

The Role of Artificial Intelligence in Enhancing Criminal Justice Systems

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Abstract: *The criminal justice system is in disarray due to the rise in cyberattacks. The essential task facing law enforcement authorities is comprehending the motivation behind crime and taking action against it. The purpose of this study is to demonstrate how artificial intelligence, machine learning, and predictive analysis with soft evidence may be utilized to classify criminal records currently on file, utilize metadata, and forecast crime. Additionally, by using the database to conduct intelligent case investigations, it would undoubtedly assist law enforcement and intelligence agencies. This would help society reduce crime by facilitating speedier and more efficient investigative procedures. By extracting the specific facts from the documents or records, it would also help the analyst monitor the associations and recent activity of different criminal components. Through this research, the prediction of the crime can be understood. Studying this subject makes it clear that the model's odds of making an accurate forecast are increased when it receives appropriate data. The study also attempted to determine the psychosocial aspects of the crime and the probable motivations behind an individual's involvement in it.*

Keywords: Artificial Intelligence, law enforcement, criminal justice, prediction algorithm, accuracy, machine learning, motives, cyber attacks, information technology laws.

1. Introduction

Concerns about the use of artificial intelligence (AI) have been aggressively addressed by the science of criminal procedure law in recent years. Laws do not govern the idea of artificial intelligence (AI); instead, scientific theories, practices, and methodologies that aim to mimic human cognitive capacities through computer systems are used to describe AI. According to the results of information processing from the outside world, several Russian writers depict artificial intelligence as a machine that is able to "act, determine its actions, and evaluate their consequences without full control on the part of a human."¹ Some writers propose that artificial intelligence can be conceptualized as computer programs that include integrated learning mechanisms and resemble the human brain. Said another way, professionals in Russian science and practice agree that artificial intelligence is required for computers to replace humans in complex problem solving, which will surely improve the standard of criminal proceedings and make them more transparent, unbiased, and equitable. This is done to recognize the increasing importance of artificial intelligence in modern law. The necessity of having a theoretical understanding of the artificial intelligence phenomenon is usually emphasized in research literature.

The majority of people define artificial intelligence as a set of theories and techniques used to create machines that can mimic human thought processes. It is advised to categorize artificial intelligence into three groups: strong, moderate, and weak. Strong artificial intelligence will make it possible to simulate the entire world and solve complex problems on its own. Because of algorithmic processing, weak artificial intelligence will improve the functionality of current information systems, whereas moderate artificial intelligence will enable extraordinary performance in a certain field of

study.² Some writers define artificial intelligence in this way. The term "artificial intelligence" (AI) in other scholarly journals describes computer programs that simulate the cognitive functions that people identify with other human minds. First, let's talk about the training and problem-solving aspects.³

2. Background

By integrating AI into the criminal justice system, increased decision-making processes in terms of efficiency, accuracy, and objectivity are promised. It also raises concerns about discrimination, privacy, and potential unintended consequences. Giving a comprehensive review of artificial intelligence and its current applications in criminal justice is the aim of this study.

Artificial Intelligence

AI is a quickly developing area of computer science. The man who is recognized as the creator of artificial intelligence, John McCarthy, coined the phrase "the science and engineering of constructing intelligent machines" in the middle of the 1950s (see sidebar, "A Brief History of Artificial Intelligence"). The ability of a computer to independently observe, react to, and carry out tasks that normally call for human intelligence and decision-making processes is known as artificial intelligence (AI), and it can do so without the direct assistance of a human. One facet of human intelligence is the ability to learn by experience. Machine learning, which simulates this ability and enables hardware and software to learn from experience, uses artificial intelligence (AI).

From the perspective of criminal justice, pattern recognition is essential. Humans are pattern-spotters, thus with practice, they can discern between a wide range of objects, people,

¹ Grishin D, Naumov V (2015) Koncepciya zakona o robototekhnike. <https://vc.ru/flood/20724-law-robots>. Accessed on 04 January 2023.

² Barr A, Feigenbaum EA, The Handbook of artificial intelligence. Vol. 1 (1981)

³ Russell SJ, Norvig P, Artificial Intelligence: A Modern Approach. (Upper Saddle River, New Jersey, 2009)

complex human emotions, facts, and circumstances on a regular basis. The goal of artificial intelligence (AI) in computer software and hardware is to mimic human intelligence. Self-learning algorithms, for example, use data sets to learn how to recognize faces in photographs, perform difficult robotics and computer jobs, understand online shopping habits, recognize medical diseases from difficult radiological pictures, and make predictions about the future.

