKER 38 (May 17, 2004).

17. Military theoreticians divide the history of modern warfare into four generations, each of which marked by technical, political, economic or social changes or advances. The first generation of modern warfare emerged with the widespread use of gunpowder and the shift in Europe from a feudal economy to the modern nation-state. Second generation warfare is identified with the nation-state’s ability to generate large revenue streams through widespread taxation on increasing wealth. The German Blitzkrieg is the starting point of third generation warfare, with high maneuverability being used to break the protracted impasses characteristic of World War I. Finally, fourth generation warfare—the mode in which theorists currently put us—is summarized by enormous advances in communications and weapon technologies along with the rise of guerilla movements and asymmetric warfare. See THOMAS X. HAMMES, *THE SLING AND THE STONE: ON WAR IN THE 21ST CENTURY* (Zenith Press 2006).

fare, where larger, better-equipped forces were often outmatched by much smaller, yet better informed, groups of guerrillas and regular army soldiers.<sup>18</sup> The post-Vietnam collapse of the U.S. military sent shock waves through the Pentagon, whose leadership began the arduous process of rebuilding a communications and intelligence centric army capable of fighting a fourth generation war.<sup>19</sup>

During this period of U.S. military restructuring, a U.S. Air Force combat flight instructor named John Boyd, long known by military strategists for his highly analytical approach to solving military problems, began development of a general theory of military organizational analysis and action. He sought to address the challenge of intelligence and communication in a fast-moving conflict.<sup>20</sup> As a veteran of air combat flying the F-86 Sabre in “MiG Alley” during the Korean War, Boyd knew well the challenge for fighter pilots of gathering, processing, and acting on information in a very short amount of time, all while flying an aircraft filled with jet fuel and munitions at hundreds of miles per hour, often while being shot at.<sup>21</sup> Boyd, a student not only of the great modern military theorists such as Clausewitz and J.F.C. Fuller, but also of philosophers, mathematicians, and physicists, including Kurt Gödel and Werner Heisenberg, actively sought out symmetries and commonalities in his analyses in an attempt to get at the true root of the problem at hand.<sup>22</sup> His multidisciplinary approach allowed him to extrapolate common principles from his experiences, and in 1976, he authored the first of five essays on the cognitive,

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18. A prime example of this phenomenon can be found in the January 1968 Tet Offensive, where North Vietnamese Army (NVA) and Viet Cong (VC) guerilla forces conducted a series of well-timed, highly-coordinated attacks on U.S. military installations and South Vietnamese government buildings across all of South Vietnam. While these attacks were ultimately repulsed by U.S. and South Vietnamese forces, the widespread effects of the offensive marked the beginning of the end of the American war in Vietnam. Historians and military theorists widely attribute much of the success of the outnumbered NVA and VC forces to poor U.S. military intelligence, which completely failed to anticipate the Tet Offensive as well as the military, political, and social costs that would follow from it. See JAMES J. WIRTZ, *THE TET OFFENSIVE: INTELLIGENCE FAILURE IN WAR* (1994).

19. See HARRY G. SUMMERS, *ON STRATEGY: A CRITICAL ANALYSIS OF THE VIETNAM WAR* (1995). “Fourth-generation warfare” is the term military analysts have used to describe the post-9/11 style of asymmetric war now seen, where the first-generation war was Napoleonic in nature, the second-generation war was Prussian, and the third-generation war was based on rapid maneuver.

20. See Scott E. McIntosh, *The Wingman-Philosopher of MiG Alley: John Boyd and the OODA loop*, 58 *AIR POWER HIST.*, 24, 24 (2011)

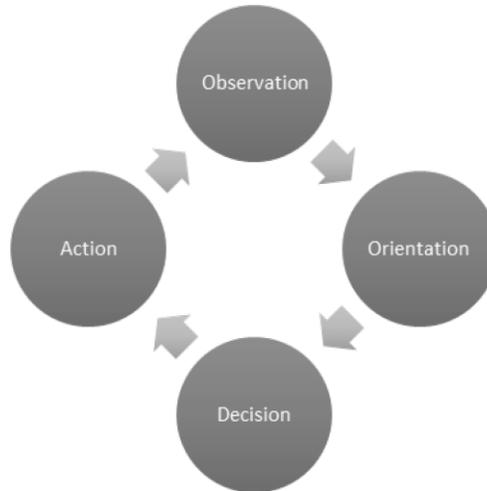
21. See DAVID S. FADOK, *JOHN BOYD AND JOHN WARDEN: AIR POWER’S QUEST FOR STRATEGIC PARALYSIS* (1995). It is somewhat noteworthy that Boyd himself shot down no enemy aircraft during his combat tour in Korea. This was due not to a lack of combat sorties—Boyd flew 22—but to the fact that all of his combat flights were as a wingman, rather than lead. His perspective and experience in this role, however, may well have given Boyd the insights he later developed in his military theories and instruction. See McIntosh, *supra* note 20.

22. See FADOK, *supra* note 21, at 14-15.

psychological, and temporal processes core to all military intelligence analysis and decision-making processes, from the highest command levels to the lowest.<sup>23</sup>

Boyd's described his groundbreaking theory as a cognitive cycle containing four tasks: Observation, Orientation, Decision, and Action (OODA) (see Figure 1).<sup>24</sup> These actions worked together to create a feedback loop that gave those who were more adept at accelerating this loop a tactical advantage over their less-nimble adversaries. As applied to Boyd's initial use of the term in aviation combat, a pilot first considers the relevant information available about the situation ("observation"), such as an adversary's weaponry, their level of training, and the environmental conditions. The pilot uses these observations to narrow the possible universe of decisions ("orientation") in the tactical situation. Based on these first two steps, the pilot selects the best solution to their tactical problem ("decision") and makes the necessary adjustments to realize their decision ("action").

FIGURE 1: THE OODA LOOP



Through informed use of the Boyd Cycle—more often referred to as the OODA loop—one could not only gain a strategic or tactical advantage over one's enemy, but in turn, disrupt the enemy's own OODA loop by denying them the ability to run through its stages due to the speed at

23. *Id.* at 14.

24. Since this Article is not devoted to Boyd's OODA loop per se, I will restrict the cycle's description to its most basic form. Boyd's insight can still be quite easily seen in this summarized version, as it describes the rational human behavior found in individuals as well as organizations. For a detailed analysis of the OODA loop, see *Id.*; Arthur K. Cebrowski & John J. Garstka, *Network-Centric Warfare: Its Origin and Future*, U.S. NAVAL INST. PROC. 28 (1998); McIntosh, *supra* note 20.

which you are able to run through your own.<sup>25</sup> The goal for any military organization, according to Boyd, is to increase the speed at which it can navigate this cycle, or to “tighten” the OODA loop.<sup>26</sup> Therefore, the army that can affect the tightest OODA loop is able to “get inside” their opponent’s cycle, and thus disrupt their ability to gather, process, and act on intelligence.<sup>27</sup>

The OODA loop, as Boyd observed, characterized the process all living things go through as part of their everyday survival.<sup>28</sup> Learning and adapting are what successful individuals and groups accomplish faster than their less lucky competitors. Boyd’s great contribution was distilling this naturally occurring process into a form, which could be analyzed and implemented by military strategists and tacticians. Boyd continued to develop this concept through the mid-1980s and continued to present his theories to large military and civilian audiences well into his retirement.<sup>29</sup> Boyd’s theories enjoyed moderate success among contemporary military leadership at the time, mainly among theorists and scholars. But in the early 2000s, his ideas were rediscovered and found a heightened relevance among a new generation of warriors joining a high-tech military in a post-9/11 world.<sup>30</sup> This renewed popularity soared even further when nonmilitary and quasi-military organizations seeking a competitive advantage over crime through information-centric efficiency—universally accepted as the path to success since the earliest days of industrialization—increasingly turned to military organizational theories and doctrines for inspiration.<sup>31</sup>

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25. See FADOK, *supra* note 21.

26. See McIntosh, *supra* note 20, at 29.

27. *Id.* at 26.

28. See McIntosh, *supra* note 20.

29. See Bruce Berkowitz, *John Boyd: The American Sun Tzu*, 47 ORBIS 370, 372-73 (2003).

30. See *infra* Section III for a detailed exploration of this phenomenon.

31. See, e.g., MARK BENDER, OPERATION EXCELLENCE: SUCCEEDING IN BUSINESS AND LIFE THE U.S. MILITARY WAY (2004); PARTHA BOSE, ALEXANDER THE GREAT’S ART OF STRATEGY: THE TIMELESS LEADERSHIP LESSONS OF HISTORY’S GREATEST EMPIRE BUILDER (2003); DAN CARRISON & ROD WALSH, SEMPER FI: BUSINESS LEADERSHIP THE MARINE CORPS WAY (1999); SCOTT W. CHRISTIE, PRECISION GUIDED LEADERSHIP: HOW MODERN MILITARY DOCTRINE CAN SAVE CORPORATE AMERICA (2003); GENE KLANN, CRISIS LEADERSHIP: USING MILITARY LESSONS, ORGANIZATIONAL EXPERIENCES, AND THE POWER OF INFLUENCE TO LESSEN THE IMPACT OF CHAOS ON THE PEOPLE YOU LEAD (2003); ANTHONY J. LE STORTI, WHEN YOU’RE ASKED TO DO THE IMPOSSIBLE: PRINCIPLES OF BUSINESS TEAMWORK AND LEADERSHIP FROM THE U.S. ARMY’S ELITE RANGERS (2003); Douglas C. Bernhardt, ‘I Want It Fast, Factual, Actionable’—*Tailoring Competitive Intelligence to Executives’ Needs*, 27 LONG RANGE PLANNING 3, 12-24 (1994) (showing that, since the mid-1990s, businesses and other non-military organizations have fostered the emergence of a sizable cottage industry of books, consultants, and other organizational coaches applying military “lessons learned” to non-military environments). *But see* Richard H. Kohn, *Out of Control: The Crisis in Civil-Military Relations*, 35 NAT’L INTEREST 1, 3 (1994) (showing that this phenomenon would have been largely unthinkable in the fifteen years between the American military’s ignominious withdrawal

### B. *The Audit Society and the Allure of Information Management*

While Boyd's OODA loop theories were revolutionary in their military context, their foundations began to form nearly two centuries earlier with the emergence of industrialization and the associated growth of information-centric organizational theory.<sup>32</sup> The rise of bureaucracy as an efficient means of organizing at scales unnecessary in agrarian society brought with it a strong inclination toward surveillance, information processing, and data-based planning as a means of constant management and improvement, a school of thought both inspired and followed by military organizational theory.<sup>33</sup> Weber's theory of legitimate order and authority within a bureaucratic structure, with its "dut[ies] without regard to personal considerations," and an "obligation to obedience," provided the sort of military-based organizational socialization needed—albeit with some allowance of modification for less martial pursuits—for the management of such modern concepts as large-scale factories, prisons, hospitals, and law enforcement.<sup>34</sup>

Militaries of the 18th and 19th centuries were quick to adopt these organizational innovations, which fit well with their existing hierarchical frameworks and provided the tools to realize a modern form of military intelligence and personnel management, which contemporary organizational models would not support.<sup>35</sup> All of these advances were necessary to support and maintain large armies, but military intelligence was perhaps the biggest beneficiary of these innovations. The increasing amounts of information necessary to make military—or, in fact, any state—decisions in a rapidly modernizing world highlighted the importance of bureaucracy

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from Vietnam and its rebuilt success in the First Gulf War. The hangover from this period lingered through 2001 in the form of military contempt for its civilian leadership).

32. See JAMES R. BENIGER, *THE CONTROL REVOLUTION: TECHNOLOGICAL AND ECONOMIC ORIGINS OF THE INFORMATION SOCIETY* 7 (1986); MAX WEBER, *ECONOMY AND SOCIETY* 969–74 (1978); Edward Higgs, *The Rise of the Information State: The Development of Central State Surveillance of the Citizen in England, 1500–2000*, 14 *J. Hist. Soc.* 175 (2001); MICHAEL POWER, *THE AUDIT EXPLOSION* (1994); Michael Power, *Evaluating the Audit Explosion*, 25 *L. & POL'Y.* 185, 185–202 (2003).

33. See ANTHONY GIDDENS, *THE NATION-STATE AND VIOLENCE* (1985). See also Ulrich Beck, *Risk Society and the Provident State*, in *RISK, ENVIRONMENT AND MODERNITY: TOWARD A NEW ECOLOGY*, 27 (Scott Lash et al., eds., Martin Chambers trans., 1998) (describing the need for increased surveillance as a direct result of industrial society, when the "social, political, ecological, and individual risks created by the momentum of innovation increasingly elude the control and protective institutions of industrial society.").

