THE ROLE OF ARTIFICIAL INTELLIGENCE IN CRIMINAL INVESTIGATION

by

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ABSTRACT

AI has accelerated its development, taking the lead in digital innovation by improving various areas through its high-speed data analysis, pattern detection and self-directed choices. Over the past few years, AI has begun changing criminal justice systems globally by improving modern criminal investigations. To improve the efficiency of their crime-investigation operations, law enforcement organisations are utilising AI-powered facial recognition, connected cameras, predictive policing, and forensic equipment. Given that crimes are becoming more difficult to tackle, these tools are now necessary to support police work.

This research investigates the impact that AI now has on law enforcement and the ways it positively affects the field. Using AI technology, police forces reduce mistakes, work quickly to solve crimes and manage their available resources in a better way. But, the use of AI raises many difficulties that demand careful attention as soon as possible. Concerns include how one-sided AI decisions can be, threats to personal privacy, how difficult it is to see behind the decisions made by AI and the risk that surveillance cameras may be misused. They seriously threaten the basic rights and justice that America stands for. The research evaluates the legislation related to AI in law enforcement and assesses how well they handle the problems caused by using AI in policing. It dedicates its studies to international cases and laws from nations like the United States, India and the European Union to give a global comparison. A deep investigation makes it possible to find weaknesses in the rules and develop suggestions for policies to support safe use of AI in criminal cases.

Ultimately, this dissertation seeks to present balanced, practical guidance for the integration of AI into criminal justice systems. It aims to support a framework that upholds both technological advancement and the protection of human rights, contributing to the ongoing global discourse on how to ethically and effectively embed AI within systems of law enforcement.

Keywords: Artificial Intelligence, Criminal Investigation, Predictive Policing, Algorithmic Bias, Legal Regulation

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INTRODUCTION

Since 2010, Artificial Intelligence (AI) has led to major changes in industries, with tasks being performed differently, decisions being made using new methods and information being managed in innovative ways. Essentially, AI lets machines behave like people by learning, analyzing patterns, using logic and solving problems. As a result, these systems can work with much more data in a short time and find insights uncoverable by humans in a longer period. With the evolution of this technology, it now supports advancements in various fields by making things faster, more accurate and more innovative.

In the criminal justice system, one of the main affected areas is criminal investigations due to the development of AI. Because modern crimes rely more on technology, the old approach to investigating them has shown flaws. In the past, inquests depended mainly on what those who saw the event said, how police interpret the incident and paper notes. While these techniques have helped the justice system for many years, they are often prone to mistakes, biased opinions and lengthy waiting periods.

Modern tools rely on AI to provide solutions that are more detailed and based on data. The use of AI now helps catch suspects through identification, as well as predict where future crimes might occur. Using AI, experts can automate reviewing digital files, while surveillance cameras with machine learning are able to track recordings and live video more precisely. Thanks to AI, law enforcement agencies can recognize threats by studying information gathered from social media, internet traffic and CCTV recordings.

The incorporation of AI into criminal investigations represents a shift from reactive, intuition-based policing toward a model rooted in proactive, evidence-driven strategies. As these technologies become more integrated into daily operations, the potential for faster case resolutions, reduced reliance on fallible human judgment and more equitable outcomes continues to grow—though not without raising important ethical and legal questions about privacy, accountability and fairness, which require careful consideration.

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On the other hand, while AI is useful for police and detectives, it can also lead to many difficulties and opposing views. The biggest worry for researchers might be algorithmic bias. If AI systems are exposed to uneven or biased data, then the results may unfairly harm vulnerable or marginalised groups. There are several real cases that reveal that using predictive

policing can result in a higher level of policing in minority areas, strengthen old biases and hinder the principles of justice and fairness in law.[1]

Furthermore, the extensive use of AI in surveillance presents important concerns regarding data security, privacy rights, and striking a balance between individual freedom and national security. For instance, facial recognition technologies used in public spaces have been criticised for enabling mass surveillance and potential abuse by state authorities.[2]The difficulty in understanding how these AI systems make decisions, often called the "black box" problem, makes it harder to hold them accountable and follow proper legal steps. AI systems usually don't explain why they give certain results, which makes it hard for courts to check if their decisions are reliable or fair.[3]

Current legal frameworks are unable to keep up with these technical developments; many nations lack complete laws that regulate the moral application of AI in law enforcement, and those that do exist are frequently out-of-date or too general to handle issues unique to AI. In jurisdictions such as India, for example, the regulatory framework is still evolving, and there is an urgent need to balance innovation with civil liberties.[4] The European Union introduced the Artificial Intelligence Act as a proactive approach, which intends to categorise AI systems based on their risk categories and put stricter restrictions on high-risk applications, especially those used in law enforcement.[5]

Focusing on AI, this research brings attention to how it can improve investigations, but at the same time creates various ethical, legal and practical challenges. It seeks to study the applications of AI in current investigate and to identify areas where human rights might suffer as well as where AI can lead to more effective justice. The subject will be understood fully by referring to academic papers, real-life examples, different legal systems and the ways they are applied.