Applications for AI in Criminal Justice and Public Welfare

Numerous strategies for using AI as a tool for public safety are being investigated. One such AI application that is widely used in both the public and business sectors is facial recognition. For instance, intelligence analysts frequently utilize facial photos to discover and identify people. It takes a lot of time and effort to go through all of the potentially important pictures and videos, and human mistake can occur for a variety of reasons, including fatigue. Machines, in contrast to humans, never tire.⁴

In an effort to improve public safety, the U. S. Department of Transportation is also investigating, creating, and testing automatic traffic accident detection based on video in order to maintain safe and efficient commuter traffic over a range of locations and weather, lighting, and traffic conditions. The use of AI algorithms in the medical industry to analyze radiological pictures could have a big impact on medical forensics and criminal justice in terms of figuring out how and why someone died.⁵

In forensic science, AI algorithms have also been studied in a variety of domains, including DNA analysis. Furthermore, AI is swiftly becoming as a crucial instrument for fraud detection. By consistently adding massive volumes of data to their fraud detection algorithms, online businesses like PayPal are able to both detect and predict unusual trends as well as identify new ones, thus foiling fraudulent attempts.⁶

NIJ's Artificial Intelligence Research Portfolio

The majority of AI research funded by NIJ is focused on four areas: gunshot detection, crime predicting, DNA analysis, and public safety video and image analysis.

i. Public safety video and image analysis

The criminal justice and law enforcement sectors employ video and image analysis to gather data about people, locations, and behaviors to help criminal investigations. However, processing information from images and videos is very labor-intensive and demands a large investment in subject matter expertise. Due to the large amount of data, the rapid advancement of operating systems and smartphones, the scarcity of trained staff with the necessary skills, and the

volume of information, video and image analysis is also prone to human error.

With the help of AI-based technology, we can overcome these shortcomings in humans and carry out tasks expertly. For facial recognition and pattern analysis, traditional software algorithms are restricted to specific criteria like eye color, eye shape, and eye distance. AI video and image algorithms are capable of learning challenging tasks and autonomously generating and building their own complex facial recognition characteristics and parameters, far beyond the capabilities of human intelligence. These algorithms might be able to recognize faces, match objects to people, detect complicated events like crimes and accidents (in progress or after the fact), and identify firearms and other objects.

NIJ has invested in a number of areas to enhance the speed, quality, and specificity of data collecting, imaging, and analysis as well as the caliber of contextual information in response to the demands of the criminal justice and law enforcement sectors. With funding from the NIJ and in collaboration with the FBI and the National Institute of Standards and Technology, researchers at the University of Texas at Dallas are assessing facial recognition by humans and exploring methods for efficiently comparing AI algorithms and skilled facial examiners in order to comprehend the potential speed benefits of AI.

Preliminary findings show that AI-based face recognition algorithms created in 2017 perform on par with human facial examiners when the recognition period is limited to 30 seconds. These results suggest that using AI-based algorithms as a "second pair of eyes" to improve the accuracy of skilled human face examiners could increase productivity.

ii. DNA analysis

From the standpoint of science and evidence processing, artificial intelligence can help the legal system. This is especially true in the case of forensic DNA testing, which has had a notable influence on the criminal justice system during the last few decades. Contact with people or objects can transfer biological material, such as blood, saliva, semen, and skin cells, when committing a crime. DNA technology has advanced along with the sensitivity of DNA analysis, allowing forensic experts to locate and utilize DNA evidence that was previously unusable because of low levels, deterioration, or other reasons. For example, for analysis, laboratories are getting more and more DNA evidence from major crimes, such as cold case homicides and sexual assaults, that dates back decades.

The possibility of DNA detection is expanded by greater sensitivity, which makes it possible to detect smaller amounts of DNA. even at extremely tiny quantities, from multiple donors. These and other advancements are posing new challenges for crime laboratories. For example, using extremely sensitive methods on evidence, it would be possible to find DNA from many offenders or from someone who had nothing to do with the crime. This raises the issue of how to interpret DNA mixes and the need to locate and

⁴ The Intelligence Advanced Research Projects Activity, "Janus," Washington, DC: Office of the Director of National Intelligence, Available at: <https://www.iarpa.gov/index.php/research-programs/janus>. Last accessed on 04 January 2023

⁵ Rachel Z. Arndt, "Artificial Intelligence Takes on Medical Imaging," Transportation Hub (July 8, 2017).