34. See MAX WEBER, *THE THEORY OF SOCIAL AND ECONOMIC ORGANIZATION* 330–40 (Talcott Parsons ed., Free Press 2009) (1947).

35. The need for larger and more widely distributed militaries, driven largely by the expanding imperial goals of many nations, created serious organizational problems for military leadership. Muster lists, payroll records, logistics planning, and other forms of the modern military's more prosaic tasks benefited greatly from these new forms of communication and information processing. See Higgs, *supra* note 32, at 178.

as an essential tool in dealing with the modern crisis of control.<sup>36</sup> But even with the benefit of a modern bureaucracy, some of which already existed within military organizations, an army's ability to process intelligence information had been quite limited by existing technologies.<sup>37</sup> This limitation of a military organization's ability to make informed decisions based on "coded" intelligence information was directly dependent upon its ability to communicate, store, and process that information, described in Weber's concept of rationalization.<sup>38</sup> The promise of increasingly detailed intelligence pictures—improved "situational awareness"—generated by a combination of the improved organizational methods of Weberian bureaucracy and the advances in communication, transportation, and information processing technologies of industrialization, began to move military thinking toward an information-centric style of warfare.<sup>39</sup>

This quest for more information, better data processing tools, and improved communication methods has become paradigmatic of modern (and post-modern) society.<sup>40</sup> This "control revolution," as Beniger puts it, has grown to permeate every area of society where efficiency is sought, bringing with it a need to develop metrics for program effectiveness.<sup>41</sup>

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36. Reinhard Bendix notes that any study of modern bureaucracy must acknowledge both the challenges to and protections of individual freedoms: "[I]t is clear that these changes are so significant in their implications for the exercise of power by a government that studies of bureaucracy in the traditional sense do not suffice. We must search instead for the underlying transformations in society that have prompted these developments. We must seek to interpret the technical and social changes which affect governmental bureaucracy, not only in order to improve the civil service, but in order to understand more fully the problems of power which it involves." Reinhard Bendix, *Bureaucracy and the Problem of Power*, 5 PUB. ADMIN. REV. 194, 196 (1945).

37. BENIGER, *supra* note 32, at 9.

38. Rationalization is the proposition that an organization's creation and containment of power through control can increase either through increasing the organization's capability to process coded information or by limiting the amount of that information to be processed. *Id.* at 15-16. The modern military modified this concept by maximizing both precepts: increasing information processing capability to effectively decrease the amount of information that is processed.

39. This is not to say that modernization has solved the military intelligence problem, of course. Indeed, the same organizational and technological advances that have enabled the modern military intelligence framework have also yielded an increasingly complex and chaotic world within which militaries are expected to operate. See THOMAS X. HAMMES, *THE SLING AND THE STONE: ON WAR IN THE 21ST CENTURY* (Zenith Press 2006); Rathmell, *supra* note 15, at 87-104.

40. See BENIGER, *supra* note 32, at v; Higgs, *supra* note 32, at 175. (1978).

41. This concept is not always as uncontroversial as it might seem on the surface. For example, one of the chief criticisms of Utilitarianism, an early version of the information-centric movement originally promulgated by Bentham and Mill, has been in its concentration on the maximization of utility, which in turn requires that measurability is always an option. Such an approach cannot apply to every human endeavor, say critics, as there are concepts like morality and justice that defy measurement. See BENIGER, *supra* note 32, at 9; Bendix, *supra* note 36 at 196. See John Rawls, *Justice as Fairness*, 67 PHIL. REV. 164 (1958).

The concept of civilian police agencies is driven primarily by as the realization of a society's social control function, and as such, makes them prime candidates for the information-centric style of organization and leadership.<sup>42</sup>

The quasi-military structure most police departments now adhere to can be found in the organization of Sir Robert Peel's London Metropolitan Police in 1829, credited as the first modern civilian law enforcement organization.<sup>43</sup> The rapid industrialization of Europe and the United States in the first half of the 19th century brought with it a sudden increase in the population, much of it concentrated in urban areas.<sup>44</sup> This caused no small amount of concern among the upper classes, who feared disease, petty crime, property damage, and political insurrections, just to name a few of the phobias the ruling elite held regarding the "dangerous classes."<sup>45</sup> Peel, as Chief Secretary for Ireland, introduced legislation creating paramilitary forces to suppress Catholic and nationalist "disturbances." Peel applied the methods he had refined in Ireland to London and continued the use of the military organization as a model for civilian law enforcement.<sup>46</sup> In addition, Peel recognized that former members of the military made excellent candidates for the role of civilian police officer, since they would arrive on the job pre-acclimated to a quasi-military environment, and would have an instinctive preference for hierarchy, discipline, and order.<sup>47</sup>

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42. The use of the term social control function bears with it a requirement to explain its definition in this context. Here, I refer to control in its most general sense—to influence or direct behavior toward some predetermined goal. This definition is informed by the sociology literature, which examines the social relationship, the organization, voluntary or compulsory social participation, and consensual and imposed order. Hence, control, in this sense, is primarily concerned with the two elements of influence and purpose, and control theory—in both the sociological and mathematical senses—require facilities for the communication and processing of information in order to manage behavior through feedback. See Richard Bellman, *Control Theory*, 211 SCI. AM. 186, 186 (1964); WILLIAM T. POWERS, *BEHAVIOR: THE CONTROL OF PERCEPTION* (1973); Jay Wright Forrester, *Industrial Dynamics: A Major Breakthrough for Decision Makers*, 36 HARV. BUS. REV. 37 (1958).

43. James H. Auten, *The Paramilitary Model of Police and Police Professionalism*, 4 POLICE STUD.: INT'L REV. POLICE DEV. 67, 67 (1981); J. L. Lyman, *The Metropolitan Police Act of 1829: An Analysis of Certain Events Influencing the Passage and Character of the Metropolitan Police Act in England*, 55 J. CRIM. L., CRIMINOLOGY, & POLICE SCI. 141, 141 (1964); John M. Jermier & Leslie J. Berkes, *Leader Behavior in a Police Command Bureaucracy: A Closer Look at the Quasi-Military Model*, 24 ADMIN. SCI. Q. 1, 2 (1979).

44. See Lyman, *supra* note 43.

45. Giddens argues that the crisis of control brought about by industrialization required a dramatic change in the state's view of its citizens, as "no pre-modern states were able even to approach the level of administrative coordination developed in the [modern] nation-state." ANTHONY GIDDENS, *THE CONSEQUENCES OF MODERNITY* 57, 60-63 (1990).

46. See Tadhg O' Ceallaigh, *Peel and Police Reform in Ireland, 1814-18*, 6 STUDIA HIBERNICA 25, 26-28 (1966); See Lyman, *supra* note 43, at 149-150; See Auten, *supra* note 43, at 67.

47. There is something of a "chicken and egg" relationship between Peel's quasi-military organization of the London Metropolitan Police and the natural fit with former members of the

These somewhat practical decisions cannot, however, be separated entirely from the growth of information-centric organization theory, political economics, and surveillance technologies which were interlaced with much of the social, political, and economic activity of industrialization and modernity. In the period from the mid-18th through the mid-19th centuries, as industrialization in western nations began to create increasingly complex systems of interdependencies between manufacturing, capital, energy production, labor, and markets, new means of communication and control were required to take full advantage of new economies of scale and realize productivity levels unheard of under earlier forms of management and organization.<sup>48</sup> As Giddens points out, advances in the information management enabled organizations to form more effective bureaucratic structures and gave these budding bureaucracies more control over the “timing and spacing” of human activities.<sup>49</sup> These advances, joined with the modern bureaucracy’s growing appetite for information ultimately led to the surveillant assemblage as integrated into our contemporary concept of governance.<sup>50</sup>

In the mid-1990s, a movement among military theorists began to develop around the concept of exploiting a technological and communications advantage to create a new kind of army, where every soldier and piece of material was equipped with sensors that would allow direct com-

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British military; was a quasi-military organizational structure selected for its qualities as best suited for civilian policing, thus making military men (they were all men) the best candidates for the job? Or was the choice of a quasi-military police force pre-ordained by the desired characteristics and availability of former soldiers? The literature suggests the former, but even today, we still see a career transition from a soldier to a civilian police officer as quite natural. See J. L. Lyman, *The Metropolitan Police Act of 1829: An Analysis of Certain Events Influencing the Passage and Character of the Metropolitan Police Act in England*, 55 J. CRIM. L. CRIMINOLOGY & POLICE SCI. 141, 152-53 (1964).

48. *Id.* at 7-10. See generally BENIGER, *supra* note 32. Among the innovations of industrialization, perhaps the most successful is that of the modern bureaucracy. Rapid advances in manufacturing and transportation technologies brought an abrupt end to millennia of primarily agricultural societies, and thus required new modes of thought around societal, economic, and political questions. New means of social control were necessary, as the dramatic increase in transactional speed brought about by industrialization quickly outpaced existing modes of control and interaction, and began to threaten the viability of existing institutions. Beniger characterizes this phenomenon as a “crisis of control,” a period in which a society’s organizational, information processing, and communication capabilities are outpaced by manufacturing and transportation technologies, resulting in a systemic loss of political and economic control which threatens existing social and governmental institutions and structures.

49. See ANTHONY GIDDENS, *THE NATION-STATE AND VIOLENCE* 46-48 (University of California Press, 2013).

50. See Kevin D. Haggerty & Richard V. Ericson, *The Surveillant Assemblage*, 51 BRITISH J. SOC. 605-622 (2000); Sean P. Hier, *Probing the Surveillant Assemblage: On the Dialectics of Surveillance Practices as Processes of Social Control*, 1 SURVEILLANCE & SOC’Y 399 (2003), <http://www.surveillance-and-society.org>. For a complete analysis of this phenomenon, see Jeffrey L. Vagle, *The History, Means, and Effects of Structural Surveillance*, UNIV. OF PA. L. SCH. FAC. SCHOLARSHIP 1 (2016), [http://scholarship.law.upenn.edu/faculty\\_scholarship/1625](http://scholarship.law.upenn.edu/faculty_scholarship/1625).

munication of information at the lowest organizational levels, but would also pass this information up the chain of command to give military leaders a “God’s eye view” of the battle space, allowing for even tighter OODA loops.<sup>51</sup> This concept, generally known as network-centric warfare, envisioned the sort of information-driven military hitherto impossible, now enabled by smaller, faster, and cheaper technology that was starting to drive American businesses, and especially advances in networking and communications.<sup>52</sup> Military strategists picked up on the new style of “bottom-up” management enabled through these technological advances, where information, gathered from the very edges of an organization and passed to leadership in near real time, could allow leaders of even the largest businesses to view, analyze, and make decisions about detailed data — actionable intelligence — that Weber, Bentham, Mill, and their contemporaries could only dream of.<sup>53</sup> Following this model, an information- and network-centric military could be more agile and aware than its adversaries, thus allowing fewer troops to cover much wider geographic areas, with less equipment, and with dynamic, ad-hoc supply chains that could place material in the right place at the right time, a philosophy at the center of Secretary of Defense Donald Rumsfeld’s wholesale “Force Transformation” program of the early- and mid-2000s.<sup>54</sup>

The Bush administration’s focus on transforming the military through a network-centric shift from platforms to networks, while viewed

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51. See Arthur K. Cebrowski & John J. Garstka, *Network-Centric Warfare: Its Origin and Future*, 124 in U.S. NAVAL INST. PROCS. 28–35 (1998), [http://mattcegelske.com/wp-content/uploads/2012/04/ncw\\_origin\\_future.pdf](http://mattcegelske.com/wp-content/uploads/2012/04/ncw_origin_future.pdf) (last visited Dec. 9, 2016).

52. *Id.*

53. One of the better-known examples of early business adopters of this new information-centric management style is Wal-Mart, which pioneered the concept of “precision retailing.” Wal-Mart generated a competitive advantage by deploying a network of sensors throughout all levels of the organization. This infrastructure fed real-time information through Wal-Mart’s networks, giving them the ability to make decisions on extremely accurate and fresh data, a concept whose usefulness was not lost on military planners. See generally DAVID S. ALBERTS, JOHN GARSTKA & FREDERICK P. STEIN, *NETWORK CENTRIC WARFARE: DEVELOPING AND LEVERAGING INFORMATION SUPERIORITY* (1999).