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[1] Andrew Ferguson, *The Rise of Big Data Policing: Surveillance, Race, and the Future of Law Enforcement* (NYU Press 2017).
[2] Woodrow Hartzog and Evan Selinger, 'Facial Recognition is the Perfect Tool for Oppression' *The New York Times* (15 August 2019) https://www.nytimes.com/2019/08/15/opinion/facial-recognition-ban.html accessed 1 May 2025.
[3] Sandra Wachter, Brent Mittelstadt and Chris Russell, 'Why Fairness Cannot Be Automated: Bridging the Gap Between EU Non-Discrimination Law and AI' (2021) 41(1) *Computer Law & Security Review* 105567.
[4] Vidushi Marda, 'Artificial Intelligence Policy in India: A Framework for Ethical AI' (2019) Carnegie India https://carnegieindia.org/2019/08/01/artificial-intelligence-policy-in-india-framework-for-ethical-ai-pub-79636 accessed 1 May 2025.
[5] European Commission, 'Proposal for a Regulation Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act)' COM (2021) 206 final.

It brings together ideas from law, technology, ethics and criminology to study this area. It aims to build upon the ongoing knowledge in technology and law-enforcement rights and recommend ways to use AI responsibly in this domain. Special care is taken to see that any use of technology meets the requirements of the constitution, protects human dignity and follows the rules of natural justice.

Several chapters in the dissertation are used to guide the analysis step by step. After the introduction, the literature review describes what is known and not known about AI in criminal justice. The next chapter will discuss how AI is applied in investigative work such as help in solving crimes through forecasting crime, biometric analysis and analyzing digital evidence. Following this, the report will focus on the problems caused by AI, including bias in algorithms, increased monitoring through AI, whether AI-generated information can be used as evidence in court and the threat to civil rights.

Next, international legal frameworks and regulations related to AI in law enforcement will get attention, along with a look at the different methods nations use to deal with AI adoption. The penultimate chapter will set guidelines, as well as provide suggestions, to help reduce dangers and improve how AI is used in the criminal justice system. At the end, the report will go over the key recommendations and suggest some paths to foster a fair and rights-based way of using AI in criminal investigations in the future.

AI still requires careful planning and following all standards in the way it is developed and put to use in criminal inquiries. The use of AI can benefit a society without jeopardizing the basic freedoms and rights at the foundation of legal systems by adopting a balanced approach.

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CONCEPTUALISING ARTIFICIAL INTELLIGENCE

The ability of software or robots to do tasks that frequently need human intelligence is known as artificial intelligence (AI). This includes learning, thinking, problem-solving, understanding natural language, and recognising patterns. Despite the fact that the term "AI" often evokes images of autonomous robots, the vast majority of its current applications in criminal justice are software-driven and algorithmic.

John McCarthy, a pioneer in the field, defined AI as "the science and engineering of making intelligent machines"[6] Both the behavioural and technical components of AI systems are captured in this concept. Narrow AI, which carries out specific tasks (like facial recognition), and general AI, which would have the wider cognitive capacities of a human being (though the latter is still primarily theoretical), are the two basic categories into which AI can be divided in practice.

In law enforcement, narrow AI tools are most commonly used. Examples include predictive policing algorithms, biometric recognition systems, natural language processing tools for document review, and machine learning models used in data analytics[7]. These technologies do not "think" like humans but are designed to process large datasets, identify patterns, and make inferences that would otherwise be too complex or time-consuming for human officers.

KEY TECHNOLOGIES IN AI FOR CRIMINAL INVESTIGATIONS

Several AI-driven technologies are now being used or tested in police departments and investigative agencies globally. These include:

1. **FACIAL RECOGNITION SOFTWARE**: Systems that match images captured in public spaces with databases of known individuals.

   Examples:

   - **Clearview AI** – Known for scraping billions of images from the internet for law enforcement use,
   - **Face++** (by Megvii, China) – Widely used in public surveillance systems.
   - **Amazon Rekognition** – Offers facial analysis and comparison feature.

2. **PREDICTIVE POLICING ALGORITHMS**: Tools like PredPol that forecast where crimes are likely to occur based on historical data[8].

   Examples:

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[6] John McCarthy, *What is Artificial Intelligence?* (Stanford University, 2004).
[7] Simon Chesterman, *We, the Robots? Regulating Artificial Intelligence and the Limits of the Law* (CUP 2021).
[8] Rashida Richardson, Jason M. Schultz and Kate Crawford, 'Dirty Data, Bad Predictions' (2019) 105 Cornell L Rev 133.

- **PredPol** (now known as Geolitica) – One of the most cited predictive policing tools used in the U.S.
- **HunchLab** – A platform that uses historical crime data, socio-economic data, and police activity to forecast crime locations.
- **CompStat** – Not AI in itself, but often integrated with predictive analytics tools for strategic decision-making.

3. **AUTOMATED LICENSE PLATE READERS (ALPRS)**: Devices that can read and analyse thousands of license plates in real time.

   Examples:

- **Vigilant Solutions** – A major provider of ALPR technology in the U.S., often used by police departments.
- **PlateSmart ARES** – Uses AI and video analytics for real-time plate recognition and threat detection.
- **Genetec AutoVu** – Provides mobile and fixed ALPR solutions with analytics.

