

# Artificial Intelligence Applications in Law Enforcement

## An overview of artificial intelligence applications and considerations for state, local, and tribal law enforcement

This technology brief is the second in a four-part series that examines artificial intelligence (AI) applications in the criminal justice system. This brief highlights AI applications currently in use by law enforcement agencies, introduces frameworks for evaluating AI applications, and summarizes critical risks to consider when deploying AI systems. Additional briefs provide a high-level overview of AI within the [criminal justice system](#) and AI topics related to the [criminal courts system](#) and [corrections](#).

### Key Takeaways

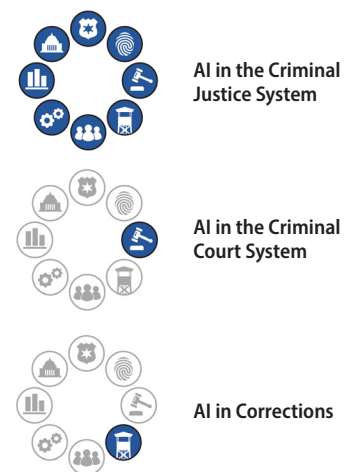
- AI and advanced robotics in policing are not yet widespread; however, many law enforcement agencies are experimenting with these technologies. Opportunities to utilize AI applications in law enforcement will continue to increase as technologies evolve, including AI, 5G, and autonomous vehicles.
- This brief provides use cases, products, and vendor technologies to illustrate how some agencies have incorporated AI; the hope is for this information to inspire an ongoing dialogue between law enforcement leaders about how to improve policing.
- AI solutions hold promise to increase efficiency, promote data-driven practices, and expand capabilities for law enforcement agencies. The challenge will be for law enforcement agencies to identify use cases in which data quality and availability, technology maturity, and ethical constraints match their needs and their communities' needs.
- Law enforcement agencies, communities, and the legal system need to have ongoing conversations about the tradeoffs between personal privacy and public safety/security as AI enables more sophisticated surveillance and investigation.

This technology brief provides law enforcement executives with example AI applications in use by law enforcement today, introduces frameworks for evaluating AI applications, and summarizes critical risks to consider when deploying AI systems. Although many of the examples highlighted in this brief have not yet been widely adopted, AI has the power to improve efficiency, increase data-driven practices, and expand capabilities within law enforcement.

### Resources for Considering AI in Criminal Justice Applications

This document explores AI within law enforcement.

Additional briefs address specific application areas.

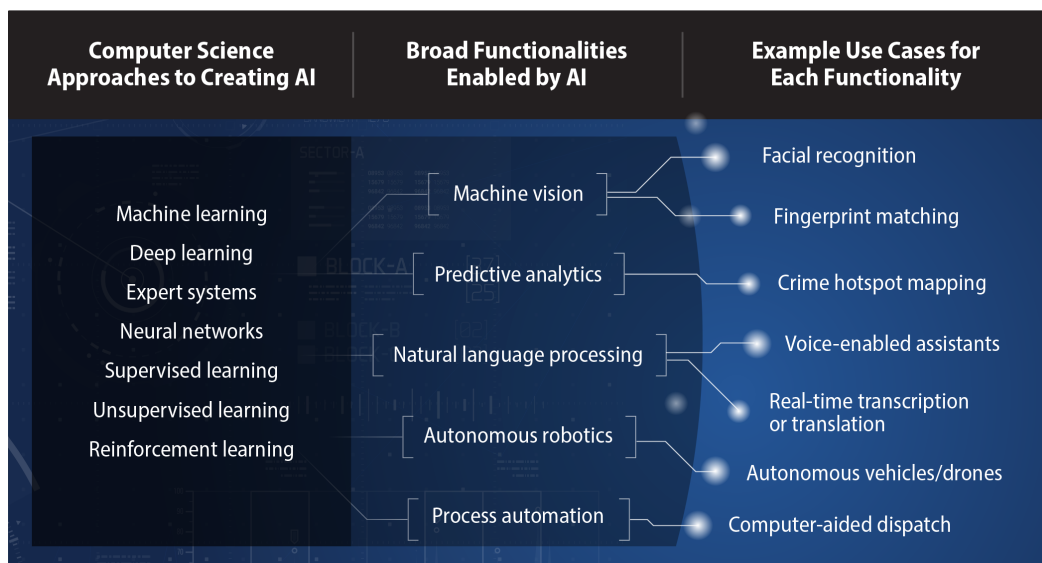


**Figure 1: Implementing AI impacts all stakeholders in the criminal justice community. Briefs in this series frame AI within the community and focus on AI applications in law enforcement, [criminal courts](#), and [corrections](#).**