54. While a full exploration of the history of Rumsfeld’s Office of Force Transformation is beyond the scope of this Article, it is relevant and worth noting that a wide array of analysis of the performance of the “transformed” military in Afghanistan and (especially) Iraq, led many to observe that the optimism about a small, lighter, network-centric military was, at best, misplaced or premature, and at worst, willfully negligent. See, e.g., Jeffrey L. Groh, *Network-Centric Warfare: Leveraging the Power of Information*, 1 U.S. ARMY WAR C. GUIDE TO NAT’L SECURITY ISSUES: THEORY OF WAR & STRATEGY 323, 331–32 (2008) (enumerating some of the principle criticisms and limitations of network-centric warfare); Noah Shachtman, *How Technology Almost Lost the War: In Iraq, the Critical Networks Are Social — Not Electronic*, WIRE, (Nov. 27, 2007), [http://archive.wired.com/politics/security/magazine/15-12/ff\\_futurewar?currentPage=all](http://archive.wired.com/politics/security/magazine/15-12/ff_futurewar?currentPage=all) (explaining how the claims of the “Wal-Mart model” of network-centric war fighting led to understaffed and underpowered military units on the ground); Francis Fukuyama & Abram Shulsky, *Military Organization in the Information Age: Lessons from the World of Business*, in STRATEGIC APPRAISAL: THE CHANGING ROLE OF INFORMATION IN WARFARE 327–60 (1999).

with skepticism by rank-and-file troops, was enthusiastically accepted by the U.S. military's civilian and political leadership, and opened up a wide array of new business opportunities for contractors willing to help implement this vision.<sup>55</sup> Many of these new programs concentrated on the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C<sup>4</sup>ISR) space, where the true power of distributed information superiority could be fully realized.<sup>56</sup> Key programs quickly emerged to build survivable, robust communications and sensor networks, information operations (IO) platforms, geospatial analysis tools, computer-assisted targeting platforms, and unmanned intelligence gathering platforms (colloquially known as drones, and later equipped with weapons systems of their own), all of which were designed to support an agile force far superior to the “muscle-bound and clumsy,” “industrial-age dinosaurs” that were the legacy of outmoded Cold War thinking.<sup>57</sup>

As the U.S. military began to withdraw from their engagements in Afghanistan and Iraq, funding streams for contractors who had tooled up in support for network-centric warfare and force transformation also began to evaporate, and businesses looking for alternative markets for their C<sup>4</sup>ISR platforms found a ready partner in civilian LEAs.<sup>58</sup> Like the mili-

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55. In his 2003 Annual Report to the President and Congress, Secretary of Defense Rumsfeld articulated his vision for a network-centric military, and laid out the plans, and associated risks, for force transformation. See DEP'T OF DEF., SECRETARY OF DEF., OMB No. 0704-0188, ANNUAL REPORT TO THE PRESIDENT AND THE CONGRESS, (2003). The proposed transition to a “21st-century military” was sweeping, with a greater reliance on small, technology-equipped special forces teams, and a move away from the large, heavy army divisions built up during the Cold War. Rumsfeld estimated the initial cost of this transformation to be \$24.3 billion, and \$239 billion overall. *Id.* Later estimates, however, put the figure nearer to \$1 trillion by 2010, with program costs continuing long into the future. RUSSELL RUMBAUGH, STIMSON CENTER, WHAT WE BOUGHT: DEFENSE PROCUREMENT FROM FY01 TO FY10, at 5 (2011). For example, the F-35A Joint Strike Fighter, expected to cost \$1.5 trillion alone over the life of the program, and has been questioned as an effective fighting platform. See David Francis, *How DOD's \$1.5 Trillion F-35 Broke the Air Force*, CNBC (July 31, 2014), <http://www.cnbc.com/2014/07/31/how-dods-15-trillion-f-35-broke-the-air-force.html>; David Axe, *Air Force Admits: Our New Stealth Fighter Can't Fight*, DAILY BEAST, (Sept. 17, 2015), <http://www.thedailybeast.com/articles/2015/09/17/air-force-admits-our-new-stealth-fighter-can-t-fight.html>.

56. See Jeffrey L. Groh, *Network-Centric Warfare: Leveraging the Power of Information*, in 1 U.S. ARMY WAR C. GUIDE TO NAT'L SECURITY ISSUES: THEORY OF WAR & STRATEGY 323 (J. Boone Bartholomees, Jr. ed., 2008). See generally PETER J. DOMBROWSKI, EUGENE GHOLZ & ANDREW L. ROSS, MILITARY TRANSFORMATION AND THE DEFENSE INDUSTRY AFTER NEXT (2003).

57. John Ferris, *Netcentric Warfare, C4ISR and Information Operations: Towards a Revolution in Military Intelligence?*, 19 INTELLIGENCE & NAT'L SECURITY 199, 203 (2004); DOMBROWSKI, GHOLZ & ROSS, *supra* note 56, at 8 (2003); Steve Niva, *Disappearing Violence: JSOC and the Pentagon's New Cartography of Networked Warfare*, 44 SECURITY DIALOGUE 185, 186 (2013); Peter J. Dombrowski, Eugene Gholz & Andrew L. Ross, *Selling military transformation: The defense industry and innovation*, 46 ORBIS 523, 523 (2002).

58. See Peter Andreas & Richard Price, *From War Fighting to Crime Fighting: Transforming the American National Security State*, 3 INT'L STUD. REV. 31–52 (2001).

tary of the mid-1990s, police departments had also discovered the promise of network-centricity, a concept that fit well within the quasi-military organizational structures found in most police organizations.<sup>59</sup> Beginning in the mid-1970s, police departments, especially those in larger U.S. cities, began to feel political pressure to address what was widely seen as a crime epidemic and the “downward spiral of urban decay” that accompanied a post-industrial economic slowdown.<sup>60</sup> The standard tactics built around the police patrol car did not seem to be having any real success in reducing the crime rate, and LEAs were looking for alternatives.<sup>61</sup>

In 1982, *The Atlantic Monthly* published an article written by two social scientists who, after studying the tactics of police departments, concluded that disorder and crime are inextricably linked, and, therefore by addressing the petty crimes associated with community disorder — such as loitering, vandalism, and public intoxication, “humble” crimes that were generally considered unworthy of police attention — LEAs will, in turn, prevent the more serious crimes from flourishing in those areas.<sup>62</sup> The approach became known as “broken windows policing,” named for the tendency for buildings with a broken window to encourage further window breaking and other forms of vandalism, a phenomenon described by Stanford psychologist Philip Zimbardo in his well-known abandoned car experiment.<sup>63</sup>

Police departments in large American cities began to take an active interest in the broken windows theory, and by the late 1980s and early 1990s, police departments in New York City, Chicago, and Los Angeles had all implemented some version of this model.<sup>64</sup> In New York, then-mayor Rudy Giuliani introduced a version of broken windows known as “zero-tolerance” policing, which placed a greater emphasis on the “quality

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59. *Id.* at 38-40.

60. George L. Kelling & William J. Bratton, *Declining Crime Rates: Insiders' Views of the New York City Story*, 88 J. CRIM. L. & CRIMINOLOGY 1217, 1219 (1998) (quoting WESLEY SKOGAN, *DISORDER AND DECLINE: CRIME AND THE SPIRAL OF URBAN DECAY IN AMERICAN NEIGHBORHOODS* 84 (1990)).

61. *Id.*

62. James Q. Wilson & George L. Kelling, *Broken Windows*, *ATLANTIC MONTHLY* March 1982, at 29 (1982).

63. Zimbardo established a field study to demonstrate the effects of decaying community on crime. In his experiment, Zimbardo “abandoned” cars in generally good condition in multiple locations in the Bronx and Palo Alto. While the cars left in Palo Alto were generally reported to police and left unmolested, the cars in the Bronx were almost immediately vandalized and stripped of valuable parts. The key difference between these two cities, Zimbardo theorized, was the strong sense of community in Palo Alto, where people cared about what happened in their neighborhood, and the comparative lack of such a community sentiment in the Bronx. Zimbardo concluded that a breakdown of shared community values could lead to a certain anonymity that allowed for petty and serious crime to take hold. *Diary of a Vandalized Car*, *TIME*, Feb. 28, 1969, at 62.

64. See Harcourt & Ludwig, *supra* note 5, at 276.

of life” issues that Wilson and Kelling pointed out in their original work.<sup>65</sup> As an early adopter of the broken windows model, the New York Police Department (NYPD) quickly discovered that any effective implementation of such a program would require curbing disorder not only on the streets, but also within the police department itself, which had been in a decades-long decline of poor leadership, corruption, and an overall breakdown of discipline.<sup>66</sup> Addressing these (not unrelated) problems in a city the size of New York, with a sworn police force numbering in the tens of thousands, would require an approach that could go beyond classical organizational techniques.<sup>67</sup> The data- and network-centric approaches made possible by the rapid technological advances beginning in the late 1980s and early 1990s, and implemented as a successful proof-of-concept by Wal-Mart during this time, began to instill in the NYPD other police departments a growing faith in algorithms and automated decision tools.<sup>68</sup>

### C. *Drugs, Terrorism, and the Blurring of Military and Civilian Spheres*

The confluence of military and police use of data- and network-centric approaches in their hitherto separate spheres can be traced in its earliest forms to the war on drugs.<sup>69</sup> As drug trafficking began to be seen not only as a law enforcement issue, but also a threat to national security, military and police agencies began to engage as partners in this effort, sometimes through the exchange of ideas, sometimes quite literally, through interagency actions.<sup>70</sup> These activities were complicated by the

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65. Giuliani's NYPD put special emphasis on prostitution, graffiti, low-level drug offenses, and "aggressive" panhandling as symptoms of urban decay and disorder. Police had largely ignored petty offenses in all but the most extreme cases up to this point, and Giuliani promulgated a no-tolerance approach as a method of "reclaiming the open spaces of New York." Judith A. Greene, *Zero Tolerance: A Case Study of Police Policies and Practices in New York City*, 45 *CRIME & DELINQ.* 171, 171-73 (1999).

66. See John A. Eterno & Eli B. Silverman, *The New York City Police Department's Comstat: Dream or Nightmare?*, 8 *INT'L J. POLICE SCI. & MGMT.* 218, 219-20 (2006).

67. The NYPD had 31,236 full-time sworn officers in 1990. This number does not include part-time and administrative staff. BRIAN A. REAVES & MATTHEW J. HICKMAN, *U.S. DEP'T OF JUST. BUREAU OF JUST. STAT., POLICE DEPARTMENTS IN LARGE CITIES, 1990-2000*, at 2 (2002).

68. See Noah Shachtman, *How Technology Almost Lost the War: In Iraq, the Critical Networks Are Social — Not Electronic*, *WIRED* (Nov. 27, 2007), [http://archive.wired.com/politics/security/magazine/15-12/ff\\_futurewar?currentPage=all](http://archive.wired.com/politics/security/magazine/15-12/ff_futurewar?currentPage=all); Peter K. Manning, *Information Technologies and the Police*, *CRIME & JUST.* 349, 350 (1992). See also *infra* Section 0.

69. Early manifestations of police militarization took traditional forms, where military equipment, such as assault rifles and armored personnel carriers, and their associated tactics were adopted by civilian police departments, justified by the increased threat (real or perceived) from drug trafficking in major U.S. cities. Sandra Bass, *Policing Space, Policing Race: Social Control Imperatives and Police Discretionary Decisions*, 28 *SOC. JUST.* 156, 164 (2001).

70. See, e.g., EVAN MUNSING & CHRISTOPHER J. LAMB, *INST. NAT'L STRATEGIC STUD., JOINT INTERAGENCY TASK FORCE-SOUTH: THE BEST KNOWN, LEAST UNDERSTOOD INTERAGENCY SUCCESS 3* (2011).

fact that the 1878 Posse Comitatus Act generally prohibited the use of federal military forces for domestic law enforcement purposes.<sup>71</sup> Congress amended the Posse Comitatus Act in 1981 to address this legal obstacle, which allowed for military support of civilian LEAs, with the clear legislative intent that this military-law enforcement cooperation be employed in counterdrug operations.<sup>72</sup>

Both the concept and the realization of the war on drugs have a rather spotty record.<sup>73</sup> The political rhetoric that tends to accompany calls for such a war creates images of a “dangerous other,” who threatens social stability due to lax morals and inherent inabilities to exercise self-control.<sup>74</sup> Efforts within the war on drugs are therefore designed to “target” such “deviant” groups within society, and by doing so, promise to reestablish the societal values held by the upstanding citizens the laws are there to protect.<sup>75</sup> These words describing the dangerous other are carefully selected to mask their veiled intent: to play on white fears of racial minorities.<sup>76</sup> The disproportionate effects of this war on African-Americans and Hispanics have been well-documented, resulting in broken social structures, overcrowded prisons, and a retrenchment of Jim Crow policies (albeit under different names).<sup>77</sup>

A vivid example of the literal law enforcement-military partnership in the drug war can be found in the 1988 formation of Joint Task Force-6, now known as Joint Task Force-South (JTF-South), which combined combat and reconnaissance forces from the Department of Defense (DoD), intelligence services, and civilian LEAs to patrol sections of the U.S.-Mexican border on drug interdiction missions.<sup>78</sup> The regular armed border pa-

71. Sean J. Kealy, *Reexamining the Posse Comitatus Act: Toward a Right to Civil Law Enforcement*, 21 *YALE L. & POL’Y REV.* 383, 384 (2003).