4. **VOICE AND SPEECH ANALYSIS**: AI can analyse voice stress levels or detect linguistic cues to identify potential suspects or false statements.

   Examples :

- **Nemesysco Layered Voice Analysis (LVA)** – Used for lie detection and emotional profiling.
- **Veritone IDentify** – An AI-powered voice recognition tool used for forensic voice matching.
- **Sonic Analytics** – Offers voice analytics tools for behavioural and emotional detection in interviews.

5. **MACHINE LEARNING IN DATA ANALYSIS**: Algorithms trained on case data to flag suspicious activities, identify crime trends, or link cases.

   Examples:

- **Palantir Gotham** – Used by intelligence agencies and law enforcement to integrate and analyse vast data sets for crime investigation.
- **IBM i2 Analyst's Notebook** – Supports link analysis and crime pattern recognition.
- **Axon Evidence** (formerly Evidence.com) – Uses machine learning for organizing and analysing digital evidence.

While these tools promise faster and data-rich investigations, they also raise questions about their fairness, reliability, and oversight mechanisms.

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CONCEPTUALISING CRIMINAL INVESTIGATION

Investigating crime consists of gathering information to decide if a violation has taken place and identifying the responsible person or persons. It has included gathering evidence such as witness statements, SCAN-AI |crime square

It is established law that criminal investigations should be conducted with and authorized by authority under legal rules and principles of due process. The process should safeguard the rights of everyone involved and all those leading the investigation must remain objective throughout. They are also requirements of fundamental ethical principles. They are also included in international treaties on human rights and local laws of countries.

AI is changing the focus of investigations from reacting to incidents following a crime to proactively taking steps to stop crimes from occurring. However, this new method conflicts with essential legal assumptions if people are singled out for investigation simply because an algorithm says so[9].

THE INTERSECTION OF AI AND CRIMINAL INVESTIGATION

The integration of AI into criminal investigations represents a convergence of law, ethics, and technology. At this intersection, AI offers powerful tools to enhance the efficiency and scope of investigations. For example, AI systems can analyse thousands of CCTV feeds simultaneously, flagging anomalous behaviour far more efficiently than human operators ever could[10].

There are significant hurdles involved in bringing the two technologies together. Using datasets that contain bias can lead to AI making decisions that reinforce existing discrimination. Such a tool could unfairly concentrate surveillance in neighbourhoods with a history of unfair treatment by police. It prompts concerns about whether these technologies deliver accurate results and whether they operate equitably.

In addition, AI is quick, but it cannot provide the situational insight that human officers use when evaluating evidence. Judgments restricted to AI predictions often fail to take account of people's individual intentions, backgrounds and circumstances.

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[9] Andrew Guthrie Ferguson, *The Rise of Big Data Policing: Surveillance, Race, and the Future of Law Enforcement* (NYU Press 2017).
[10] Brent Daniel Mittelstadt et al, 'The Ethics of Algorithms' (2016) 3(2) Big Data & Society 1.

HISTORICAL EVOLUTION OF TECHNOLOGY IN CRIMINAL INVESTIGATIONS

Prior to the development of artificial intelligence, human intuition, witness accounts, and crude forensic methods were the mainstays of criminal investigations. The foundation for empirical approaches in policing was laid in the late 19th and early 20th centuries with the institutionalisation of fingerprint analysis and basic ballistics.[11] More advanced instruments, such as polygraphs and early computerised databases, such as the FBI's Automated Fingerprint Identification System (AFIS), which made its debut in the 1970s, were developed in the years following World War II.[12]

The digital revolution of the late 20th century dramatically altered the landscape of crime and investigation. The proliferation of CCTV surveillance, mobile communication, and data analytics introduced new methods of tracking and surveillance. As cybercrime grew more prevalent, traditional policing tools proved inadequate to handle crimes involving encrypted data, anonymity networks, and digital identities.[13] This growing complexity created a vacuum that AI was primed to fill.

Police departments and national security organisations started making significant investments in AI-powered technologies around the beginning of the twenty-first century. Software for digital forensic reconstruction, social network analysis to map criminal syndicates, and machine learning to identify financial fraud have all become more widespread.[14] The UK's National Crime Agency, for instance, has employed AI tools to analyse encrypted messages and track illicit dark web transactions.[15] These developments marked the transition from passive surveillance and reactive investigation to proactive and predictive policing.

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Early AI applications in law enforcement were heavily criticised in spite of these advancements. Several studies found that AI systems trained on biassed datasets replicated and even exacerbated inequalities in the justice system.[16] The infamous COMPAS (Correctional

[11] Simon A Cole, *Suspect Identities: A History of Fingerprinting and Criminal Identification* (Harvard University Press 2002).
[12] United States Federal Bureau of Investigation, 'AFIS: A Revolution in Identification' (FBI, 1977) https://www.fbi.gov/history/brief-history-of-identification accessed 1 May 2025.

[13] Jonathan Clough, *Principles of Cybercrime* (2nd edn, Cambridge University Press 2015) 54–58.
[14] Ian Kerr and Carissima Mathen, 'Privacy, Law Enforcement and Artificial Intelligence' in Markus Dubber, Frank Pasquale and Sunit Das (eds), *The Oxford Handbook of Ethics of AI* (Oxford University Press 2020) 469.
[15] National Crime Agency, 'AI and Encrypted Crime' (2020) https://www.nationalcrimeagency.gov.uk/what-we-do/crime-threats/cyber-crime accessed 1 May 2025.
[16] Virginia Eubanks, *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor* (St Martin's Press 2018).