Today, AI is heralded as a transformational force with the power to reshape industry. Nation states are vying to become global leaders in AI, and corporations are seeking to integrate AI for increased personalization and user convenience. While vendors are touting the power of their AI-enabled systems, many civil rights groups have been advocating for caution and restraint—especially for AI’s use in law enforcement applications. In the case of facial recognition technologies, industry observers recognize the power of emerging digital tools to consolidate authoritarian control—including China’s reported use of facial recognition technology in identifying and tracking minority populations.<sup>1</sup> In addition, facial recognition algorithms have shown different error rates for people with different skin colors, which may lead to the perpetuation of racial bias in facial recognition applications.<sup>2</sup> Consequently, IBM will no longer pursue development of this technology, and Amazon has banned law enforcement use of its Rekognition facial recognition platform.<sup>3</sup> The examples in this document point to the positive impacts AI can have in criminal justice applications, but the promise of this new technology must be considered alongside its potential for harm. The hype surrounding AI has skewed public perception; with that in mind, futurist Roy Amara’s words may be particularly true when it comes to AI in law enforcement: “We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.”<sup>4</sup>

## What is Artificial Intelligence?

AI is commonly misconstrued as a single, new technology. In reality, AI is a collection of computer science methods that have been studied as far back as the 1950s.<sup>5</sup> The exact definition of AI is a point of debate; however, **AI can be broadly understood as a domain of computer science that seeks to create machines that mimic human intelligence.** There are multiple approaches to developing AI, and various functionalities of AI such as **machine vision, predictive analytics, natural language processing, autonomous robotics, and robotic process automation.** These functionalities are explored in more depth in the [first brief](#) within this series, and **Figure 2** highlights example law enforcement use cases for each functionality.



**Figure 2:** Different types of AI enable vastly different applications within law enforcement.



1. Mozur, P. (2019, April 14). One Month, 500,000 Face Scans: How China Is Using A.I. to Profile a Minority. Retrieved April 1, 2020, from <https://www.nytimes.com/2019/04/14/technology/china-surveillance-artificial-intelligence-racial-profiling.html>
2. Face Recognition Vendor Test (FRVT) Part 3: Demographic Effects (December 2019). Retrieved March 27, 2020, from <https://nvlpubs.nist.gov/nistpubs/ir/2019/NIST.IR.8280.pdf> From the study: Using the higher quality Application photos, false positive rates are highest in West and East African and East Asian people, and lowest in Eastern European individuals. This effect is generally large, with a factor of 100 more false positives between countries. However, with a number of algorithms developed in China this effect is reversed, with low false positive rates on East Asian faces. With domestic law enforcement images, the highest false positives are in American Indians, with elevated rates in African American and Asian populations; the relative ordering depends on sex and varies with algorithm.
3. Statt, N. (2020). Amazon Bans Police From Using its Facial Recognition Technology for the Next Year. The Verge. Retrieved from <https://www.theverge.com/2020/6/10/21287101/amazon-rekognition-facial-recognition-police-ban-one-year-ai-racial-bias>
4. Ratcliffe, S. (Ed.). (2016). Oxford essential quotations. Oxford, UK: Oxford University Press
5. National Research Council 1997. Computer Science and Artificial Intelligence. Washington, DC: The National Academies Press. <https://doi.org/10.17226/5812>.



## Identifying Law Enforcement Use Cases for AI

AI-enabled technologies have the potential to impact a wide range of internal and public-facing law enforcement operations. Law enforcement leaders should take a design thinking approach to evaluating AI-enabled technology. **Design thinking** is an approach to innovation that emphasizes deep understanding of the problem, its context, and constraints before deciding which solution is best.<sup>6</sup>

Broadly speaking, AI solutions can help law enforcement **make decisions** and **perform tasks**. AI-enabled solutions often seek to improve efficiency, increase data-driven practices, or expand capabilities for specific tasks or decisions. **Figure 3** shows some of the decisions and tasks that face law enforcement agencies.