72. The 1981 Military Cooperation with Law Enforcement Officials Act encouraged military agencies to supply intelligence, equipment, and training to civilian police departments. In the 1980s and 1990s, Congress continued to expand the military’s ability to work directly with civilian law enforcement, through such legislation as the National Defense Authorization Act, which authorized and funded direct National Guard participation in drug operations. *See* MUNSING & LAMB, *supra* note 70; *See* Kealy, *supra* note 71.

73. When Judge Richard Posner was asked in 1983 whether he thought the nation was fighting a war on drugs, he responded, “I don’t know, but if we are at war, we’re losing.” When asked if he had an alternative solution, he said, “Yes, they ought to legalize it.” William J. Bauer, *The War on Drugs*, *WIS. L. REV.* 1, 2-3 (2014).

74. Jeff Yates & Andrew B. Whitford, *Race in the War on Drugs: The Social Consequences of Presidential Rhetoric*, 6 *J. EMPIRICAL LEGAL STUD.* 874, 875-77 (2009).

75. *Id.*

76. Doris M. Provine, *Race and Inequality in the War on Drugs*, 7 *ANN. REV. L. & SOC. SCI.* 41, 42 (2011); Yates & Whitford, *supra* note 74, at 876.

77. *See* Provine, *supra* note 76, at 47, 54.

78. The circumstances of the civilian shooting by JTF-6 personnel are quite tragic, yet should have been foreseeable under the circumstances. The shooting took place at night when JTF-6 Marines were using night vision equipment to patrol a section of the U.S.-Mexican border. Though every Marine was armed, their explicit orders were to limit their operations to

trols by military personnel abruptly stopped in 1997, after a young U.S. Marine shot and killed an unarmed civilian.<sup>79</sup> The American public's appetite for the use of military troops within its borders evaporated after this incident, only to be revived on September 11, 2001.<sup>80</sup>

The terrorist attacks of 9/11 opened the floodgates on law enforcement-military cooperation, with many of the political and legal objections to such partnerships disappearing almost overnight. This sudden paradigm shift, brought on by a level of terroristic violence previously unthinkable in the United States, created an environment within which the traditionally separate spheres of military and civilian law enforcement began to significantly blur.<sup>81</sup> The military contractors, large and small, that tooled up to support the war effort — both the literal combat operations in Afghanistan and Iraq, as well as the larger, more metaphorical sense — began making much of this material available to civilian LEAs, including machine guns, semi-automatic shotguns, night vision equipment, sniper rifles, combat uniforms, grenades, and high-tech surveillance gear.<sup>82</sup> Many civilian police departments were especially appreciative of the expansion of two DoD programs designed to equip LEAs with military gear through the transfer or direct purchase of material.<sup>83</sup> Because of the highly visible nature of military equipment such as armored personnel carriers, flash-bang grenades, and sniper rifles, much of the subsequent attention from those ex-

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observation and reconnaissance, relaying all suspicious activity to civilian law enforcement for possible action. When the JTF-6 Marines thought they heard gunfire in the area, they immediately returned fire, killing a civilian. Commentators later suggested that this sort of tragedy was inevitable, because armed marines, trained for combat, were put in a law enforcement role. JTF-6 further exacerbated the inherent problems of military-civilian law enforcement activities through their direct involvement in the 1993 siege of the Branch Davidian compound in Waco, TX. See MUNSING & LAMB, *supra* note 70.

79. Anti-terrorism military cooperation programs within U.S. civilian LEAs had, of course, existed prior to the events of 9/11, with some commentators arguing that the fight against terrorism was a far better use of military-law enforcement partnerships than the war on drugs, since military units were better trained and equipped to address the special needs of counter-terror operations. See Kealy, *supra* note 71, at 419. These early efforts remained somewhat controversial, however, even among military leaders prior to 2001. These controversies ended quite abruptly after 9/11. As Cofer Black, the former head of the CIA's Counterterrorism Center put it when he appeared before the Senate Intelligence Committee, "[T]here was 'before' 9/11 and 'after' 9/11. After 9/11 the gloves come off." *Joint Inquiry Into Intelligence Community Activities Before and After the Terrorist Attacks of September 11, 2001: Hearing Before the Select S. Comm. on Intelligence and the Permanent H.R. Select Comm. on Intelligence*, 107th Cong. 589-94 (2004) (statement of Cofer Black, Former Chief, DCI's Counterterrorist Center, Central Intelligence Agency), <http://www.intelligence.senate.gov/hearings/joint-inquiry-intelligence-community-activities-and-after-terrorist-attacks-september-11-0>.

80. See MUNSING & LAMB, *supra* note 70.

81. See Peter B. Kraska, *Militarization and Policing—Its Relevance to 21st Century Police*, 30 POLICING 501, 502-11 (2007).

82. See Kraska & Cubellis, *supra* note 6, at 607-629.

83. See Karena Rahall, *The Green to Blue Pipeline: Defense Contractors and the Police Industrial Complex*, 36 CARDOZO L. REV. 1785, 1791-92 (2015).

aming the increased militarization of civilian police forces has been focused on these items.<sup>84</sup> But the use of this sort of military gear by civilian law enforcement is largely limited to special police units and is not typically found on the average patrol officer.<sup>85</sup> It is the widespread and increased adoption by civilian police agencies of military intelligence technologies, many of which are integrated invisibly into existing police information and decision support tools, which likely has a more dramatic impact across entire police departments. This invisibility, coupled with an unproven — or misplaced — faith in these technologies, has led to a growing system of structural surveillance that has had a disparate racial impact in many cases.

## II. THE EXPANSION OF ALGORITHMIC POLICING STRATEGIES

### A. Early Data-Centric Efforts: Compstat and Its Kin

When then-mayor Rudy Giuliani first began implementing New York City's version of broken windows policing in the early 1990s, he recognized that the disorder to be addressed could be found not only on the city's streets while also within the ranks of the NYPD.<sup>86</sup> Significantly changing the direction of an organization the size of the NYPD — as a shift to the broken windows policing model surely required — would be a difficult task in even the most functional of police departments, something New York City had not had for decades.<sup>87</sup> The organizational management tools necessary for such an endeavor simply did not exist until advances in information technology opened up the possibility of automated, data- and network-centric decision support systems that could take vast amounts of raw data as input, analyze those data, and provide critical insights to its human users, all within the relative blink of an eye.<sup>88</sup> It was

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84. *Id.*; Kraska, *supra* note 83; Kraska & Cubellis, *supra* note 6; Kraska & Kappeler, *supra* note 4, at 1-18.

85. While this is still true in general, there has been a disturbing trend across police departments to deploy military gear more widely. This topic goes beyond the scope of this Article. *But see* Kraska & Cubellis, *supra* note 6; Kraska & Kappeler, *supra* note 4, at 1-18; Rahall, *supra* note 83.

86. *See* Kelling & Bratton, *supra* note 60. *See also supra* text accompanying note 60.

87. *Id.*

88. While the term big data analytics hadn't yet made its way into our lexicon in the early 1990s, the concepts and principles therein had begun to take form. A great deal of enthusiasm emerged for automated decision support tools, expert systems, and other data intelligence tools, especially in military applications, where critical decisions based on unmanageable information loads had to be made within a time span that was too short for human reasoning. *See* Jeung Choi, Jae Joo & Dong Cho, *Situation/Threat Assessment Fusion System (STAFS)*, 2 INFO. FUSION, 2002: PROC. FIFTH INT'L CONF. 1374 (2002); Jung P. Shim et al., *Past, Present, and Future of Decision Support Technology*, 33 DECISION SUPPORT SYS. 111, 111-13 (2002); Heath A. Ruff, Sundaram Narayanan & Mark H. Draper, *Human Interaction with Levels of Automation and Decision-aid Fidelity in the Supervisory Control of Multiple Simulated Unmanned Air Vehicles*, 11 PRESENCE: TELEOPERATORS & VIRTUAL ENV'TS 335 (2002).

exactly this sort of system that a few forward thinkers within the NYPD proposed as a solution to their burgeoning organizational management problem.

In 1994, NYPD Commissioner William Bratton revealed the Compstat program as a centralized solution to the department's organizational dilemma.<sup>89</sup> The goal of the program was to obtain accurate, up-to-date crime statistics at every level within the department, something that had proven impossible up to that point.<sup>90</sup> By requiring patrol officers to keep records of their daily activities, including stops, arrests, and the details of each incident, the NYPD could collect these data on a computer database, which allowed them to generate weekly books of city-wide statistics they could slice and dice as they saw fit: if they wanted statistics on gun crimes specifically, or wished to compare precinct activity, they could do so with relative ease.<sup>91</sup> With these data and analysis tools, the NYPD could now begin to efficiently address the city's broken windows trouble spots, and do so by directing the minimum amount of manpower to the right place at the right time—exactly the outcome Giuliani and Bratton sought.<sup>92</sup>

The NYPD began to see a significant amount of success with the Compstat system, both with their ability to address the “quality of life crimes” highlighted by broken windows policing, as well as in their ability to effectively manage a large and growing police force.<sup>93</sup> This successful adoption gave Compstat a fair amount of national publicity, and it was touted, alongside broken windows policing, as the new paradigm of crime prevention in the United States.<sup>94</sup> Soon, other cities began to emulate and adapt Compstat systems within their own police departments.<sup>95</sup>

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89. There appears to be a relevant disagreement over the meaning behind the name “Compstat”. Many authors have claimed the name is a shortening of “computer statistics,” which Eterno and Silverman demonstrate is incorrect. Eterno & Silverman, *supra* note 66, at 218–31. See also Kevin J. Walsh & Vincent E. Henry, *Compstat, OODA Loops and Police Performance Management*, 2 *POLICING* 349, 349–58 (2008); James J. Willis, Stephen D. Mastrofski & David Weisburd, *Making Sense of COMPSTAT: A Theory-Based Analysis of Organizational Change in Three Police Departments*, 41 *LAW & SOC'Y REV.* 147–88 (2007).

90. See Eterno & Silverman, *supra* note 66.

91. See Eterno & Silverman, *supra* note 66, at 220.

92. See Willis, Mastrofski & Weisburd, *supra* note 89, at 189–90; see BENIGER, *supra* note 32, at 399–400, 407–411 (providing historical illustrations of the organizational leaps made through bureaucratic data processing).

93. See Walsh & Henry, *supra* note 89, at 350–51. By 2000, the number of full-time sworn officers in the NYPD rose to 40,435. BRIAN A. REAVES & MATTHEW J. HICKMAN, U.S. DEP'T OF JUST., BUREAU OF JUST. STAT., *POLICE DEPARTMENTS IN LARGE CITIES, 1990–2000*, at 2 (2002).

94. See David Weisburd et al., *Reforming to Preserve: Compstat and Strategic Problem Solving in American Policing*, 2 *CRIMINOLOGY & PUB. POL'Y* 421, 422 (2002).

95. See Willis, Mastrofski & Weisburd, *supra* note 89, at 189–90; see BENIGER *supra* note 32, at 399–400, 407–411.

With the early success of Compstat also came a redoubled faith in the possibilities of automated law enforcement intelligence systems, allowing police departments to do more with less.<sup>96</sup> As police departments became increasingly convinced that the broken windows model of policing, with its dynamic, problem-oriented approach, would replace the old, static bureaucratic model that police agencies had relied on for generations, they began to accept and explore more deeply the managerial tools and techniques offered by algorithmic, data-driven systems.<sup>97</sup> This new thinking sparked a flurry of data- and network-centric experiments in LEAs around the world, and revived a global interest in an intelligence-based model of policing that had been deployed by British police departments since the 1980s.<sup>98</sup>

### B. *The Rise of Intelligence-Led Policing*

The British model of “intelligence-led policing” was developed in part as a response to the privatization initiatives in the UK in the 1980s and 1990s, where portions of government services were either taken over by private companies or adopted a private business model within their organizations, effectively becoming quasi-private agencies.<sup>99</sup> The British National Criminal Intelligence Service (NCIS), originally organized to address drug trafficking, and later expanded to include organized crime generally, adopted a business data processing model to develop the National Intelligence Model (NIM), a nationwide system for use by all police agencies across the UK, replacing their existing bureaucratic management processes with an intelligence-led policing model.<sup>100</sup> This model had been developed by British authorities to mimic the traditional military intelligence model, where data are collected and analyzed in order to identify patterns and generate actionable intelligence to best prioritize the deployment of patrols based on a set of problem-oriented goals.<sup>101</sup>

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96. In 1996, the Compstat system was given the Innovations in American Government Award, a prestigious honor granted by the Ford Foundation and Harvard University’s John F. Kennedy School of Government. William F. Walsh, *Compstat: An Analysis of an Emerging Police Managerial Paradigm*, 24 POLICING: INT’L J. POLICE STRATEGY & MGMT. 347, 347 (2001).