Offender Management Profiling for Alternative Sanctions) tool, which is used in the US to assess recidivism risk, has been shown to disproportionately classify African-American offenders as high-risk.[17] The controversy surrounding such tools has spurred extensive academic debate on the ethical permissibility and constitutional compatibility of algorithmic decision-making in criminal justice.

This historical trajectory underscores the importance of contextualising AI within the broader technological evolution of criminal investigations. It also reveals that while innovation has often enhanced investigative capabilities, additionally, it has continuously brought up fresh concerns on accountability, justice, and human rights.

CURRENT APPLICATIONS OF AI IN CRIMINAL JUSTICE

AI applications in criminal justice are no longer hypothetical concepts but tangible tools deployed in various jurisdictions. Their use spans from crime prediction and resource allocation to facial recognition and digital forensics. This section explores these applications in detail and evaluates academic discourse surrounding their benefits and controversies.

1. PREDICTIVE POLICING

Using past data and algorithms, predictive policing forecasts possible criminal activity. To predict where crimes are likely to happen or which people are likely to commit offences, these algorithms usually examine crime trends, locations, and timings. One of the most popular apps, PredPol (Predictive Policing), was initially implemented by the Los Angeles Police Department.[18]

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Proponents contend that by enabling law enforcement organisations to more efficiently allocate resources, predictive policing improves efficiency.[19] Furthermore, it has been proposed that AI can assist in spotting patterns that are hidden from view, allowing for preventative measures.[20] But there are serious issues brought forward by scholarly detractors. PredPol and related

[17] Julia Angwin and others, 'Machine Bias: There's Software Used Across the Country to Predict Future Criminals. And It's Biased Against Blacks' *ProPublica* (23 May 2016) https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing accessed 1 May 2025.
[18] Andrew Guthrie Ferguson, *The Rise of Big Data Policing: Surveillance, Race, and the Future of Law Enforcement* (NYU Press 2017) 104.
[19] Sarah Brayne, 'Big Data Surveillance: The Case of Policing' (2017) 82 *American Sociological Review* 977.
[20] Elizabeth E Joh, 'The New Surveillance Discretion: Automated Suspicion, Big Data, and Policing' (2016) 10(1) *Harvard Law & Policy Review* 15.

programs mostly rely on past crime statistics, which might be contaminated by institutional biases, excessive enforcement in some areas, and ineffective reporting procedures.[21]

Lum and Isaac's empirical study highlighted that predictive policing tools can disproportionately target minority communities because the input data reflects existing structural inequalities.[22] Additionally, these algorithms frequently lack transparency, which makes it challenging for defendants to contest AI-generated evaluations in court.[23] The lack of an accountable framework may make these tools incompatible with the standards of due process and Article 6 of the European Convention on Human Rights guarantees a fair trial.[24]

2. FACIAL RECOGNITION TECHNOLOGIES

Authorities may now compare face features with digital photographs stored in databases thanks to facial recognition technology (FRT), which has become a potent investigation tool. To identify suspects, the London Metropolitan Police Service has deployed Live Facial Recognition (LFR) equipment in public areas.[25] AI-driven facial recognition can process vast image datasets far faster than manual methods, leading to faster suspect apprehension.

FRT has drawn a lot of attention despite these efficiencies. Studies have indicated that facial recognition algorithms may have high error rates, especially when applied to women and people with darker skin tones.[26] According to Buolamwini and Gebru's Gender Shades research, up to 35% of the time, commercial facial recognition software misdiagnosed Black women.[27] These errors raise serious human rights implications, particularly concerning unlawful detention and racial profiling.

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The rules governing the usage of FRT vary greatly from nation to nation. The UK Court of Appeal ruled in Bridges v. Chief Constable of South Wales Police that South Wales Police's use of LFR was unlawful due to inadequate safeguards and effect assessments.[28] The ruling emphasised the necessity of strict regulation and adherence to data protection rules, especially the Data Protection Act of 2018 and the General Data Protection Regulation (GDPR).

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[21] Kristian Lum and William Isaac, 'To Predict and Serve?' (2016) 13 *Significance* 14.
[22] ibid.
[23] Danielle Keats Citron, 'Technological Due Process' (2008) 85 *Washington University Law Review* 1249.
[24] European Convention on Human Rights, art 6.
[25] UK Home Office, 'Facial Recognition Technology and Policing: Position Statement' (2020) https://www.gov.uk/government/publications accessed 1 May 2025.
[26] Joy Buolamwini and Timnit Gebru, 'Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification' (2018) 81 *Proceedings of Machine Learning Research* 1.
[27] ibid.
[28] *Bridges v Chief Constable of South Wales Police* [2020] EWCA Civ 1058.