 <b>Example Decisions</b>	 <b>Example Tasks</b>
<p>How many officers does my agency need?</p> <p>Where should I deploy resources?</p> <p>What is the optimal scheduling strategy for officers?</p> <p>How should crime prevention resources be focused?</p>	<p>Transcribe notes</p> <p>Provide crime statistics and administrative data to the community</p> <p>Investigate crimes</p> <p>Identify stolen cars</p> <p>Find victims of human trafficking</p> <p>Conduct surveillance</p> <p>Engage the community</p> <p>Improve officer safety</p> <p>Prevent crime</p>

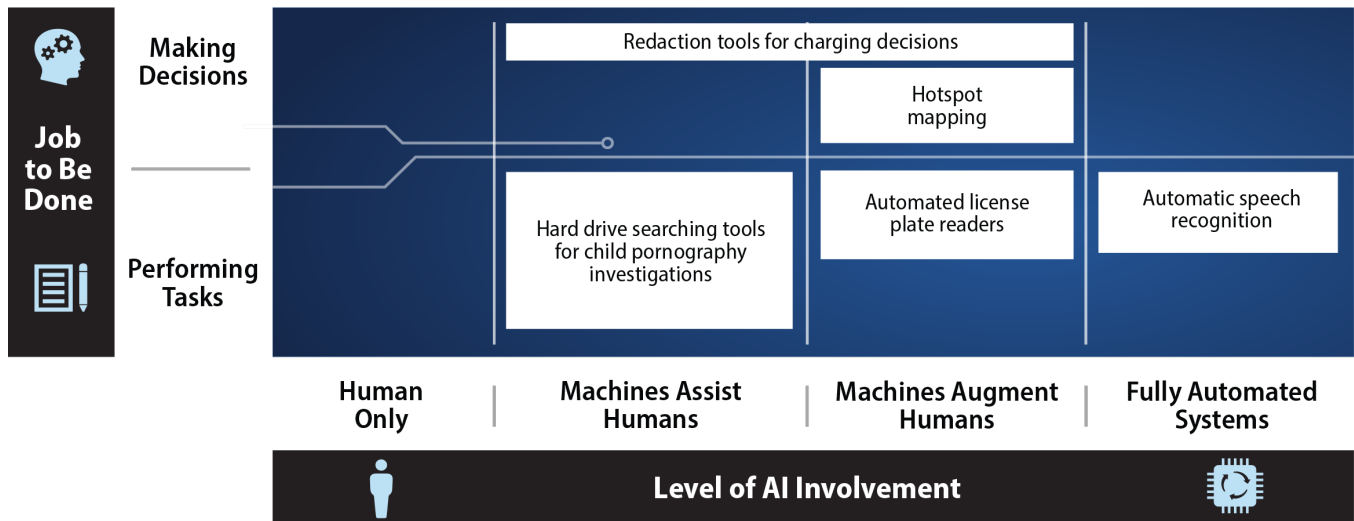
**Figure 3:** AI may one day address tasks and decisions facing law enforcement agencies.

A crucial step of design thinking is to identify how an AI application would support law enforcement (e.g., completing a task or making a decision) and decide the appropriate level of AI involvement, from helping the end user do their job more efficiently to automating the job entirely. **Figure 4** provides examples of applications (which are explained in further detail in later sections) that help law enforcement perform tasks or make decisions with differing levels of AI involvement.

**“We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.”**

—Roy Amara, Futurist

<sup>6</sup> Linke, R. (2017) Design thinking, explained. Retrieved April 7, 2020, from <https://mitsloan.mit.edu/ideas-made-to-matter/design-thinking-explained>



**Figure 4:** Design thinking can help identify AI use cases by considering the level of AI involvement in the job that needs to be done.

Rather than rush to deploy AI, law enforcement leaders should evaluate both AI and non-AI based solutions to determine which one best meets law enforcement needs. For each decision or task in law enforcement’s daily operations, there is a unique context and set of constraints that must be considered.

**Although not all tasks are appropriate for AI, these technologies can provide benefits to law enforcement, including cost savings, efficiency improvements, data-driven practices, and enhanced capabilities.**

The following section highlights current examples of AI-enabled use cases aimed at helping law enforcement agencies with decision-making and task completion. As with all technological advancements, agencies must carefully consider both benefits and costs associated with AI adoption.