97. *Id.* at 356–58.

98. See David L. Carter & Jeremy G. Carter, *Intelligence-Led Policing: Conceptual and Functional Considerations for Public Policy*, 20 CRIM. JUST. POL’Y REV. 310–25 (2009) (explaining the history of data-led policing as a paradigm in the UK and US).

99. *Id.* at 311.

100. *Id.* at 313–15.

101. One can see very similar lines of thinking between the British intelligence-led policing model and the American Compstat model, where automated systems backed by advanced technology would deliver the “right information . . . to the right people at the right time.” Nina Cope, *Intelligence Led Policing or Policing Led Intelligence?: Integrating Volume Crime Analysis into Policing*, 44 BRIT. J. CRIMINOLOGY 188, 191 (2004). Perhaps unsurprisingly, this almost exactly echoes the oft-stated goals for the military’s network-centric warfare transformation, where the goal is “getting the right information, faster, to the right forces—who in turn can take the right

It is not difficult to see the allure of such a system. The combination of tightening budgets, increased public concern over crime and disorder, and a rising perception that the world had become a more dangerous place (due in large part to drug trafficking, terrorism, and a general breakdown of civil order) created an environment that made automated solutions to these problems all the more credible. Rapid advances in technology and research into data mining and automated, intelligent decision support systems began to instill in police departments a newfound enthusiasm for technology not generally seen since the days of Sputnik and the space race. Researchers began looking for existing mathematical and physical models, which could provide even faster and more accurate intelligence.<sup>102</sup> By the late 1990s, police departments began to consider the possibility that intelligence-led policing, coupled with advanced technologies and analytical tools, could move LEAs beyond mere crime fighting and into the realm of crime prevention.<sup>103</sup>

### C. *The Tantalizing Prospect of Predictive Policing*

Organizations seeking to tighten their respective OODA loops have followed Boyd's logic to an inevitable conclusion: Instead of merely seeking further methods to tighten the OODA loop, they find ways to tighten the loop to a point where it has "inverted into itself"—that is, the decision cycle becomes *predictive*, rather than *reactive*.<sup>104</sup> The possibility of prevent-

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action, faster, against the right objective." JOHN LUDDY, LEXINGTON INST., THE CHALLENGE AND PROMISE OF NETWORK-CENTRIC WARFARE 3 (2005), <http://lex2015.borczdixon.com/wp-content/uploads/challenge-promise-network-centric-warfare.pdf>.

102. This analytical method was not necessarily new in the 1990s, since Boyd and others had been applying these techniques since the 1950s, albeit without the benefit of the technology available to analysts and researchers toward the end of the 20th century. But because of these new technological tools, methods that required a great deal of processing power were now available outside of supercomputing centers. Complicated models and techniques such as simulated annealing were explored for their ability to arrive at solutions through complex analytical methods. See Steven J. D'Amico et al., *A Simulated Annealing Approach to Police District Design*, 29 COMPUTERS & OPERATIONS RES. 667–684 (2002).

103. See Charlie Beck & Colleen McCue, *Predictive Policing: What Can We Learn from Wal-Mart and Amazon about Fighting Crime in a Recession*, 76 POLICE CHIEF 18 (2009); Beth Pearsall, *Predictive Policing: The Future of Law Enforcement*, 266 NAT'L INST. JUST. J. 16–19 (2010).

104. Mathematical modeling has long been employed in this manner, using data-fed simulations to mimic or predict real-world phenomena. Statistical methods such as Bayesian analysis and Markov chain Monte Carlo (MCMC) simulations have driven enormous advances in the fields of computer science, theoretical and applied physics, and the social sciences. See Adrian F. M. Smith & Gareth O. Roberts, *Bayesian Computation via the Gibbs Sampler and Related Markov Chain Monte Carlo Methods*, 55 J. ROYAL STAT. SOC'Y 3 (1993); Bradley P. Carlin & Siddhartha Chib, *Bayesian Model Choice via Markov Chain Monte Carlo Methods*, 57 J. ROYAL STAT. SOC'Y 473–484 (1995). These and related methods have been combined with research in information theory, decision theory, and neural networks to create successful extrapolation and predictive systems across a wide range of fields and problems. See CHRISTOPHER M. BISHOP, PATTERN RECOGNITION AND MACHINE LEARNING (Michael Jordan et al. eds., 2006).

ing crime before it actually happens has been the Holy Grail of police departments, especially when local, state, and federal governments were actively looking for ways to cut back on police budgets.<sup>105</sup> The apparent successes of broken windows and zero tolerance policing backed by sophisticated decision support systems like Compstat and intelligence-led policing, gave many in law enforcement the firm belief that these systems and methodologies would eventually yield tools that would collect the massive amounts of data now available from inside and outside of police departments, swiftly store and analyze those data, and produce results “to anticipate, prevent and respond more effectively to future crime.”<sup>106</sup>

A common trope among police department is that an experienced and talented officer can apply their knowledge and analytical skills to attain an imperfect version of predictive policing, but that the model does not scale well.<sup>107</sup> The benefit these new analytical tools and methods could bring to these officers could mean the difference between investigating a crime that just occurred versus preventing the crime from happening in the first place.<sup>108</sup> The savings to society in administrative costs, property damage, and human lives alone make this a worthy goal for a data- and network-centric police force.

But for such a police intelligence system to work as advertised, one needs to provide it with as much good data as possible from as broad a sampling as possible so that the pattern recognition models can achieve the nearest thing to a God’s eye view, thus allowing the analyst to find the proverbial needle in the haystack.<sup>109</sup> This means police agencies need to turn to nontraditional sources of information, such as social media, as well as developing and refining internal data sources.<sup>110</sup> The risks inherent in such an approach—especially if implementation or strategy is rushed or otherwise undertaken without a full understanding of the implications—can include not only the more obvious issues of privacy and fairness, but also technical liabilities attributable to cyber security and the long-term effects on due process, all of which present serious ethical questions and responsibilities.<sup>111</sup>

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105. See Beck & McCue, *supra* note 103, at 16–19.

106. Pearsall, *supra* note 103, at 16.

107. See Cope, *supra* note 101.

108. See Samuel Greengard, *Policing the Future*, 55 COMM. ACM 19 (Mar. 2012).

109. See Pearsall, *supra* note 103, at 16–19. For those who have followed the national security version of this debate, this logical progression will seem quite familiar. In government hearings across Europe and America, intelligence agencies have argued that in order to find needles, they need access to the entire data haystack. See Patrick Wintour, *New Spying Legislation is Needed, Intelligence Committee Will Say*, THE GUARDIAN, (March 12, 2015, 1:00 PM), <http://www.theguardian.com/uk-news/2015/mar/12/intelligence-committee-to-report-new-spying-legislation-is-needed>.

110. See Pearsall, *supra* note 103, at 17.

111. See, e.g., K. Krasnow Waterman & Paula J. Bruening, *Big Data analytics: Risks and Responsibilities*, 4 INT’L DATA PRIVACY L. 89 (2014). The ethical considerations inherent in big

### III. THE ENHANCEMENT OF STRUCTURAL SURVEILLANCE AND DE FACTO RACE BIAS

#### A. Criticisms of the Broken Windows Policing Model

The broken windows policing model, along with the collection of technologies and techniques supporting this approach, have met with a growing body of criticisms, even as police departments continue to adopt and promote these methods.<sup>112</sup> Central to many of these criticisms is the core role that “disorder” plays in the broken windows model, specifically, the subjective definition and measurement of the term, as well as the limited beneficiaries of this approach.<sup>113</sup> These criticisms have seriously questioned the premise of broken windows, citing statistics that indicate that the broken windows model has a measurable, direct negative effect on the very neighborhoods and communities whose “hot spots” were supposedly the beneficiaries of increased police focus.<sup>114</sup>

Among the sharpest critiques of the broken windows policing model is that, whatever the original intent was of such programs, their implementations have been less about policing disorder than about the control of poor neighborhoods and poor people, most of whom are racial minorities.<sup>115</sup> The longstanding practice within the American legal system of us-

data analysis are not mere academic exercises. The use of algorithmic and data-centric tools by civilian police departments, coupled with our natural tendency toward automation bias (see Section 0), can yield very real consequences to those on the wrong end of the equation. See, e.g., Angwin et. al, *supra* note 1.

112. As crime rates began to drop in cities like New York in the late 1990s, proponents of broken windows policing claimed this as evidence that this new policing paradigm was working. See George L. Kelling & William J. Bratton, *Declining Crime Rates: Insiders' Views of the New York City Story*, 88 J. CRIM. L. & CRIMINOLOGY. 1217, 1217 (1998). In fact, the drop in crime rates in New York City was double the national average at the time. Dan M. Kahan, *Social Influence, Social Meaning, and Deterrence*, 83 VA. L. REV. 349, 367-68 (1997). Critics of the broken windows model, however, argued that its proponents were too quick to claim responsibility for the drop in crime rates, asserting that other factors are just as likely, or more likely, to explain the decline, such as more favorable economic conditions, shifts in drug use, and the general increase in the New York police force. See, e.g., Joshua C. Hinkle & David Weisburd, *The Irony of Broken Windows Policing*, 36 J. CRIM. JUST. 503 (2008); Joshua C. Hinkle & Sue-Ming Yang, *A New Look into Broken Windows: What Shapes Individuals' Perceptions of Social Disorder?*, 42 J. CRIM. JUST. 26 (2014); Aaron R. S. Lorenz, *The Windows Remain Broken: How Zero Tolerance Destroyed Due Process*, 12 PUB. INTEGRITY 247 (2010).

113. See Jacinta M. Gau & Travis C. Pratt, *Revisiting Broken Windows Theory: Examining the Sources of the Discriminant Validity of Perceived Disorder and Crime*, 38 J. CRIM. JUST. 758, 758 (2010); Bernard E. Harcourt, *Reflecting on the Subject: A Critique of the Social Influence Conception of Deterrence, the Broken Windows Theory, and Order-Maintenance Policing New York Style*, 97 MICH. L. REV. 291, 292 (1998).

114. See, e.g., Gau & Pratt, *supra* note 113; Hinkle & Weisburd, *supra* note 112.

115. Empirical evidence collected in cities that have implemented versions of broken windows policing strongly indicates a race bias in the execution of the policy. See Jeffrey Fagan & Garth Davies, *Street Stops and Broken Windows: Terry, Race and Disorder in New York City*, 28 FORDHAM URB. L. J. 457, 458 (2000); Mike King, “Broken Windows,” *Urban Policing, and the Social Contexts of Race and Neighborhood (Dis-)Empowerment*, 21 CRITICAL CRIMINOLOGY 533,

ing race as a signal of increased risk of criminal behavior combined with programs encouraging police officers to gather “intelligence” data through arbitrary stop and frisk programs (sometimes referred to as “enhanced Terry stops”) to feed into automated intelligence systems, has created an environment where racial minorities end up bearing the costs of broken windows, while wealthy, White communities tend to see the majority of its benefits.<sup>116</sup> The social disorder that broken windows policing targets has been shown to be a very fluid concept, where the perceptions of a minority neighborhood’s residents are often far different than those of the police officers patrolling those neighborhoods, who frequently come from other, wealthier neighborhoods.<sup>117</sup>

The result of the intelligence data collected based on race or class bias, or parochial perceptions of social disorder, creates an inherent bias in automated decision support systems that tends to be reinforced with every trip around the OODA loop.<sup>118</sup> This result can be directly traced to the sort of feedback loops data-centric decision support systems like Compstat are prone to encounter.<sup>119</sup> That is, if the data used to initiate an automated decision support tool is biased or otherwise flawed, the “actionable intelligence” that emerges will likely also be biased or flawed. If this bad intelligence is then acted upon, the resulting stops or arrests will likely generate even more bad data, which is then fed back into the decision support system, and so on.<sup>120</sup>

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535 (2013); Robert J. Sampson & Stephen W. Raudenbush, *Seeing Disorder: Neighborhood Stigma and the Social Construction of “Broken Windows,”* 67 SOC. PSYCHOL. Q. 319, 321 (2004); Forrest Stuart, *Race, Space, and the Regulation of Surplus Labor: Policing African Americans in Los Angeles’s Skid Row,* 13 SOULS 197, 206 (2011).