3. AI IN SURVEILLANCE AND DATA MINING

AI is increasingly used for large-scale surveillance and data mining by law enforcement agencies. AI systems can monitor closed-circuit television (CCTV) footage, extract behavioural patterns, and raise alerts about suspicious activity. This is particularly useful in high-density urban areas or large-scale public events.[29] Furthermore, machine learning algorithms are capable of scraping and analyzing data from social media, telecommunications, and the dark web to identify criminal networks and track illegal transactions.

The benefits of these tools are clear in the context of national security and counter-terrorism. For instance, the U.S. National Security Agency has used AI-based tools for anomaly detection in communications metadata to thwart terrorist plots. However, scholars warn against "surveillance creep," where tools intended for serious crimes are gradually normalised for broader policing purposes, including minor offences and protest monitoring.

Serious privacy concerns are also raised by the growing use of AI surveillance capabilities. Opponents contend that continuous monitoring infringes upon the right to privacy guarantyd by Article 8 of the European Convention on Human Rights.[30] Furthermore, particularly in democracies, such actions may stifle the right to free speech and assembly.

4. AI IN FORENSICS AND EVIDENCE ANALYSIS

AI is also transforming forensic science. Tools powered by AI can perform voice recognition, pattern analysis, ballistic matching, and DNA sequencing more quickly and accurately than human analysts. These technologies are increasingly being used to reconstruct crime scenes, identify potential suspects, and process digital evidence from seized devices.

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AI has proven particularly useful in digital forensics, where it can recover deleted files, analyse metadata, and detect file tampering. For example, Cellebrite, an Israeli firm, offers AI-enhanced forensic software capable of extracting and decrypting data from encrypted smartphones.

While the promise of AI in forensics is substantial, it is not without controversy. Questions have arisen about the scientific validity and reliability of such tools in courtrooms. Courts are

[29] Claire Garvie, 'The Perpetual Line-Up: Unregulated Police Face Recognition in America' (2016) Georgetown Law Center on Privacy & Technology https://www.perpetuallineup.org accessed 1 May 2025.
[30] European Convention on Human Rights, art 8.

beginning to grapple with whether AI-generated forensic analysis meets the *Daubert* or *Frye* standards of admissibility in the U.S. legal system, and their equivalents in other jurisdictions.[31]

The opacity of private AI forensic technologies is another issue. It may be difficult for defendants and their legal teams to contest or validate the evidence used against them if they are not granted access to the algorithms or source code. The adversarial character of criminal trials is weakened by this secrecy, which also runs the risk of going against the equality of arms principle.

OPPORTUNITIES OF AI IN CRIMINAL JUSTICE

While the deployment of AI in criminal investigations raises a variety of concerns, it also presents significant opportunities. These opportunities range from improving the efficiency of investigations to enhancing fairness in legal outcomes and optimising resource allocation within law enforcement agencies. Below, we explore some of the primary advantages AI brings to criminal justice.

- **EFFICIENCY, SPEED, AND ACCURACY**

AI's potential to streamline criminal investigations is perhaps its most well-publicised benefit. Traditional investigative methods can be time-consuming, and often suffer from human limitations such as bias, fatigue, and oversight. AI, on the other hand, can process vast datasets much faster than humans, enabling quicker identification of suspects, patterns, and potential leads. Algorithms used in digital forensics can scan thousands of files within seconds, recovering deleted data or identifying anomalies in encrypted messages.

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For example, AI-powered tools like Palantir have been adopted by law enforcement agencies to analyse large-scale criminal data, cross-checking evidence and tracking criminal activities across jurisdictions. In surveillance, AI technologies such as predictive policing software help authorities respond proactively to crime patterns, potentially preventing crimes before they occur. By predicting high-risk areas and times for criminal activity, police can allocate resources more effectively, reducing crime rates in these hotspots.[32]

Beyond surveillance and predictive policing, AI's application in judicial processes can also expedite legal proceedings. AI systems are capable of sifting through thousands of case files to

[31] *Daubert v Merrell Dow Pharmaceuticals Inc* 509 US 579 (1993); *Frye v United States* 293 F 1013 (DC Cir 1923).
[32] Elizabeth E Joh, 'The Surveillance State: Policing, Crime, and AI in the 21st Century' (2019) 21 *Police Practice and Research* 88

uncover relevant precedents or suggest potential legal arguments. The ability to automate routine tasks such as document review, evidence sorting, and case analysis can significantly reduce the time and cost involved in investigations, enabling law enforcement agencies to direct their resources towards more pressing issues.[33]

- **CRIME PREVENTION AND RESOURCE ALLOCATION**

A further advantage is that AI supports the better use of policing resources and acts as a force to prevent many kinds of crime. By using AI, authorities can get results that show where crimes might take place which helps them focus resources and security ahead of time. Using AI can help discover patterns in the evenins of the actions of burglars or gang members which human officers may miss. Because of its predictive strength, AI in law enforcement has helped decrease crime in cities that use it. Detectives in Los Angeles claim that the city's use of PredPol reduced specific crimes in Los Angeles by up to 40 percent during the first year of its use.[34]

In addition, AI helps in managing resources by relying on up-to-date and predicted information. As a result, AI can spot where police presence is needed more and guide police to make better use of resources in these locations. By doing this, important resources, including police officers and cameras, can help Security the most.