## Current Examples of AI Applications in Law Enforcement

Although the use of AI in law enforcement is not currently widespread, many agencies are beginning to experiment with AI and advanced robotics. This section, which highlights example AI-enabled products and services, is intended to make law enforcement leaders aware of these applications and inspire ongoing dialogue about how or if AI technologies should be implemented.<sup>7</sup>

### Expanding Capabilities

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#### Automated License Plate Readers (ALPRs)

ALPRs have been a tool for both law enforcement and private companies for years;<sup>8</sup> AI-driven improvements in machine vision technology have enhanced capabilities and decreased costs of ALPRs. As the costs of ALPR systems have decreased, both law enforcement and private companies have found new uses for this surveillance tool.<sup>9</sup> From creating “virtual fences” to pinpoint which vehicles enter and exit a geographical boundary or jurisdiction, to automating the issuing of tickets for red light violations, ALPRs are one of the most widely used implementations of machine vision in law enforcement today.

#### Video and Photo Surveillance

In addition to ALPRs, cameras made for video surveillance or other security applications are also advancing. Hardware companies have begun embedding AI capabilities (e.g., chips that can run deep neural networks) directly in their cameras. These upgraded cameras run their AI algorithms on a camera’s hardware rather than on the cloud, decreasing costs, increasing speed, and decreasing bandwidth requirements.<sup>10</sup> AI-enabled hardware is being used in new law enforcement use cases like real-time facial recognition in large public places<sup>11</sup> and real-time weapons detection.<sup>12</sup>

#### Redaction to Reduce Systemic Bias

Although many think of redaction in the context of public release, AI may end up playing an important role in mitigating unconscious bias toward individuals within the criminal justice system. For example, the District Attorney for San Francisco plans to use AI’s redaction capabilities to combat any potential bias by modifying police narratives to automatically redact the race and other background characteristics of suspects and victims. The goal is to allow prosecutors to make charging decisions in cases without potentially engaging in biased decision-making.<sup>13</sup>

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7. These products and vendor technologies serve as illustrative examples only. The Criminal Justice Testing and Evaluation Consortium does not endorse any specific product or vendor. Mentions of companies and/or products do not represent approval or endorsement by the National Institute of Justice.

8. Roberts, D., Casanova, M., (2012, September) Automated License Plate Recognition (ALPR) Use by Law Enforcement: Policy and Operational Guide, Summary. Retrieved April 3, 2020, from <https://www.ncjrs.gov/pdffiles1/nij/grants/239605.pdf>

9. Kaplan, J. (2019, July 10). Who’s Using License Plate Cameras to Track Cars? Cops, Landlords, and Your Neighbors. Retrieved April 1, 2020, from <https://slate.com/technology/2019/07/automatic-license-plate-readers-hoa-police-openalpr.html>

10. Faggella, D. (2019, February 2). AI for Crime Prevention and Detection—5 Current Applications. Retrieved April 1, 2020, from <https://emerj.com/ai-sector-overviews/ai-crime-prevention-5-current-applications/>

11. China is using AI in combination with some of its more than 200 million surveillance cameras to identify and track its citizens. <https://www.nytimes.com/2018/07/08/business/china-surveillance-technology.html>

12. ZeroEyes is a technology company that has developed AI-enabled video analytics software; this software provides real-time weapon detection and alerts, improving the safety in schools and other settings by detecting when a person enters a facility with a concealed gun. <https://zeroeyes.com/>

13. Queally, J. (2019, June 12). San Francisco D.A. Unveils Program Aimed At Removing Implicit Bias from Prosecutions. Retrieved April 1, 2020, from <https://www.latimes.com/local/lanow/la-me-san-francisco-da-prosecutions-implicit-bias-software-20190612-story.html>



## Gunshot Detection and Mapping

Law enforcement has access to systems that detect, record, and locate gunshots. Local law enforcement agencies in over 100 cities<sup>14</sup> have already adopted acoustic gunshot detectors, such as [ShotSpotter®](#); however, startups like [Aegis](#) have incorporated AI into these systems by using visual gun recognition to detect gunshots before they are fired. While not specifically focused on evaluating the AI systems underlying gunshot detection technology, the impact of gunshot detection software is an active area of research for the National Institute of Justice.<sup>15, 16</sup>

## Combatting Human Trafficking and Child Predators

The nonprofit startup [Thorn](#) is using Amazon's facial recognition technology (FRT) to scan internet ads and the dark web for pictures of known missing children.<sup>17</sup> Thorn's use of AI highlights how systems can enhance, rather than replace, traditional policing practices. After trafficked children are identified and located, traditional policing practices must still be used to capture offenders or rescue victims.