116. See Jeffrey Fagan & Garth Davies, *supra* note 115. It is worth noting that *Terry v. Ohio*, 392 U.S. 1 (1968), which allowed a police officer’s “professional judgment” to serve as the basis for warrantless stops and searches, involves a race-based decision by a police officer. Specifically, Detective McFadden, who was White, stopped the defendant, Terry, who was African-American, based on McFadden’s sole observation that Terry was seen in a commercial district far from an area of the city where most African Americans lived. McFadden stated Terry’s presence “didn’t look right to [him] at the time.”

117. See Joshua C. Hinkle & Sue-Ming Yang, *A New Look into Broken Windows: What Shapes Individuals’ Perceptions of Social Disorder?*, 42 J. CRIM. JUST. 26, 33 (2014).

118. Some officers within police organizations have also expressed levels of dissatisfaction with algorithmic tools like Compstat, indicating that the pressures on lower-level officers within departments from upper management result in a system of perverse incentives, where the rank-and-file tend to be rewarded only if they continue to propagate and support the system’s existing structure. See John A. Eterno & Eli B. Silverman, *Understanding Police Management: A Typology of the Underside of Compstat*, 5 PROF. ISSUES CRIM. JUST. 11, 14-16 (2010).

119. Negative feedback loops in police decision support tools have been a concern for some time, especially if data collection processes are not updated to fit the goals of the community. See James J. Willis, Stephen D. Mastrofski & Tammy Rinehart Kochel, *Recommendations for Integrating Compstat and Community Policing*, 4 POLICING 182, 189-91 (2010).

120. See, e.g., Thomas Oommen, Laurie G. Baise & Richard M. Vogel, *Sampling Bias and Class Imbalance in Maximum-Likelihood Logistic Regression*, 43 MATHEMATICAL GEOSCIENCES 99, 118 (2010); CHRISTOPHER M BISHOP, *PATTERN RECOGNITION AND MACHINE LEARNING*

B. *Algorithms, Data, Neutrality, and Bias*

What makes automated, predictive policing systems an attractive as a solution for LEAs seeking to increase efficiency is the same aspect that makes them potentially dangerous: We tend to implicitly trust algorithms and data since we assume that computers have no bias, and numbers do not lie.<sup>121</sup> This common misconception is based on two fundamental misunderstandings of automated decision support or expert systems. First, while it is true that computers, as finite state machines that at their core (no pun intended) are strictly limited to the instructions we give them through their programming, it does not follow that the algorithms we run on these computers are necessarily unbiased. Computer programs—algorithms coded by humans into a form a computer’s chipset can interpret—are written with the objectives, design choices, and general experiences of the programmer as background. The series of instructions, data structures, and design choices that end up in a finished computer program can often translate subtle biases, often in unexpected ways.<sup>122</sup>

For example, from an algorithmic modeling perspective, incorrect or imbalanced input data has long been shown to lead to biased results.<sup>123</sup> Perhaps the most commonly used statistical method in predictive modeling systems is linear regression,<sup>124</sup> particularly a maximum likelihood linear

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(Michael Jordan et al. eds., 2006); Brian Mac Namee et al., *The problem of Bias in Training Data in Regression Problems in Medical Decision Support*, 24 ARTIFICIAL INTELLIGENCE IN MEDICINE 51, 54 (2002).

121. See J. Elin Bahner, Anke-Dorothea Hüper & Dietrich Manzey, *Misuse of Automated Decision Aids: Complacency, Automation Bias and the Impact of Training Experience*, 66 INT’L J. HUM.-COMPUTER STUD. 688, 688–690 (2008); Linda J. Skitka, Kathleen L. Mosier & Mark Burdick, *Does Automation Bias Decision-making?* 51 INT’L J. HUM.-COMPUTER STUD. 991, 993 (1999).

122. This concept has been generalized into what are known as the “no free lunch” (NFL) theorems, which state that bias-free learning is futile. For a detailed description—conceptually and mathematically—of these theorems, see David H. Wolpert & William G. Macready, *No Free Lunch Theorems for Optimization*, 1 IEEE TRANSACTIONS ON EVOLUTIONARY COMPUTATION 67 (1997). See also David H. Wolpert & William G. Macready, *No Free Lunch Theorems for Search* 3–5 (Feb. 6, 1995) (unpublished manuscript) (on file with the Sante Fe Institute).

123. The problems of unbalanced data have long been recognized in various fields, such as statistics and econometrics, where a number of novel approaches have been proposed to account for the data imbalance. See, e.g., S. R. Cosslett, *Maximum Likelihood Estimator for Choice-Based Samples*, 49 ECONOMETRICA 1289 (1981); Vicente García, Ramón Alberto Mollineda & José Salvador Sánchez, *On the k-NN Performance in a Challenging Scenario of Imbalance and Overlapping*, 11 PATTERN ANALYSIS & APPLICATIONS 269 (2007); Xu-Ying Liu, Jianxin Wu & Zhi-Hua Zhou, *Exploratory Undersampling For Class-Imbalance Learning*, 39 IEEE TRANSACTIONS SYS., MAN., & CYBERNETICS, PART B (CYBERNETICS) 539 (2009); Yuchun Tang et al., *Correspondence, SVMs Modeling for Highly Imbalanced Classification*, 39 IEEE TRANSACTIONS ON SYS., MAN., & CYBERNETICS, PART B (CYBERNETICS) 281 (2009); David P. Williams, Miranda S. Silvius Vincent Myers, *Mine Classification with Imbalanced Data*, 6 IEEE GEOSCIENCE & REMOTE SENSING LETTERS 528 (2009).

124. Logistic regression, a variant of statistical linear regression used when the dependent variable is not continuous but is instead a binary value (e.g., “yes/no”), is often used to predict

regression, which is a widely used technique in military and police predictive intelligence systems.<sup>125</sup> In systems such as these, the data used often contain a large number of events belonging to one class, while the other class contains only a few data points, a data disparity known as a class imbalance.<sup>126</sup> This phenomenon often occurs in data where the event of interest (the crime) is sampled far more frequently than non-events.<sup>127</sup> This problem also manifests itself in the differences in class data representations between the sample set and the actual population, known as sampling bias.<sup>128</sup> There are, of course, statistical sampling methods to mitigate these effects, but there is no clear consensus as to which method of class distribution sampling will work best in all—or even most—situations.<sup>129</sup> The best solutions tend to be those that are specially selected based on such factors as the statistical methods employed, the population size, the sample size, and specifics regarding the event in question.<sup>130</sup> In plain language, this means that a one-size-fits-all solution is likely to produce questionable results, at best, and at worst, dangerously biased results. This danger becomes

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the probability of an event on a range from 0 to 1. ALAN AGRESTI, *CATEGORICAL DATA ANALYSIS* 115-116 (2013).

125. See Gary King & Langche Zeng, *Explaining Rare Events in International Relations*, 55 *INT'L ORG.* 693, 697 (2001); Jacqueline Cohen, Wilpen L. Gorr & Andreas M. Olligschlaeger, *Leading Indicators and Spatial Interactions: A Crime-forecasting Model for Proactive Police Deployment*, 39 *GEOGRAPHICAL ANALYSIS* 105 (2007); *MAPPING AND ANALYSING CRIME DATA* (Alex Hirschfield & Kate Bowers, eds., CRC Press 2003); *THE INFLUENCE OF TECHNOLOGY ON SOCIAL NETWORK ANALYSIS AND MINING* 567 (Tansel Özyer et al. eds., 2013).

126. See George Forman, *Quantifying Trends Accurately Despite Classifier Error and Class Imbalance*, in *PROC. 12TH ACM SIGKDD INT'L CONF. ON KNOWLEDGE, DISCOVERY & DATA MINING* 160 (2006). See also Thomas Oommen, Laurie G Baise & Richard M. Vogel, *Sampling Bias and Class Imbalance in Maximum-likelihood Logistic Regression*, 43 *MATHEMATICAL GEOSCIENCES* 99, 200 (2010).

127. Sampling bias occurs when researchers rely heavily on records that contain more complete or relevant data, which creates a bias toward those people or events that are the primary subject of the study, as they tend to have higher degrees of data sufficiency and are more likely to be included. For example, hidden bias tends to show up when studying diseases, because sicker patients tend to have more data. See, e.g., Alexander Rusanov et al., *Hidden in Plain Sight: Bias Towards Sick Patients When Sampling Patients With Sufficient Electronic Health Record Data For Research*, 14 *BMC MED. INFORMATICS & DECISION MAKING* 1, 1-2 (2014).

128. See, e.g., Hui Zhou & Wencal Du, *Studying the Sampling Bias of Network Topology Discovery*, 15 *INT'L INFO. INST.* 193 (2012); KENNETH P. BURNHAM & DAVID R. ANDERSON, *MODEL SELECTION AND INFERENCE: A PRACTICAL INFORMATION-THEORETIC APPROACH* 32-35 (2nd ed. 2013); David A. Freedman, David Collier & Jasjeet S. Sekhon, *STATISTICAL MODELS AND CAUSAL INFERENCE: A DIALOGUE WITH THE SOCIAL SCIENCES* 29 (2010); Yoav Freund, László Györfi & György Turán, *Sample Selection Bias Correction Theory*, in *ALGORITHMIC LEARNING THEORY* (Yoav Freund et al. eds., 2008); PAUL GUSTAFSON, *MEASUREMENT ERROR AND MISCLASSIFICATION IN STATISTICS AND EPIDEMIOLOGY: IMPACTS AND BAYESIAN ADJUSTMENTS* 22-24 (2003).

129. See Gary M. Weiss & Foster Provost, *Learning When Training Data are Costly: The Effect of Class Distribution on Tree Induction*, 19 *J. ARTIFICIAL INTELLIGENCE RES.* 315 (2003).

130. See Oommen, *supra* note 120, at 118.

increasingly amplified when one examines the trend of police analysis being extended from the realm of geospatial analysis—predicting which neighborhoods are most likely to be crime hot spots—to the individual, where police keep close tabs on people who, according to predictive algorithms, are more likely to be involved in future crimes.<sup>131</sup>

### C. *The Introduction of Automation Bias*

The rise of the information and audit society and the associated increase in the use of automated information systems in organizational decision making often leads to an overreliance on—and overconfidence in—the results of these systems. This automation bias leads to misuse of automated intelligence systems combined with automation-induced user complacency.<sup>132</sup> The negative effects of this automation bias have been seen in healthcare, transportation, power distribution, defense, and space exploration, often with serious, life-threatening consequences.<sup>133</sup> There are multiple reasons for this behavior, including our natural tendencies to seek out paths of least cognitive effort, to expend less energy when part of a team (including teams with automated members), and to treat computers as decision-making authorities.<sup>134</sup> These errors have been further categorized into two classes that manifest in automated environments: *omission* errors, where operators fail to respond to system anomalies because the automated system fails to detect or warn of them; and *commission* errors, where users

131. See John Eligon & Timothy Williams, *Police Program Aims to Pinpoint Those Most Likely to Commit Crimes*, N.Y. TIMES (Sept. 24, 2015), <http://www.nytimes.com/2015/09/25/us/police-program-aims-to-pinpoint-those-most-likely-to-commit-crimes.html>.

132. See Eugenio Alberdi et al., *Why Are People's Decisions Sometimes Worse With Computer Support?*, 5775 COMPUTER SAFETY 18, 19 (2009); J. Elin Bahner, Monika F. Elepfandt & Dietrich Manzey, *Misuse of Diagnostic Aids in Process Control: The Effects of Automation Misses on Complacency and Automation Bias*, 52 PROC. HUM. FACTORS & ERGONOMICS SOC'Y 52ND ANN. MEETING 1330, 1330 (2008); See John D. Lee & Katrina A. See, *Trust in Automation: Designing for Appropriate Reliance*, 46 HUM. FACTORS 50, 76 (2004).

133. See Linda J. Skitka, Kathleen Mosier & Mark D. Burdick, *Accountability and Automation Bias*, 52 INT'L J. HUM.-COMPUTER STUD. 701 (2000); Mark D. Burdick et al., *The Ameliorating Effects of Accountability on Automation Bias*, in THIRD ANN. SYMP. ON HUM. INTERACTION WITH COMPLEX SYS. HICS '96, at 142 (1996); Kate Goddard, Abdul Roudsari & Jeremy C. Wyatt, *Automation Bias: Empirical Results Assessing Influencing Factors*, 83 INT'L J. MED. INFORMATICS 368 (2014); John D. Lee & Katrina A. See, *Trust in Automation: Designing for Appropriate Reliance*, 46 HUM. FACTORS 50 (2004).