These tools might help to reduce the amount of work involved in crime investigation. If human staff is not enough, AI systems can quickly collect information from the internet, retrieve proof from cellphones and computers and help with interviews. With the help of AI, law enforcement agencies can better deal with preventing crimes and solving those that have happened.[35]

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- **SUPPORTING PROSECUTION AND JUDICIAL PROCESS**

AI may also help improve the process in courts and for prosecutors. A good example of this is when analyzing digital evidence. AI tools are useful for finding important proof in big digital collections, for example, social media posts, emails and other forms of electronic messages. In cybercrime, especially, handling a lot of information at once can be very helpful.

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[33] Michael G. Smith, 'Artificial Intelligence and the Future of Legal Practice' (2019) 23 *Law and Technology Review* 55.
[34] Andrew Ferguson, 'Predictive Policing and the Racialization of Law Enforcement' (2018) 47 *University of Pennsylvania Law Review* 1319.
[35] Elizabeth E Joh, 'Technologies of Surveillance and Control: Data Mining in Policing' (2017) 22 *Police Practice and Research* 61.

It also helps to make the analysis of facts objective during a trial. By studying criminal behaviour, machine learning can predict if an individual might commit another offense, helping judges decide what sentences to give. In the U.S., the COMPAS tool is used to predict if a person might reoffend, but many disagree with its accuracy. It is hoped that these tools will make sentences rely more on facts from evidence than on its creators' opinions or biases.[36]

Further, AI could improve transparency and efficiency in the courtroom. AI systems can analyse legal documents and case precedents, offering recommendations for case law and supporting legal professionals in making informed decisions. This reduces the likelihood of errors in legal judgment and helps ensure more consistent outcomes.

CHALLENGES OF AI IN CRIMINAL INVESTIGATIONS

Even with AI's obvious potential, there are several obstacles to overcome before it can be used in criminal investigations. These include concerns about privacy, legal admissibility, algorithmic bias, and openness. We look more closely at these difficulties below.

I. ALGORITHMIC BIAS AND DISCRIMINATION

One of the main challenges that AI poses to criminal investigations is the issue of prejudice. Implicit biases may be present in past data used to train AI systems due to societal discrimination. Predictive policing technology, for example, have been accused of perpetuating racial profiling and over-policing in minority neighbourhoods.[37] The way these systems are trained often brings back prejudices, with law enforcement targeting communities of color more often in the past. As a result, anticipating higher crime numbers in these locations by AI could support existing biases, even whether the reason is clear or not.

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It has been shown that AI tends to make more errors in recognizing women, young individuals and those who have dark skin. One such case is the Gender Shades experiment that found that facial recognition software from commercial companies misidentified darker-skinned women much more frequently than lighter-skinned men.[38] Such biases are a big challenge for law enforcement, because sometimes misidentification leads to those who have not committed the crime being arrested.

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[36] Sarah Brayne, 'Big Data Policing' (2018) 24 *American Sociological Review* 320.
[37] Michelle Alexander, *The New Jim Crow: Mass Incarceration in the Age of Colorblindness* (The New Press 2010).
[38] Joy Buolamwini and Timnit Gebru, 'Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification' (2018) 81 *Proceedings of Machine Learning Research* 1.

Applying AI in criminal justice could lead to more serious problems of justice inequality. Because of AI, some people classified as high-risk by these algorithms might be from disadvantaged backgrounds, but again, they haven't been convicted. Since we cannot know how decisions are made by AI, people feel it is difficult to question why certain actions are taken which causes those actions to seem unclear and unfair.

II. PRIVACY AND SURVEILLANCE CONCERNS

Another important problem with using AI is how it may affect privacy in criminal investigations. Because many businesses use surveillance technologies such as face recognition and AI-operated cameras, there are serious privacy concerns for people. Admirers say these tools increase safety, but opponents point out they could lead to misuse. People's activities often feel monitored, discouraging them from doing what they want normally. AI can store up large amounts of people's personal data, including their habits, who they talk to and private messages, without them knowing or allowing it.[39]

In R (on Edward Bridges' application) v. Chief Constable of South Wales Police, a UK citizen named Edward Bridges objected to live face recognition because he believed it infringed his privacy and did not understand the purpose of the technology. After the Court of Appeal ruled that using this AI was illegal, it became clear that stricter rules and control are needed for AI police technology.[40]

III. LEGAL ADMISSIBILITY AND EVIDENTIARY CONCERNS

AI evidence appears in court only when both sides are happy with it. Most jurisdictions use evidence rules in criminal trials that say evidence must be relevant, trustworthy and open to being reviewed by both sides. But, because AI-generated evidence is not very clear, evaluating or understanding it can be quite tough. That is, AI algorithms may decide things in a way that's difficult to understand. The fact that AI evidence is not easy to check makes it harder to understand if it is accurate.

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Law courts have begun discussing whether artificial intelligence should take part in criminal proceedings. The use of COMPAS to decide if someone will offend again has led to lawsuits in America. As people are worried AI tools can be biased and hard to check, some are suggesting tighter rules for their use in courts.

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[39] David Lyon, *Surveillance Society: Monitoring Everyday Life* (Open University Press 2001).
[40] *Bridges v Chief Constable of South Wales Police* [2020] EWCA Civ 1058.