Similar approaches are being used to identify and disrupt child pornography supply chains and apprehend child predators.<sup>18</sup> In collaboration with Thorn and other organizations, Microsoft has developed its Project Artemis tool. Project Artemis identifies communication patterns that predators use in online chat rooms to prey and target children. Additionally, other consumer-oriented internet monitoring companies have extended their impact by partnering with law enforcement agencies to identify child predators.<sup>19</sup>

## Increasing Efficiency

### Video Redaction

The proliferation of body cameras used by law enforcement agencies<sup>20</sup> has created increased challenges related to video redaction. In many instances, either by regulation or by choice, identifying information is redacted from police body cam footage prior to releasing the footage to the public. Some states even specify timelines for the public release of body cam recordings.<sup>21</sup> With manual redaction taking up to 10 minutes for just 2 minutes of video, more and more police agencies are seeking AI-driven solutions for video redaction. Companies like Microsoft, various academics, and other technology vendors are actively developing video redaction solutions.<sup>22, 23</sup>

### AI-Enabled Transcription

Automatic speech recognition (ASR) software improves the quality of law enforcement reporting and increases reporting efficiency.<sup>24</sup> Instead of typing a report narrative, law enforcement officers are adopting voice-to-text dictation tools to expedite the reporting process. In addition to speeding up the transcription step, AI-enhanced ASR may also help eliminate human errors—such as misidentifying speakers' voices from witness testimonies, interrogations, and other audiovisual materials.

14. Acoustic Gunshot Detection. (n.d.). Retrieved April 1, 2020, from <https://www.eff.org/pages/gunshot-detection>

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23. Sah, S., Shringi, A., Ptucha, R., Burry, A. M., & Loce, R. P. (2017, July 20). Video Redaction: A Survey and Comparison of Enabling Technologies. Retrieved April 1, 2020, from <https://www.spiedigitallibrary.org/journals/journal-of-electronic-imaging/volume-26/issue-05/051406/Video-redaction-a-survey-and-comparison-of-enabling-technologies/10.1117/1.JEI.26.5.051406.full?SSO=1>

24. Dragon Law Enforcement—Speed Incident Reporting by Voice. (n.d.). Retrieved April 1, 2020, from <https://www.nuance.com/dragon/industry/dragon-law-enforcement.html>





### Computer Aided Dispatch (CAD)

Law enforcement and emergency medical services (EMS) agencies can use CAD systems to capture data from incoming calls, inform resource deployment decisions, or assist with reporting.<sup>25</sup> Some CAD software providers like [RapidDeploy](#) are beginning to incorporate AI or advanced analytics capabilities into their software platforms. Integrating AI in CAD systems can lead to optimized resource allocation, as well as time and cost savings given the potential of AI systems to analyze historic data, make predictions, inform decisions, and automate workflows. In addition, AI could enable a CAD system to learn and adapt its recommendations in real time.

### Hotspot Mapping or Predictive Policing

Systems for predictive policing and hotspot mapping have been around for many years to support resource optimization. However, AI technologies are being incorporated into some of these systems to improve predictive capabilities.<sup>26</sup> Generally, AI is used to augment place-based and individual-based predictive policing models. Place-based predictive policing uses information to identify specific areas (at specific times) that are at an increased risk of crime and/or disorder. Individual-based predictive policing uses information about a person—such as their involvement with the criminal justice system—to identify individuals at risk of being involved, either as a victim or an offender, in future incidents of law enforcement interest. Each type of predictive model has inherent drawbacks, including the perpetuation of systemic bias and the potential to over-police certain communities within a jurisdiction. AI can also be used to leverage crime databases to automatically cluster and detect patterns, which could predict whether multiple crimes were committed by the same perpetrator or to suggest who may be a perpetrator based on historical data.