134. In addition to empirical studies on this topic, scholars have collected a number of anecdotal examples of this phenomenon to better illustrate the point. One of the earliest identified examples of this can be found in the 1983 Korean Airlines (KAL) incident, in which Soviet fighters shot down a passenger aircraft. Forensic examinations and experiments showed that the KAL crew had grown complacent in their reliance on the aircraft's automated navigation systems, and followed the systems' recommended headings rather than cross-checking its results against other navigation methods, as is typically required. Due to the crew's lack of vigilance and deep trust in the automated systems, the flight path given by the automated navigation systems led the crew into Soviet airspace. See Skitka et al., *Does Automation Bias Decision-making?*, *supra* note 121, at 992.

blindly follow incorrect guidance from automated systems in spite of contraindications from other information sources.<sup>135</sup> Studies have repeatedly shown that automation bias of both types leads to users making incorrect decisions at a rate as high as 75%, even when the information they needed to make the correct decision was readily available.<sup>136</sup>

Automation bias becomes especially dangerous when life or liberty is at stake. Multiple studies in domains such as health care, air transportation, and military command and control have repeatedly shown how bias and complacency lead users of automated systems to make very costly mistakes.<sup>137</sup> In military environments especially, overconfidence in the authority of automated decision support systems can be particularly catastrophic, where the importance of situational awareness is paramount.<sup>138</sup> The average person is well equipped to engage in naturalistic decision-making processes, where one is expected to solve real-world problems under a certain amount of stress.<sup>139</sup> We are, however, prone to overreliance on sources of information that we regard as authoritative.<sup>140</sup> Military intelligent decision support systems operate within organizational hierarchies wherein users are predisposed, through their training, to defer to authorities within their supervisory structure, a trait that remains in effect when users of these systems seek guidance from algorithms and data structures.<sup>141</sup> The natural result is an amplification of automation bias in these overtly hierarchical environments, where users exhibit tendencies to rely exclusively on automated systems, even when conflicting information

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135. See Skitka et al., *Accountability and Automation Bias*, *supra* note 136, at 702; see Skitka et al., *Does Automation Bias Decision-making?*, *supra* note 121, at 993.

136. See Linda J. Skitka, Kathleen Mosier & Mark D. Burdick, *Accountability and Automation Bias*, 51 INT'L J. HUM.-COMPUTER STUD. 701, 702 (2000).

137. See, e.g., Raja Parasuraman & Dietrich H. Manzey, *Complacency and Bias in Human Use of Automation: An Attentional Integration*, 52 HUM. FACTORS 381 (2010); Robert J. de Boer, Wijnand Heems & Karel Hurts, *The Duration of Automation Bias in a Realistic Setting*, 24 INT'L J. AVIATION PSYCHOL. 287 (2014); John M. McGuirl & Nadine B. Sarter, *Supporting Trust Calibration and the Effective Use of Decision Aids by Presenting Dynamic System Confidence Information*, 48 HUM. FACTORS 656 (2006); Gregory P. Noone & Diana C. Noone, *The Debate over Autonomous Weapons Systems*, 47 CASE W. RES. J. INT'L L. 25 (2015); Erika Rovira & Kathleen McGarry & Rajaj Paasuraman, *Effects of Imperfect Automation on Decision Making in a Simulated Command and Control Task*, 49 HUM. FACTORS 76 (2007); William M. Crocoll & Bruce G. Coury, *Status or Recommendation: Selecting the Type of Information for Decision Aiding*, 34 PROC. HUM. FACTORS SOC'Y 1524 (1990); Mary L. Cummings, *Automation Bias in Intelligent Time Critical Decision Support Systems*, AM. INST. AERONAUTICS & ASTRONAUTICS, AIAA 1ST INTELLIGENT SYSTEMS TECHNICAL CONF. 1 (2004).

138. See Erika Rovira, et al., *Effects of Imperfect Automation on Decision Making in a Simulated Command and Control Task*, 49 HUM. FACTORS 76 (2007).

139. See Gary Klein, *Naturalistic Decision Making*, 50 HUM. FACTORS 456 (2008).

140. See Mary L. Cummings, *Automation Bias in Intelligent Time Critical Decision Support Systems*, AM. INST. AERONAUTICS & ASTRONAUTICS, AIAA 1ST INTELLIGENT SYSTEMS TECHNICAL CONF. (2004).

141. *Id.*

is presented by other available systems.<sup>142</sup> The transfer of military intelligent decision support systems to civilian law enforcement organizations, where the paramilitary organizational structure closely resembles that of the military, makes police susceptible to the same dangerous automation bias exhibited in military environments. So how do law enforcement organizations take advantage of continued advances in automated intelligence and decision support techniques without either further alienating the communities they serve or succumbing to various data- and algorithm-based biases?

#### IV. A COMMUNITY POLICING SOLUTION TO ALGORITHMIC RACE BIAS

Of course, to completely ignore the opportunities presented by advances in automation makes no sense. There are many tasks that computers simply do better than humans, such as repetitive tasks, rapid response to control tasks, rule-based deductive reasoning, and simultaneous task handling.<sup>143</sup> As our systems—both human and computer—grow increasingly complex, we need automation to give us the enhanced capabilities to handle time-critical and complex control environments. The trick, then, is to recognize the critical role automated information systems play in these domains, but at the same time, maintain an informed awareness of the pitfalls an overreliance on automated decision support can bring. This is of great importance to LEAs, who have a special duty to their communities, not only to enforce the laws but also to protect and maintain the health and safety of everyone in those communities. Allocating the appropriate amount of functionality between police officers and automated systems is critical to this role. In this Section, I recommend a two-element approach to this problem that takes into account both the important social role police play within their communities as well as the phenomenon of automation and data bias that can artificially reinforce racial disparities in police treatment.

##### A. *A Return to the Original Intent of Community Policing*

A significant part of the original broken windows policing concept articulated by Wilson and Kelling was the role of the police officer in reassuring community members of their safety, and maintaining a high degree of sensitivity to signaling by community residents, with respect not only to criminal activity, but also with their comfort with the police agency it-

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142. See Erika Rovira, et al., *Effects of Imperfect Automation on Decision Making in a Simulated Command and Control Task*, 49 HUMAN FACTORS 76 (2007).

143. See Mary L. Cummings, *Automation Bias in Intelligent Time Critical Decision Support Systems*, AM. INST. AERONAUTICS & ASTRONAUTICS, AIAA 1ST INTELLIGENT SYSTEMS TECHNICAL CONF. 1 (2004).

self.<sup>144</sup> Community policing requires a more holistic approach to the problem of public safety that goes beyond mere crime fighting to encompass overall community health, safety, and quality of life.<sup>145</sup> Under this model, crime fighting was not an end in itself, but the means toward healthier communities, and was seen as a more modern, inclusive method of policing.<sup>146</sup>

Too many implementations of broken windows and intelligence-led policing models, however, failed to follow through on this part of the theory. Rather than measure their performance—and direct their activities—using data that reflected a community’s overall health and quality of life, systems like Compstat relied heavily, sometimes exclusively, on traditional crime statistics, such as the number of stops, arrests, and clearance rates, despite the fact that these metrics have repeatedly been shown to have little to no bearing on overall community safety.<sup>147</sup> Sadly, this flawed approach to the original community-policing concept originates in the fact that these crime statistics are easy to collect and measure, and police departments have developed a high degree of comfort with these metrics over the years.<sup>148</sup> Thus, the most direct approach to solving the problem of bad data leading to biased results from data-centric decision support tools is to require that police departments retool their data collection and analysis efforts toward more meaningful metrics.

Another misinterpreted requirement of the original Wilson and Kelling model is the concept of proactive policing. Most police departments implementing broken windows models have designed their systems as incident-oriented frameworks, which do a poor job at addressing levels of criminality in a community and serve mainly to feed a cycle of incarceration.<sup>149</sup> The Wilson and Kelling method of proactive policing focuses instead on the root causes of criminality, such as poverty, economic and

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144. See P.A.J. Waddington, *Community Policing*, 1 POLICING 129, 129–131 (2007).

145. See David L. Carter & Allen D. Sapp, *Issues and Perspectives of Law Enforcement Accreditation: A National Study of Police Chiefs*, 22 J. CRIM. JUST. 195 (1994); GEORGE L. KELLING & CATHERINE M. COLES, *FIXING BROKEN WINDOWS: RESTORING ORDER AND REDUCING CRIME IN OUR COMMUNITIES* (1997); WESLEY G. SKOGAN, *POLICE AND COMMUNITY IN CHICAGO: A TALE OF THREE CITIES* (2006).

146. *Id.*

147. See PETER W. GREENWOOD, JOAN PETERSILIA & JAN M. CHAIKEN, *THE CRIMINAL INVESTIGATION PROCESS* 57–58 (1975); JEROME H. SKOLNICK, *JUSTICE WITHOUT TRIAL: LAW ENFORCEMENT IN DEMOCRATIC SOCIETY* (2011).

148. See VICTOR E. KAPPELER & LARRY K. GAINES, *COMMUNITY POLICING: A CONTEMPORARY PERSPECTIVE* 180 (2012).

149. See Mike King, “Broken Windows,” *Urban Policing, and the Social Contexts of Race and Neighborhood (Dis-)Empowerment*, 21 CRITICAL CRIMINOLOGY 533 (2013) (reviewing ROBERT SAMPSON, “GREAT AMERICAN CITY” (2012)); Jeffrey Fagan et al., *Street Stops and Broken Windows Revisited: The Demography and Logic of Proactive Policing in a Safe and Changing City*, in RACE, ETHNICITY, AND POLICING: NEW AND ESSENTIAL READINGS 333 (Stephen K. Rice & Michael D. White eds., New York University Press 2009).

ecological injustice, and racism, where police departments form part of a larger community team to go beyond the punishing of window breakers, and actually fix the broken windows.<sup>150</sup>

Finally, community policing requires police departments to hone their sensitivities to cultural norms and the needs of the community, since perceptions of social disorder can be highly dependent upon time, place, and circumstance, and most police officers are not residents of the communities they patrol.<sup>151</sup> Public perceptions can also vary by context, which means social disorder often falls into the “I can’t define it, but I know it when I see it” category.<sup>152</sup> When police officers develop a feel for their communities they patrol, they will also benefit their departments by providing better, more meaningful intelligence data, which can then be used to improve their decision support outcomes.<sup>153</sup>

Police department policies and procedures that are put in place with automated decision support tools like Compstat, which supports the broken windows policing regimes, have had a distinctly negative effect on minority communities.<sup>154</sup> As discussed in Section III above, this problem is not a new one, but is instead one that has been exacerbated by the use of military tactics and technologies.<sup>155</sup> LEAs, already obligated to collect evidence, especially feel the pressure in information societies to observe, collect, record, and evaluate all available data.<sup>156</sup> This predilection leads police to treat their communities as intelligence landscapes and people as “data

150. Wesley G. Skogan, *Broken Windows: Why—and How—we Should Take Them Seriously*, 7 CRIMINOLOGY & PUB. POL’Y 198–200 (2008).

151. See William J. Chambliss, *Policing the Ghetto Underclass: The Politics of Law and Law Enforcement*, 41 SOC. PROBS. 177–81 (1994).

152. See Joshua C. Hinkle & Sue-Ming Yang, *A New Look into Broken Windows: What Shapes Individuals’ Perceptions of Social Disorder?*, 42 J. CRIM. JUST. 26 (2014); Robert J. Sampson & Stephen W. Raudenbush, *Seeing disorder: Neighborhood Stigma and the Social Construction of “Broken Windows”*, 67 SOC. PSYCHOL. Q. 319 (2004); Ioanna Gouseti & Jonathan Jackson, *Construal Level Theory and the Fear of Crime*, in PSYCHOLOGY OF CRIME, FEAR AND THE MEDIA 22 (Derek Chadee ed., 2016).

153. Craig Paterson, *‘Street-level Surveillance’: Human Agency and the Electronic Monitoring of Offenders*, 4 SURVEILLANCE & SOC’Y 314 (2007); William J. Bratton & Sean W. Malinowski, *Police Performance Management in Practice: Taking COMPSTAT to the Next Level*, 2 POLICING 259, 259–65 (2008).

154. See generally Jeffrey Fagan & Garth Davies, *Street Stops and Broken Windows: Terry, Race, and Disorder in New York City*, 28 FORDHAM URB. L. J. 457 (2000); Yili Xu et al., *Discovering the Impact of Community Policing: The Broken Windows Thesis, Collective Efficacy, and Citizens’ Judgment*, 42 J. RES. CRIME & DELINQ. 147 (2005).