COMPARATIVE LEGAL AND POLICY FRAMEWORKS

It is increasingly necessary to have solid legal structures in place to ensure AI is used ethically, fairly and effectively as it is introduced into different global criminal justice systems. Countries have taken different approaches in regulating AI for criminal justice purposes. While one country might emphasise new technologies and protection, another may concentrate on ensuring the rights of its people. This section explains how each model for using AI in criminal justice works and looks at their strengths and weaknesses.

• A FRAGMENTED APPROACH TO AI REGULATION IN THE US

The legal framework for AI in criminal justice in the United States is currently developing and is yet rather disjointed. Although there is no comprehensive regulation that expressly addresses AI technologies in police and surveillance, federal law offers some guidelines on privacy and data protection. For instance, municipal and state laws mainly control the use of AI in predictive policing, creating a patchwork of laws that differ greatly between jurisdictions.[41]

The U.S. has, however, made some strides in regulating the use of AI in criminal justice. The *Artificial Intelligence in Criminal Justice Act*, introduced in Congress in 2020, proposed creating a federal framework for regulating AI tools in law enforcement. This includes creating a centralised body to oversee AI usage in the justice system and ensure that algorithms are transparent, non-discriminatory, and accountable.[42] However, critics argue that such legislation does not go far enough, particularly in terms of addressing racial biases in AI tools used for predictive policing and sentencing.

The U.S. Department of Justice's Ferguson Report, which questioned the opaqueness of the use of AI technologies like COMPAS in risk assessments, is another noteworthy development. The report suggested that people have the right to contest choices made by AI and that such technologies be subject to stricter public scrutiny.[43] Despite these recommendations, federal oversight remains minimal, and much of the regulation surrounding AI use in criminal justice is left to local authorities.

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[41] Megan S. Bender, 'AI in Criminal Justice: U.S. Approaches and Legal Considerations' (2021) 14 *Journal of Law and Technology* 215.
[42] Artificial Intelligence in Criminal Justice Act (2020) 116th Congress (2020).
[43] U.S. Department of Justice, 'Ferguson Report: The Role of Predictive Analytics in Criminal Justice' (2019).

- **EUROPEAN UNION: THE GDPR AND EMERGING AI REGULATIONS**

Compared to the US, the European Union has more stringent regulations regarding AI in terms of data security and privacy. An important law that regulates the gathering, use, and storage of sensitive data within Europe is the General Data Protection Regulation (GDPR). Although there isn't much discussion of AI in criminal justice settings, the GDPR provides a solid foundation for protecting people's rights when automated choices are being made. When decisions are made solely using automated methods, for example, the GDPR requires that any AI employed in criminal justice be transparent and provide individuals with an explanation.[44]

Additionally, the European Commission is developing a comprehensive AI regulation that is anticipated to contain clauses unique to the application of AI in law enforcement and justice. The proposed Artificial Intelligence Act (AI Act) will regulate AI technologies according to their level of risk. Facial recognition and predictive policing are examples of high-risk AI technologies that will be closely examined and need audits and effect analyses.[45]

The EU's regulatory approach to AI places a high premium on protecting people's equality and privacy. Thus, the EU's efforts to stop AI technology from infringing on people's rights or escalating social injustices are exemplified by the GDPR and AI Act. Others contend that conventional legislative frameworks stifle innovation and that industry-specific regulations might be more successful for particular applications of AI in the legal system.[46]

- **CHINA: AI AS A TOOL FOR STATE CONTROL**

China takes a distinctive stance on AI regulation, valuing it primarily as a tool for government control and public safety. China has eagerly adopted AI capabilities for the purposes of crime prevention and public security. Facial recognition and AI-assisted policing initiatives have led to China being described as one of the most monitored nations on earth. China has used AI to track how its citizens live, work and feel, arguably in the name of ensuring public safety. On the other hand, concerns have been raised about how opaque the deployment of such systems is and the implications that this has for individual privacy.[47]

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[44] General Data Protection Regulation (EU) 2016/679, art 22.
[45] European Commission, 'Proposal for a Regulation of the European Parliament and of the Council on Artificial Intelligence' (2021).
[46] Thomas W. Barlow, 'The Ethical and Regulatory Challenges of AI in Law Enforcement' (2020) 12 *Journal of Criminal Justice Ethics* 88.
[47] Xuemin Wang, 'China's Surveillance State: The Intersection of AI and Human Rights' (2020) 47 *Human Rights Review* 159.

The development of artificial intelligence laws in China's criminal justice system is still in its infancy. To encourage the expansion of AI applications for national security, the government has released some recommendations. China's goal to lead the world in artificial intelligence by 2030 is outlined in the Next Generation Artificial Intelligence Development Plan. China has strict data protection rules to regulate the collection and use of such data in AI systems, even though the country lacks specific legislation governing AI. As a result, many claim that the laws are frequently broken and that they put state security ahead of individual liberties.[48]

GLOBAL DIFFERENCES IN LEGAL AND ETHICAL STANDARDS

AI regulations in criminal justice differ from one nation to the next since they reflect a nation's legal traditions, cultural values and policy choices. In the U.S., policymakers are taking a network of piecemeal regulations to safeguard both privacy and innovation, whereas the EU places particular attention on privacy protections and human rights with the GDPR and AI Act. In contrast, the Chinese government relies heavily on AI for state control with less regard for the protection of citizens' privacy and freedoms.