⁶ Eric Knorr, "How PayPal Beats the Bad Guys With Machine Learning," Ahead of the Curve, InfoWorld (April 13, 2015).

deconstruct individual profiles in order to produce vital leads for law enforcement investigations.

iii. Gunshot detection

Another application for AI algorithms is the identification of pattern signatures in gunshot analysis. In one project, Cadre Research Labs, LLC was funded by the National Institute of Justice "based on the observation that the type of firearm and ammunition, the geometry of the scene, and the recording device used influence the content and quality of gunshot recordings" in order to analyze audio files of gunshots from smartphones and other smart devices. The Cadre scientists are creating algorithms that can identify gunshots, tell the difference between shock waves and muzzle blasts, measure the number of firearms present, assign specific shots to particular firearms, and compute probabilities of class and calibre. These algorithms could aid law enforcement in their investigations.⁷

iv. Crime forecasting

Large amounts of data are used in the intricate process of predictive analysis to forecast and develop future outcomes. Police, probation officers, and other professionals who work in the field of criminal justice are primarily responsible for this task and must develop their skills over many years.⁸ AI may be used to discover criminal enterprises, forecast and identify individuals who are at risk from criminal enterprises, and make recommendations on rulings based on a vast amount of legal precedent, social data, and media data. The University of Pittsburgh is researching and creating computational techniques for statutory interpretation in an effort to improve and speed up the work that is done by professionals such as judges, attorneys, prosecutors, and administrative personnel. The NIJ is providing funding for these researchers. It is theoretically possible for a computer algorithm to automatically identify particular language types that are important for interpreting legislation. The objective is to create a proof - of - concept expert system for automatic interpretation of cybercrime.

3. Future of Artificial Intelligence in Criminal Justice

There may be new AI criminal justice applications every day, which might lead to more chances in the future to help the criminal justice system and, eventually, improve public safety. By identifying suspects and stopping crimes before they happen, movement and pattern analysis, video analytics for integrated facial recognition, the detection of people across multiple cameras or locations using closed - circuit television, and object and activity detection can all be used to aid in the investigation of crimes. Owing to the enormous volumes of data generated by devices like cameras, video, and social media, artificial intelligence (AI) may be able to spot crimes that would otherwise go unreported and enhance public safety by investigating potential criminal activity. As

⁷ "Development of Computational Methods for the Audio Analysis of Gunshots at Cadre Research Labs, LLC, NIJ 2016."

⁸ "Effects of Human Factors on the Accuracy of Fingerprint Analysis, National Institute of Justice, Available at: <https://nij.gov/topics/forensics/evidence/impression/Pages/human-factors.aspx>, last accessed on 03 January 2023"

a result, the public will have more faith in the criminal justice system and law enforcement. AI may help crime labs across the nation in tasks like intricate DNA combination analysis. Illegal activity may be prevented, reduced, and punished through the analysis of data trends. Algorithms may also aid criminal justice professionals in ways that were previously unthinkable by preventing victims and potential offenders from becoming criminals. The ability of AI technology to give law enforcement context and situational awareness could also be advantageous, as it would enable police to respond to potentially hazardous circumstances with greater understanding and increase officer safety.

Drones and robots technologies can also be used to monitor public safety, integrated into larger public safety systems, and offered as a secure substitute for putting the public and law enforcement in danger. Drones and robotics may help with recovery tasks, offer useful intelligence, and support criminal justice staff in unexpected ways.

4. Conclusion

AI is pervasive in all facets of our lives, there is no doubt about that. The fields of healthcare, finance, security, and transportation have all seen significant advancements because to machine learning and AI algorithms. It reduces the backlog of court proceedings and promotes innovative decision - making. AI also facilitates impartial and transparent investigation practices for judges and attorneys, which has a big impact on the legal industry. AI cannot take the role of judges and attorneys because it lacks emotional intelligence. This is a limitation of contemporary technology.

It is imperative to resolve concerns about potential violations of the right to privacy, which is protected by the constitution, before AI is widely deployed in Indian law. In order to apply AI, a substantial amount of data must be fed into the system, as there is currently no legal framework for the collection and protection of data that can be fed into the system for legal and judicial use. On the practical side, legal officers and attorneys will need to be properly trained before incorporating AI into the judicial system. Updating a legal database with the latest case laws and judicial trends will always be necessary. Because of this, integrating AI into the legal system necessitates evidence and a methodical approach rather than an arbitrary one.

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