155. See Richard L. Block, *Fear of Crime and Fear of the Police*, 19 SOC. PROBS. 91 (1971); William Bloss, *Escalating US Police Surveillance After 9/11: An Examination of Causes and Effects*, 4 SURVEILLANCE & SOC’Y 208 (2007); Peter B. Kraska, *supra* note 84; Peter B. Kraska & Louis J. Cubellis, *Militarizing Mayberry and Beyond: Making Sense of American Paramilitary Policing*, 14 JUST. Q. 607 (1997).

156. See Michael Power, *Evaluating the Audit Explosion*, 25 LAW & POL’Y 185, 187–89(2003).

elements,”<sup>157</sup> resulting in dissociative or adversarial relationships between cop and citizen.<sup>158</sup>

This result is counter to the original intent behind community policing.<sup>159</sup> In hindsight, there is a certain level of disconnect between the algorithmic policing model and the community policing model, since algorithmic policing seeks to build a centralized, automated police force that operates from the inside out, while the community policing model requires a process that begins and ends with the citizen.<sup>160</sup> But a key driver behind broken windows and algorithmic policing is a heightened fear of crime and disorder, a fear that has not diminished significantly over the past few decades, despite the nearly universal drop in crime rates nationally.<sup>161</sup> A necessary part of this transformation, therefore, is to cultivate a base level of trust within police organizations as well as stakeholder communities. One method of building this trust is to continue to use the automated policing systems while redesigning them to focus on local

157. See Craig Willse, “Universal Data Elements,” or the Biopolitical Life of Homeless Populations, 5 SURVEILLANCE & SOC’Y 227 (2008) (describing how homeless populations are quantified as data elements).

158. See Alistair Fraser & Colin Atkinson, *Making Up Gangs: Looping, Labelling and the New Politics of Intelligence-led Policing*, 14 YOUTH JUST. 154, 166–67 (2014) (“The cops most of the time tend to put this information into the [intelligence] database and then we use our judgment maybe to put them in [a gang] or not.”); Craig Paterson, ‘Street-Level Surveillance’: Human Agency and the Electronic Monitoring of Offenders, 4 SURVEILLANCE & SOC’Y 314 (2007) (discussing the adversarial relations between electronically monitored offenders and their monitoring officials).

159. As originally envisioned in the early 1970s, the core community policing concept requires police officers to develop a sensitivity to community signaling regarding crime and disorder. Under this theory, this can only be done by establishing police foot patrols in neighborhoods, so that individual police officers can foster close working relationships with the citizens in those communities. See P.A.J. Waddington, Editorial, *Community Policing*, 1 POLICING 129 (2007) (evaluating the gaps between community policing theory and practice and the attendant criticisms).

160. James J. Willis et al., *Recommendations for Integrating Compstat and Community Policing*, 4 POLICING 182, 182–83 (2010).

161. See Mengyan Dai & Richard R. Johnson, *Is Neighborhood Context a Confounder? Exploring the Effects of Citizen Race and Neighborhood Context on Satisfaction with the Police*, 32 POLICING INT’L J. POLICE STRAT. & MGMT. 595 (2009) (exploring the effects of race and neighborhood on attitudes toward police); Ioanna Gouseti, *Construal Level Theory and Fear of Crime*, in PSYCHOLOGY OF FEAR, CRIME AND THE MEDIA (Derek Chadee ed., 2015) (examining levels of fear of crime as they relate to a person’s perceived psychological proximity to crime); Yung-Lien Lai & Jihong Solomon Zhao, *The Impact of Race/Ethnicity, Neighborhood Context, and Police/Citizen Interaction on Residents’ Attitudes Toward the Police*, 38 J. CRIM. JUST. 685 (2010) (a survey of public attitudes toward police and police behavior, by race, ethnicity, and neighborhood); David Weisburd et al., *The Possible “Backfire” Effects of Hot Spots Policing: An Experimental Assessment of Impacts on Legitimacy, Fear and Collective Efficacy*, 7 J. EXP. CRIMINOLOGY 297, 300–301 (2011) (examining unintended side-effects of hot spots policing, including an inflated fear of crime); David Weisburd & John E. Eck, *What Can Police Do to Reduce Crime, Disorder, and Fear?*, 593 ANNALS AM. ACAD. POL. & SOC. SCI. 42, 48–49 (2004) (studying various police techniques and their effects on reducing crime and fear of crime).

community goals rather than those of police departments or outside interests. Transparency is critical to this step's success—police management must create a system through which community members can not only seek police assistance, but can examine the systems and goals the police themselves use to guide their day-to-day patrol activities. Another critical part of this transformation is an immediate increase in accountability within police departments. Automation bias, data bias, and corrupted procedures and goals often give police departments a certain amount of artificial cover when things go badly. However, technological opacity is no substitute for human accountability up and down the LEA management chain. Finally, law enforcement resources must be shifted towards a citizen-focused organization, giving rank-and-file police officers the power to help drive automation policy, while also giving them the discretion to problem solve independent of the automated process.

B. *Incorporate Outcome and Process Feedback into Existing Systems*

We live in a time in which our lives are increasingly influenced and affected—whether we know it or not—by data, algorithms, and machine learning.<sup>162</sup> It would be a mistake to believe that police departments would somehow be immune to this trend. Therefore, the solution to modern (or post-modern) problems of public safety is not to go the way of Ned Ludd, but to develop police decision support systems with an eye toward civil rights, and avoiding race discrimination and economic injustice.

The key principle in developing any of these systems is transparency. In *Floyd et al. v. City of New York*,<sup>163</sup> the court held that the NYPD's stop and frisk program violated the Fourth Amendment by systematically conducting warrantless searches of pedestrians, the majority of which were African-American or Hispanic. Under the NYPD's stop-and-frisk program, police made over 4.4 million stops between 2004 and 2012.<sup>164</sup> Over half of these stops were of Black citizens, thirty percent were of Hispanic citizens, and only ten percent were of White citizens.<sup>165</sup> The guidelines that backed such a system were based on opaque police policy decisions implementing a broken windows policing model, and thereby creating the sort of insular environment that often fails to punish bad actors and creates perverse incentives.<sup>166</sup> Further, since most police departments do not em-

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162. See generally PEDRO DOMINGOS, *THE MASTER ALGORITHM: HOW THE QUEST FOR THE ULTIMATE LEARNING MACHINE WILL REMAKE OUR WORLD* (2015); FRANK PASQUALE, *THE BLACK BOX SOCIETY: THE SECRET ALGORITHMS THAT CONTROL MONEY AND INFORMATION* (2015).

163. 959 F. Supp. 2d 540, 560-62 (S.D.N.Y. 2013).

164. *Id.* at 556.

165. *Id.* at 559.

166. See David Weisburd & John E. Eck, *What Can Police Do to Reduce Crime, Disorder, and Fear?*, 593 ANNALS AM. ACAD. POL. & SOC. SCI. 42, 50-51 (2004); Bernard E. Harcourt, *Reflecting on the Subject: A Critique of the Social Influence Conception of Deterrence, the Broken Windows*

ploy software developers or statisticians, they are forced to purchase their decision support systems from third party contractors.<sup>167</sup> The same principles of transparency should apply to contractors so as to avoid these problems.

Next, algorithmic and predictive policing systems need to be based on accurate and meaningful data. For example, police stop and frisk programs, despite criticisms and claims of racial bias inherent in these programs, have been widely supported by LEAs based on their assertions that, while more minorities are subject to these stops, it is only because minorities commit disproportionately more crimes than Whites, and not due to any particular bias of police officers and departments.<sup>168</sup> To support these claims, police often cite automated police intelligence systems, such as Compstat, to justify these stops.<sup>169</sup> Statistical studies conducted on stop and frisk data, however, have shown that minorities are far more likely subjects of these programs, with statistical patterns pointing toward a structural racial bias, reinforced through automated decision support tools.<sup>170</sup>

Finally, we must be cognizant of the limitations of purely technical solutions to human problems. Mathematical and computer models of real-life systems can, of course, provide critical insights into complex systems, but they are imperfect. Algorithms for deriving patterns from large amounts of seemingly random data are getting better as research and technology progress, but their most effective use within the broken windows policing model is as a supplemental tool informing human decision making, not as a digital crutch upon which bad practices and biased policing may rest.

Further, known biases in automation systems can be mitigated through a number of established means. For example, automation bias and automation complacency can be avoided by increasing accountability by the users of a system.<sup>171</sup> By requiring system operators to provide complete justifications for their decisions—beyond “the machine told me

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*Theory, and Order-Maintenance Policing New York Style*, 97 MICH. L. REV. 291, 295-96 (1998). See also Jeremy D. Finn & Timothy J. Servoss, Misbehavior, Suspensions, and Security Measures in High School: Racial/Ethnic and Gender Differences, 5 J. APPLIED RES. ON CHILD. 1, 2 (2015) (exploring the relationships between student behavior, administrative discipline, race, and gender).

167. See generally David Dannels & Heather Smith, *Implementation Challenges of Intelligence Led Policing in a Quasi-rural County*, 24 J. CRIME & JUST. 103 (2001) (examining the technological challenges facing small police departments, often requiring a reliance on third-party contractors for installation, training, and maintenance of intelligence systems).

168. See Andrew Gelman, Jeffrey Fagan & Alex Kiss, *An Analysis of the NYPD's "Stop-and-Frisk Policy" Policy in the Context of Claims of Racial Bias*, 102 J. AM. STAT. ASS'N 813 (2007).

169. See, e.g., Weisburd et al., *The Possible "Backfire" Effects of Hot Spots Policing*, *supra* note 161, at 299-300.

170. Gelman, Fagan & Kiss, *supra* note 168, at 813-14.

171. See Linda J. Skitka, Kathleen Mosier & Mark D. Burdick, *Accountability and Automation bias*, 52 INT'L J. HUMAN-COMPUTER STUD. 701 (2000).

so”—users will be driven toward deeper cognitive engagement and awareness of alternative information sources.<sup>172</sup> The level of automation used in a situation should also be carefully assessed on a domain basis. That is, the level of automation available can exceed the level of automation necessary for a given situation.<sup>173</sup> Repetitive, rigid tasks that expect no user decision-making flexibility are often good candidates for a high degree of automation, while those tasks that rely on human intuition, pattern perception, and contextual reasoning, are best served with lower levels of automation.<sup>174</sup> Much of the work of law enforcement falls into this latter category.

For the time being, algorithmic and predictive approaches are only as useful as their human creators. Selecting the proper policing model for every instance is likely impossible, so one of the most important decisions in the field of machine learning is the selection of the model that will provide superior results for a particular problem, a task which still requires an experienced and informed human in the loop.<sup>175</sup> But this limit can be leveraged as a benefit, rather than a liability, by using predictive systems to decentralize police command structures, and allow more creativity and initiative among rank-and-file patrol officers, characteristics that are critical to a true community-policing model.<sup>176</sup>

## CONCLUSION

The problem of bias in algorithmic policing has deep roots, as evidenced above. Solutions to this problem cannot ignore technological advances that help us make better, more efficient decisions, but they also cannot allow these technologies to subvert the proper role of public safety in our communities. We live in an information society that is, once again, experiencing a crisis of control that we are naturally inclined to solve through data and analytic methods. But our approach must be based on lessons learned from our successes and failures in this arena. Many of these failures have led to a trust deficit between authorities and the communities

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172. *Id.* at 703–704. See also Mark D. Burdick et al., *The Ameliorating Effects of Accountability on Automation Bias*, in THIRD ANN. SYMP. ON HUM. INTERACTION WITH COMPLEX SYS. HICS '96, at 174 (1996).

173. See Mary L. Cummings, *Automation Bias in Intelligent Time Critical Decision Support Systems*, AM. INST. AERONAUTICS & ASTRONAUTICS, AIAA 1ST INTELLIGENT SYSTEMS TECHNICAL CONF. 1 (2004).

174. *Id.* at 1–2.

175. See Christophe Giraud-Carrier, *Beyond Predictive Accuracy: What?*, in PROC. ECML-98 WORKSHOP UPGRADING ON LEARNING TO META-LEVEL: MODEL SELECTION & DATA TRANSFORMATION 78 (1998), <http://dml.cs.byu.edu/~cgc/pubs/ECML98%20WS%20Summary.html>.

176. See James J. Willis et al., *Recommendations for Integrating Compstat and Community Policing*, 4 POLICING 182–93 (2010).

they govern, especially where racial prejudices have been part of these failures. Addressing these disparities in algorithmic policing cannot solve all of these problems, but it is a good start.