Divergent opinions on the best way to regulate AI in criminal justice highlight how crucial international collaboration is in defining moral principles. A global conference on AI ethics has been scheduled by the UN, which might help guarantee that AI is used responsibly everywhere.[49] However, in order to ensure that AI systems do not worsen societal injustices or infringe privacy, such an agreement would need to strike a balance between the advantages of AI and the need to uphold fundamental human rights.

LEGAL AND ETHICAL CONCEPTS IN AI USAGE

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One major issue with deploying AI in criminal investigations is ensuring that the rule of law is upheld and followed in every action taken by law enforcement. As a result, the use of AI should safeguard individual liberties, operate in an open manner and be held accountable for its decisions and actions.

Key ethical and legal principles include:

[48] China's Personal Data Protection Law (2021).
[49] United Nations, 'Global AI Ethics Guidelines: Moving Towards a Global Convention' (2021).

- Transparency and Explainability: AI decisions should be easily explained and subject to scrutiny by people. “Black-box” models which cannot be interpreted by their creators either, pose special challenges in legal systems.
- Accountability: Liability for mistakes made by AI systems should be easy to determine. egiving complete authority to machines without human involvement may diminish the ability to hold certain individuals legally responsible for resulting actions.
- Fairness and Non-discrimination: AI shouldn't reinforce preexisting prejudices. More and more studies highlight how biased training data can cause AI systems to show signs of prejudice.
- Privacy and Data Protection: Because AI incorporates huge volumes of personal information, its deployment should adhere to data protection legislations like the General Data Protection Regulation (GDPR) in the EU[50].

CONCEPTUAL CHALLENGES AND DEBATES

There are several conceptual and normative challenges that remain unresolved in the use of AI in criminal investigations:

1. The Black Box Problem: AI algorithms, especially deep learning models, are often opaque, meaning their reasoning cannot be easily understood or explained. This contradicts legal principles requiring justification for investigative decisions.
2. Over-reliance on Technology: There is a growing risk that human officers might trust algorithmic results too readily, leading to “automation bias.” This could undermine critical thinking and independent judgment.
3. Data Bias and Quality: AI can only be as good as the data it uses to train. AI will repeat and even magnify biases found in previous crime statistics, such as excessive police in particular districts[51].
4. Consent and Surveillance: Many AI tools operate in public spaces without the knowledge or consent of individuals. This raises significant concerns about mass surveillance and the erosion of civil liberties.

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[50] Regulation (EU) 2016/679 (General Data Protection Regulation).
[51] Kate Crawford and Ryan Calo, ‘There is a Blind Spot in AI Research’ (2016) 538 Nature 311.

5. Global Disparities in Regulation: While the EU has developed relatively comprehensive guidelines on AI and fundamental rights, other jurisdictions have lagged behind. This patchwork approach can create legal uncertainty and may allow for "forum shopping" where agencies choose jurisdictions with the least restrictive laws[52]

COMPARATIVE JURISDICTIONAL PERSPECTIVES

Different jurisdictions have adopted varied approaches to regulating AI in law enforcement:

- **United States:** Agencies like the FBI use AI tools, but regulation is fragmented. There is a lack of federal legislation specifically addressing AI's use in law enforcement.
- **European Union:** The EU AI Act proposes a risk-based regulatory framework, with AI applications in law enforcement being categorised as high-risk and subject to strict oversight.
- **China:** The Chinese government actively integrates AI into law enforcement, including mass surveillance, with minimal transparency or oversight.

These disparities reflect differing cultural, legal, and political attitudes toward privacy, accountability, and state authority.[53]

HUMAN OVERSIGHT AND THE ROLE OF DISCRETION

Despite the growing presence of AI, human judgment remains critical. AI should be viewed as a tool to augment, not replace, human decision-making. Investigators must understand the limitations of these systems and critically engage with their outputs.

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Andrew Ferguson's concept of "algorithmic governance" warns that unchecked reliance on data-driven systems could shift discretion away from trained officers and toward technology providers.[54] This raises questions about democratic accountability and the privatisation of core state functions.

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[52] OECD, *State of Implementation of the OECD AI Principles: Insights from National AI Policies* (2021).
[53] OECD, *State of Implementation of the OECD AI Principles: Insights from National AI Policies* (2021).
[54] Andrew Guthrie Ferguson, *The Rise of Big Data Policing: Surveillance, Race, and the Future of Law Enforcement*

CONCLUSION

The ways in which AI may impact criminal investigations present a diverse mix of potential opportunities and challenges. AI may enable law enforcement agencies to use data more effectively and detect criminal trends more quickly than ever before. At the same time, various pressing legal and ethical issues need thorough examination. Whether innovation can be reconciled with regulation, whether efficacy benefits society without infringing on rights, will influence how the policing sector develops in years to come. For this reason, the utilization of AI in criminal justice calls for strong legal rules, clear ethical guidelines and ongoing monitoring to make sure it partners with, rather than disrupts, the attainment of justice.

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