### Improving Police-Community Relations

Law enforcement agencies often need to convey important information to the public; this information includes making general public announcements and responding to requests from individuals. Advances in natural language processing allow sophisticated and intelligent systems to manage personalized communications. Virtual chatbots, for example, are being deployed commercially to support customer service applications. Similarly, these chatbots may improve the “customer experience” between police and the communities they serve. The Los Angeles Police Department deployed a virtual chatbot on its website to help answer questions from potential police recruits.<sup>27</sup> Police in Georgia and Indiana are beta-testing a community engagement chatbot developed by [civitasAI](#) that can check for an emergency, respond to a variety of frequently asked questions, and supply information about available resources and referrals.<sup>28</sup>

### Improving Case Clearance Rates

In 2018, the Department of Justice awarded a grant to the the Los Angeles Police Department (LAPD), Justice & Security Strategies, Inc. (JSS) and University of California, Los Angeles (UCLA) that aims to use machine learning to improve homicide investigations and case clearance rates. The team is applying machine learning to an extensive homicide database that includes optically scanned information from over 6,000 “Murder Books” that cover a 21-year period (1990–2010) to determine predictors of clearance and conviction rates for homicides and shootings and measure the degree to which predictors of gun homicide and shooting incidents are similar and different. The team intends to test and evaluate an investigative tool based on deep learning algorithms.<sup>29</sup>

**Whether for current or future technology, the law enforcement community should first closely examine the problem that needs to be solved and evaluate multiple solutions before determining if an AI-enabled approach is best.**

<sup>25</sup> [https://it.ojp.gov/documents/LEITSC\\_Law\\_Enforcement\\_CAD\\_Systems.pdf](https://it.ojp.gov/documents/LEITSC_Law_Enforcement_CAD_Systems.pdf)

<sup>26</sup> Baron, E. (2019, March 11). Predictive Policing Using AI Tested by Bay Area Cops. Retrieved April 1, 2020, from <https://www.govtech.com/public-safety/Predictive-Policing-Using-AI-Tested-by-Bay-Area-Cops.html>

<sup>27</sup> <https://www.govtech.com/products/Los-Angeles-Chatbot-Deputized-to-Help-with-Police-Recruitment.html>

<sup>28</sup> Norris, D. (2019, June 19). Artificial Intelligence and Community-Police Relations. Retrieved April 1, 2020, from <https://www.policechiefmagazine.org/ai-community-police-relations/>

<sup>29</sup> [http://clkrep.lacity.org/online/docs/2018/18-1219\\_misc\\_12-12-2018.pdf](http://clkrep.lacity.org/online/docs/2018/18-1219_misc_12-12-2018.pdf)



## Emerging AI Applications in Law Enforcement

The number and type of AI applications in law enforcement will continue to grow as technologies—such as Internet of Things, 5G, autonomous vehicles, and robotics—evolve. Several international bodies, including the United Nations, have already started to evaluate future law enforcement applications for AI and have begun critical discussions about the tactical, legal, and ethical implications of such applications.<sup>30</sup> Yet what many consider to be “future” applications may actually be closer to “current” applications than people realize. Although still in the development or testing phase, Dubai is experimenting with robotic police officers;<sup>31</sup> technology providers are developing voice-enabled digital assistants for police field work;<sup>32, 33</sup> and China is leveraging its 200 million surveillance cameras to track lawbreakers and deter crime.<sup>34</sup> The NIJ continues to support a portfolio of AI research projects in areas such as public safety video and image analysis, DNA analysis, gunshot detection, and crime forecasting.<sup>35</sup>

## Three AI Considerations for Law Enforcement Leaders

### 1. Considering the technical feasibility, ethical appropriateness, and operational achievability of proposed AI solutions can improve chances of successful implementation.

Law enforcement leaders can improve the likelihood of success by considering three key elements for any proposed AI application: (1) **technical feasibility**, which includes both data quality and systems that house data; (2) **ethical appropriateness** that considers the benefits and risks; and aligns all stakeholders; and (3) **operational achievability** to ensure that technology adoption would integrate well within workflows. More detail about these considerations can be found in the [first brief](#) in this series. Without considering these three factors, AI implementations are unlikely to succeed.

### 2. Questions about law enforcement’s use of AI should be discussed in an open and ongoing dialogue with the community.

Law enforcement’s use of AI is prompting important but difficult conversations that communities, states, and even nations will likely answer in different ways. There are important ethical considerations to consider when deploying AI solutions—including issues of **fairness, accountability, transparency, security, and privacy**. Some communities may decide that certain technologies are not appropriate for use in law enforcement due to privacy or other ethical concerns. For example, in 2019, California became the first state to ban the use of FRTs by law enforcement.<sup>36</sup>

30. United Nations Interregional Crime and Justice Research Institute. (n.d.). New Report: Artificial Intelligence and Robotics for Law Enforcement. Retrieved April 1, 2020, from [http://www.unicri.it/in\\_focus/on/interpol\\_unicri\\_report\\_ai](http://www.unicri.it/in_focus/on/interpol_unicri_report_ai)

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34. China is using AI in combination with some of its more than 200 million surveillance cameras to identify and track its citizens. <https://www.nytimes.com/2018/07/08/business/china-surveillance-technology.html>

35. Christopher Rigano, “Using Artificial Intelligence to Address Criminal Justice Needs,” October 8, 2018, nij.ojp.gov: <https://nij.ojp.gov/topics/articles/using-artificial-intelligence-address-criminal-justice-needs>

36. Metz, R. (2019, September 13). California Lawmakers Ban Facial-Recognition Software from Police Body Cams. Retrieved March 28, 2020, from <https://www.cnn.com/2019/09/12/tech/california-body-cam-facial-recognition-ban/index.html>





### 3. In some applications, the adoption of technology is outpacing conversations about ethics.

In some cases, conversations about what is technically feasible are at risk of taking higher priority than conversations about what is ethically appropriate. For example, unbeknownst to many of her fans, musical artist Taylor Swift has already employed FRTs at her concerts for both security and marketing purposes.<sup>37</sup> Several school systems across the country are deploying facial recognition in an effort to improve safety and security.<sup>38</sup> Looking abroad, the Chinese government is deploying both facial recognition and other surveillance technologies at massive scale to monitor its citizens<sup>39</sup>—including equipping police with mobile facial recognition units mounted on eyeglasses.<sup>40</sup> It is important to recognize that law enforcement agencies' use of cutting-edge AI-driven methods requires police also to be on the cutting edge of social and ethical conversations with the community. Refer to the [first brief](#) in this series for an overview of ethical considerations and key questions that can serve as a starting point for criminal justice leaders and decision-makers as they evaluate potential impacts of AI solutions on the community and other stakeholders.



#### Future Outlook

AI is here to stay, and advances in technical capabilities will continue. The criminal justice community faces shrinking budgets and a growing sense of mistrust from the community. With these things in mind—and considering ethical appropriateness, technical feasibility, and operational limitations—AI provides important opportunities to improve the criminal justice system. Opportunities to implement AI tools should be met with a clear understanding of the data requirement and use a design thinking approach to evaluating potential use cases. This series of briefs aims to inform decision makers about what is already happening in the criminal justice ecosystem and what is required to utilize emerging AI technologies in a thoughtful, informed, and unbiased way.

The NIJ continues to support a portfolio of AI research projects in areas such as public safety video and image analysis, DNA analysis, gunshot detection, and crime forecasting.<sup>41</sup> Looking ahead to the future, different countries and states are likely to adopt AI technologies for criminal justice applications at different rates, which presents an opportunity for learning through collaboration. Improving criminal justice outcomes through the use of AI-enabled technologies will require intentional investment, careful consideration, and sustained efforts from criminal justice decision makers. If designed and implemented well, AI-enabled tools have the potential to improve efficiency, reduce costs, and expand capabilities across many criminal justice use cases.

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**Published: August 2020**

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## Suggested Citation

Redden, J., Aagaard, B., Taniguchi, T., & Criminal Justice Testing and Evaluation Consortium. (2020). *Artificial Intelligence in Law Enforcement*. U.S. Department of Justice, National Institute of Justice, Office of Justice Programs. <http://cjtec.org/>

This publication was made possible by Award Number 2018-75-CX-K003, awarded by the National Institute of Justice, Office of Justice Programs, U.S. Department of Justice. The opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect those of the Department of Justice.

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